Attachment 6

FLO-2D Pro Build 16.06.16 Software Validation and Verification Report Software Test, (Supplement 1)
(470 pages follow)

FLO-2D PRO BUILD 16.06.16
SOFTWARE VALIDATION AND VERIFICATION REPORT
SOFTWARE TEST

for the

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North Perry, OH 44081

Energy Harbor
168 East Market Street
Akron, OH 44308

Revision 0, Supplement 1

March 20, 2021

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REVISION HISTORY

Revision	Date	Description
0		Initial Issue
0, S1		Supplement 1 of this report is generated to perform validation and verification (V&V) activities of FLO-2D Pro's RAINARF parameter. Use of this software feature was deemed necessary following completion of Revision 0 of this report. Content of this supplement is limited to evaluation of the RAINARF parameter. No changes are made to any of the previously completed V&V content. Numbering of report sections, cases and attachments are provided as continuations from Revision 0 of this report.

I. DESCRIPTION

Software Name, Version, and Build Number:	FLO-2D Pro, Build 16.06.16 Computational Engine (FLO-2D-PRO-Setup.exe) GDS Pro with VC2005-CON.dll (VC2005-CON.dll)
Supplier:	FLO-2D Software, Inc., P.O. Box 66 Nutrioso, AZ 85932, USA
File Date and size:	FLO-2D-PRO-Setup.exe, Build 16.06.16: September 27, 2016, 644,274 kb FLOPRO.exe: October 29, 2016, 10,516 kb VC2005-CON.dll: October 28, 2016, 645 kb The source code is proprietary and not readily available or distributed by the originator.
Software or Service Description:	FLO-2D Pro is a dynamic flood routing model that simulates channel flow, unconfined overland flow and street flow. It can simulate a flood over complex topography and roughness while reporting on volume conservation – the key to accurate flood distribution.

Summary of Conclusions

Based on the results of the RAINARF parameter evaluation documented in this supplement, this FLO-2D Pro software feature is determined to be accurate for modeling spatially varied precipitation events, consistent with the feature's intent as documented in the FLO-2D Pro data input manual. The results of the simulations documented herein indicate the RAINARF parameter functions as expected and sufficiently represents the modeling considerations for which the feature is used in PNPP calculations. It is concluded that the FLO-2D Pro RAINARF parameter is acceptable and accurate.

Non-conformances

This section describes all errors, discrepancies, or weaknesses discovered during testing or reported by the software vendor and the resolution or explanation of each. The applicable features for FLO-2D were verified to be accurate and acceptable for use by comparing hand calculations and/or benchmark cases to FLO-2D functions. Known deficiencies are corrected through the use of new software builds issued by the software vender by downloading them from the vendor's website (https://www.flo-2d.com/download/)

Software error discovery and notifications will be performed in accordance with NOP-SS-1001 (Reference 10). A condition report will be initiated in accordance with NOP-LP-2001, when an error or failure is discovered (as required by Reference 10).

Unresolved Issues and Work Arounds

There are two deficiencies involving FLO-2D Pro's RAINARF parameter identified as a result of the validation and verification activities performed within this supplement. The deficiencies and error resolutions are shown below. The latest "Revisions, Enhancements and Bug Fixes" report from the software vendor does not identify or resolve either issue. This report is provided as Attachment 35 of this supplemental V&V report.

1) The first deficiency identified in this supplemental validation and verification report is in regard to writing the RAIN.DAT file for flooding simulations which utilize the software's RAINARF parameter. As shown in Figures 1a and 1b (both obtained from the FLO-2D Data Input Manual), the data entry for this parameter starts on Line 5 and is shown as the first grid cell for which the RAINARF parameter is assigned. If the user only lists grid cells assigned RAINARF parameter(s), the software will apply the adjusted precipitation value only to those grid cells. All omitted grid cells (those intended to be unadjusted and subject to the total precipitation event, or RTT in Line 2 of Figure 1a) will receive zero precipitation.

   This can be addressed by the user by assigning a RAINARF parameter to each grid cell in the model domain. For grid cells where no precipitation adjustment is desired/intended, the RAINARF parameter should be set to 1, indicating 100% of the rainfall is to be modeled for the grid cell. This is not consistent with the information provided in the FLO-2D data input manual but was validated through trial and error of test simulations during the development of this supplemental report. This technique was used for Test Cases 9a through 9f and is inherently validated through the conservation of mass criteria used in these test cases.

RAIN.DAT File Variables

0 0	Line 1:	**IRAINREAL, IRAINBUILDING**
3.100 0.000 0 1	Line 2:	**RTT RAINABS RAINARF MOVINGSTORM**
R 0.000 0.000	Line 3:	**RAINCHAR = 'R' R_TIME(I) R_DISTR(I) I=1**
R 0.083 0.050	Line 3:	**RAINCHAR = 'R' R_TIME(I) R_DISTR(I) I=2**
R 0.167 0.110	Line 3:	**RAINCHAR = 'R' R_TIME(I) R_DISTR(I) I=3**
R 0.250 0.300	Line 3:	**RAINCHAR = 'R' R_TIME(I) R_DISTR(I) I=4**
R 0.330 0.450	Line 3:	**RAINCHAR = 'R' R_TIME(I) R_DISTR(I) I=5**
R....		
2.0 5	Line 4:	**RAINSPEED IRAINDIR**
2558 0.5	Line 5	**IRGRID(I) RAINARF(I)**
		I = number of rainfall depth-area reduction values

Notes:
Line 4: If MOVINGSTORM = 0, omit this line.
Line 5: If IRAINARF = 0, omit this line

Figure 1a – FLO-2D RAIN.DAT Format

RAIN.DAT File Example

```
0    0
3.100    0.000    1    1
R  0.000      0.000
R  0.083      0.050
R  0.167      0.110
R  0.250      0.300
R  0.330      0.450
R....
2.0   5
2558   0.50
```

Figure 1b – FLO-2D RAIN.DAT Example

2) The second deficiency identified in this supplemental verification and validation report is in regard to modification of the RAIN.DAT file when saving the data and output files through FLO-2D's Grid Developer System (GDS). Each time a simulation is performed, the user must click "Run FLO-2D (Save Files)" (see bottom of Figure 5) in order to run the simulation and save data and output files. When this is done, the RAIN.DAT file is re-written. If changes are made to the rainfall input the file will be modified. If no changes are made the file should not change. However, in both cases, the RAIN.DAT file is inadvertently modified by the program. The first line entry for the RAINARF parameter is deleted.

   This can be addressed by the user via inputting a duplicate line entry for Grid Cell 1 in Line 5 of the RAIN.DAT file. This is shown in Figure 2a and 2b below, as taken from Test Case 9a. Figure 2a shows the intended file data. Figure 2b shows the inclusion of the duplicate line which will be deleted by the software from the RAIN.DAT file upon running and saving the event simulation. This workaround is required each time a simulation is run using the software's RAINARF parameter. If no sacrificial data entry is made, each subsequent run of the model will delete an additional RAINARF data line.

   It should be noted that this software deficiency is most impactful for small scale simulations such as those used in this supplement V&V report as an individual grid cell represents a larger portion of the model domain and the numerically first grid cells are more critical in the output information. Conversely, in complex, large scale simulations such as those of the PNPP LIP domain, the affected grid cells are located on the model boundary and are the most hydraulically remote cells to any point of interest within the calculation. In the PNPP calculations, Grid Cell 1 represents a point over Lake Erie at the lowest elevation in the model. The next approximately 100 grid cells also represent Lake Erie (with elevation data well below that of any point of interest in PNPP flooding calculations). The

next several thousand grid cells represent Lake Erie or the low-lying area downstream of the discharge of the Major Stream which is not influential in the calculation results. As such, a given domain simulation (for a specific calculation) would need to be run thousands of times without data correction to potentially impact any results of PNPP calculations. Therefore, while this is a software discrepancy, it is of no concern to the calculation(s) which utilize the RAINARF parameter at PNPP. Note however that the above described workaround has been used for Test Cases 9a through 9f within this report.

```
R        4.4     0.88
R        4.5     0.9
R        4.6     0.92
R        4.7     0.94
R        4.8     0.96
R        4.9     0.98
R        5       1
 1       1
 2       0.2
 3       1
 4       0.2
 5       0.2
 6       1
 7       0.2
 8       1
 9       1
```

Figure 2a – Partial RAIN.DAT File (Intended Data Entry)

```
R        4.5     0.9
R        4.6     0.92
R        4.7     0.94
R        4.8     0.96
R        4.9     0.98
R        5       1
 1       1
 1       1
 2       0.2
 3       1
 4       0.2
 5       0.2
 6       1
 7       0.2
```

Figure 2b– Partial RAIN.DAT File (Required Data Entry)

Software Applicability Statement

The FLO-2D Pro, Build 16.06.16 (FLO-2D) computer program is a dynamic flood routing model that simulates channel flow, unconfined overland flow, and street flow. It can simulate a flood over complex topography and roughness while reporting on volume conservation – the key to accurate flood distribution.

FLO-2D Pro's main intended use is for calculating stillwater elevations and inundation extents for a flood caused by an LIP and floods caused by lesser precipitation events.

All known deficiencies of the software have been reviewed and have no effect on the accuracy of the data created by this software. By monitoring the software provider's website, notifications of errors (bugs) and updates are evaluated for significance and resolved in accordance with NOP-SS-1001 (Reference 10).

Program Access/Security

The software is maintained on a designated computer as an executable file to prevent unauthorized editing. Access to the computer is password protected to restrict access and deletion.

II. SOFTWARE EVALUATION

What is the safety function of the structure, system, or component (SSC) in which this software or service will be installed or used?

The FLO-2D Pro computer software must accurately make a determination of the potential flood water levels. Under-prediction of the maximum water surface elevation or flood duration could potentially result in some SSCs being under protected against a LIP domain external flooding hazard. Within this V&V report supplement, the RAINARF parameter is tested to ensure this software feature performs as expected during precipitation event simulations.

What is the design function of the software or service? Describe how the software/service functions and how the software/service will impact the results.

The FLO-2D Pro is a combined two-dimensional hydrologic and hydraulic model that is designed to simulate river overbank flows as well as unconfined flows over complex topography and variable roughness, split channel flows, mud/debris flows and urban flooding. Application of the model requires knowledge of the site, the watershed setting, goals of the study and engineering judgment.

The FLO-2D Pro computer program will be used to identify water levels and hydraulic parameters resulting from a flood caused by a LIP event or any other rainfall event at areas of interest.

The RAINARF parameter in FLO-2D Pro is used to simulate spatially variable rainfall. This variable is assigned to selected grid cells within the RAIN.DAT data file as a percentage value expressed in decimal form. The variable serves as depth reduction factor for the selected grid cell(s) allowing a percentage of the rainfall values to be removed from the model domain. Essentially, if the RAIN.DAT file prescribes two inches of uniform rainfall across the model domain, setting the RAINARF variable to 0.5 for a grid cell will yield one inch on that cell.

What are the ways in which the software or service could fail and the effects of these failures? Will these failure modes be obvious?

Improper performance of the software's RAINARF parameter could result in errors. The errors could lead to suspect or incorrect water levels and hydraulic parameters determined by the software. These false water levels and hydraulic parameters could be reported in the calculations. The errors may not be obvious.

Potential Software Errors

Conceptual Error: obtained results are incorrect/inaccurate for calculations performed within the specified range of use.

Arithmetic Error: obtained results are incorrect/inaccurate for calculations performed within the specific range of use, engineering parameters.

Interface Error: obtained results are incorrect/inaccurate when computer program is installed and interfacing with other programs, hardware or operating systems.

III. SOFTWARE CRITICAL CHARACTERISTICS TESTED

Based on the safety function(s) of the SSCs in which the software/service will be used for, what characteristics are considered critical for ensuring that the software/service will perform its intended safety function? Provide a statement of the engineering judgement used to determine the critical characteristics, and the assigned tolerance, parameter or boundary.

FLO-2D Pro includes functions for simulation of two-dimensional overland flow, channel flow, channel floodplain interface, street flow, floodplain surface storage, area modification and flow obstructions, levees, breaching, infiltration, sediment transport (mudflow), evaporation and hydraulic structures (culverts). Functions to develop a two-dimensional grid and to simulate two-dimensional overland flow, channel flow, channel floodplain interface, floodplain surface storage, area modification and flow obstructions, levees and hydraulic structures (culverts) are tested. The GDS Pro module does not contain any critical characteristics but is necessary for execution of the FLO-2D Pro engine.

10CFR21 gives the definition of a critical characteristic as “those important design, material, and performance characteristics of a commercial grade item that, once verified, will provide reasonable assurance that the item will perform its intended safety function”.

Within this supplement, only the RAINARF parameter is validated. This parameter is considered a critical characteristic.

<u>RAINARF Parameter</u>

This FLO-2D Pro parameter is used to simulate spatially variable rainfall. This variable is assigned to selected grid cells within the RAIN.DAT data file as a percentage value expressed in decimal form. The variable serves as depth reduction factor for the selected grid cell(s) allowing a percentage of the rainfall values to be removed from the model domain.

IV. SOFTWARE TESTING METHODLOGY AND CRITERIA

The RAINARF parameter of the FLO-2D PRO computer program is tested consistent with the “Method 1 – Special Tests and Inspection” requirements described in EPRI Technical Report 1025243.

This critical characteristic is examined using simple example problems with the comparison of results with those of simple hand calculations. The RAINARF parameter was identified as a critical characteristic related to software function on the basis that it has potential impact on the intended use of the program results (determination of maximum water surface elevation and flood duration).

The platform compatibility was previously verified in Revision 0 of this report and is therefore not duplicated herein. The hardware compatibility was previously verified in Revision 0 of this report and is likewise not duplicated herein.

The accuracy of the FLO-2D Pro Model’s RAINARF parameter was verified using six test case problems (test case and attachment numbering reflects the continuation of those provided in Revision 0 of this document):

Test Case 9

This test case serves as the “base” case for testing of the RAINARF parameter. This case uses a simple model comprised of 48 grid cells (set in an 8 x 6 array) with 50 ft x 50 ft grid cell size and an additional single row of outflow elements. Precipitation is applied to this model using a linearly-building event comprised of 0.1-hour timesteps. Total precipitation is 7 inches over 5 hours. The lowest row of cells (by elevation) represent the outflow elements with an assigned elevation of 100 feet. Each subsequent row is increased in elevation by 1 foot. The elevation assignments are consistent across each cell in a given row. Within this test case, no RAINARF parameters are assigned. The case is intended to serve only as a “base case” against which the subsequent test cases can be compared. No hand calculations are prepared for this case as the software functionality has been previously validated in Revision 0 of this report for the features used.

Attachment 20 provides the input and data files for this test case including the FPLAIN.DAT file, and RAIN.DAT file. Attachment 21 provides the output files for this test case including the SUMMARY.OUT file, DEPTH.OUT file, MAXWSELEVE.OUT file, FINALDEP.OUT file, OUTNQ.OUT file and VELFP.OUT file.

<u>Test Case 9 - Acceptance Criteria</u>

No acceptance criteria are specified for this base case as the overland flow and rainfall-runoff characteristics have been previously deemed acceptable in Revision 0 of this report. The results of Test Case 9 are used for comparison in several of the subsequent test cases. The results from this test case are also used for reference in modeling adjustments made in some of the following test cases.

Test Case 9a

This test case uses the same FPLAIN.DAT file as Test Case 9. For Test Case 9a the RAIN.DAT is modified via assignment of RAINARF parameters for a select population of grid cells. The RAINARF parameter is set to 0.2. The same population of grid cells are assigned this RAINARF value as in Test Case 9b and 9c. The purpose of this test case is to confirm that the total rainfall input into the model domain is appropriately reduced based on the assigned RAINARF parameter. This is confirmed through comparison of the known input to the computed model outflow.

Data/input files Test Case 9a are provided in Attachment 22. Output files for Test Case 9a are provided in Attachment 23.

<u>Test Case 9a - Acceptance Criteria</u>

The model and hand calculated rainfall runoff transformation must be within 1% to be considered acceptable. 1% is determined to be acceptable based on engineering judgement on the basis that a 1% change in runoff in the model would not adversely affect any intended use application of the result from the model. For this test case, the 1% criterion is applied to the conservation of mass within the model. That is, the known rainfall input (hand calculated based on the RAIN.DAT input file) to the model must be within 1% of the computed outflow and storage as provided in the SUMMARY.OUT file.

Test Case 9b

This test case uses the same FPLAIN.DAT file as Test Case 9. For Test Case 9b the RAIN.DAT is modified via assignment of RAINARF parameters for a select population of grid cells. The RAINARF parameter is set to 0.5. The same population of grid cells are assigned this RAINARF value as in Test Case 9a and 9c. The purpose of this test case is to confirm that the total rainfall input into the model domain is appropriately reduced based on the assigned RAINARF parameter. This is confirmed through comparison of the known input to the computed model outflow.

Data/input files Test Case 9b are provided in Attachment 24. Output files for Test Case 9b are provided in Attachment 25.

<u>Test Case 9b - Acceptance Criteria</u>

The model and hand calculated rainfall runoff transformation must be within 1% to be considered acceptable. 1% is determined to be acceptable based on engineering judgement on the basis that a 1% change in runoff in the model would not adversely affect any intended use application of the result from the model. That is, the known rainfall input (hand calculated based on the RAIN.DAT input file) to the model must be within 1% of the computed outflow and storage as provided in the SUMMARY.OUT file.

Test Case 9c

This test case uses the same FPLAIN.DAT file as Test Case 9. For Test Case 9c the RAIN.DAT is modified via assignment of RAINARF parameters for select population of grid cells. The RAINARF parameter is set to 0.8. The same population of grid cells are assigned this RAINARF value as in Test Case 9a and 9b. The purpose of this test case is to confirm that the total rainfall input into the model domain is appropriately reduced based on the assigned RAINARF parameter. This is confirmed through comparison of the known input to the computed model outflow.

Data/input files Test Case 9c are provided in Attachment 26. Output files for Test Case 9b are provided in Attachment 27.

<u>Test Case 9c - Acceptance Criteria</u>

The model and hand calculated rainfall runoff transformation must be within 1% to be considered acceptable. 1% is determined to be acceptable based on engineering judgement on the basis that a 1% change in runoff in the model would not adversely affect any intended use application of the result from the model. That is, the known rainfall input (hand calculated based on the RAIN.DAT input file) to the model must be within 1% of the computed outflow and storage as provided in the SUMMARY.OUT file.

Test Case 9d

This test case modifies the model files from Test Case 9. The RAIN.DAT file is used from Test Case 9b (RAINARF = 0.5 for selected grid cells). The model is modified through the Grid Developer System (GDS) program interface via application of levees (previously validated in Revision 0 of this document). Levees are assigned to four grid cells within the model domain. The levees are assigned in each of the eight flow directions for these four grid cells to form “pools” within the model. Two grid cells is selected from the population of cells with RAINARF parameters assigned and two are selected from the population of grid cells without the parameter assigned. The purpose of this test case is to confirm that the total rainfall input into the “pool” grid cells reflects the total rainfall that is intended through the RAIN.DAT file. Levee heights are the same for these four grid cells. Levee height is selected to be higher than the unadjusted rainfall input as well as the cell depth from the adjacent cells as determined Test Case 9 (this ensure flow does not overtop the levee from the adjacent cells). Levees are confirmed to not be overtopped by review of the LEVEE.OUT file.

Data/input files Test Case 9d are provided in Attachment 28. Output files for Test Case 9d are provided in Attachment 29.

<u>Test Case 9d - Acceptance Criteria</u>

The model and hand calculated final depth must be within 1% to be considered acceptable. 1% is determined to be acceptable based on engineering judgement on the basis that a 1% change in runoff in the model would not adversely affect any intended use application of the result from the model. That is, the known rainfall input to the levee grid cells must be within 1% of the

computed final depth as provided in the DEPTH.OUT file.

Test Case 9e

This test case modifies the model files from Test Case 9. The model is modified through the Grid Developer System (GDS) program interface via application of levees (previously validated in Revision 0 of this document). Levees are assigned along the west side of a central column of grid cells. Levee height is selected to ensure they are not overtopped during the simulation. This modeling technique essentially separates the model into two halves. The RAIN.DAT file is modified via assignment of RAINARF parameters for the eastern half of the grid cells. The purpose of this test case is to confirm that the total rainfall on each half of the model, when simulating overland flow, equals the output of the outflow grid elements (plus any final topographic storage).

Data/input files Test Case 9e are provided in Attachment 30. Output files for Test Case 9e are provided in Attachment 31.

Test Case 9e -Acceptance Criteria

The model and hand calculated rainfall runoff transformation must be within 1% to be considered acceptable. 1% is determined to be acceptable based on engineering judgement on the basis that a 1% change in runoff in the model would not adversely affect any intended use application of the result from the model. That is, the known rainfall input to the model must be within 1% of the computed outflow as provided in the OUTNQ.OUT file, plus the final topographic storage as reported in the FINALDEP.OUT file.

Test Case 9f

This test case modifies the model files from Test Case 9e. The model is modified through the Grid Developer System (GDS) program interface via application of additional levees, Area Reduction Factors (ARFs) and Width Reduction Factors (WRFs). The model changes are made to each side of model domain (the levee boundary retained from Test Case 9e). The RAIN.DAT file is also retained from Test Case 9e but modified for total precipitation amount (total rainfall is increased from seven inches to 20 inches). The purpose of this test case is to qualitatively confirm that the model responds appropriately to the inclusion of ARFs and WRFs. In particular, output data is viewed for maximum velocity, maximum floodplain depth and time-dependent depth changes. The western side of the model domain (RAINARF = 1) is used as a control comparison to the eastern side of the model domain (RAINARF = 0.5).

Data/input files Test Case 9f are provided in Attachment 32. Output files for Test Case 9f are provided in Attachment 33.

Test Case 9f -Acceptance Criteria

The model must respond consistent with basic hydrologic principles. Specifically, maximum

floodwater depths should be higher on the unadjusted rainfall side, as should velocities through the WRF levee opening. Additionally, model elements should respond consistently on both side of the domain. Specifically, grid cells assigned ARFs of 1 (representing fully blocked grid cells) should not store water (minimum domain depth should occur on these cells) on both sides of the model domain. Additionally, the time-based response of the model should reflect the difference in precipitation input. That is, the western portion of the model should reach a given depth sooner than the eastern portion of the model while the eastern portion of the model should reach equilibrium conditions sooner (drainage after termination of the precipitation input).

V. ACCEPTANCE CRITERIA TESTS AND RESULTS

This section describes the various test cases for the RAINARF parameter and analyzes the results to confirm the acceptance criteria of Section IV are satisfied.

Test Case 9a

For Test Case 9a, conservation of mass is used to confirm the modeled precipitation (as modified through application of RAINARF values) is properly converted to outflow. This is achieved by comparing the known volume of inflow (precipitation, as determined by hand calculation) based on the rain event provided in the RAIN.DAT file for Case 9a to the FLO-2D Pro inflow report (provided in the SUMMARY.OUT file). This is then compared against the outflow report (also provided in the SUMMARY.OUT file). The model domain for Test Case 9a is shown in Figure 3 below. The upper blue-hatched cells represent model outflow elements. Numerical values shown correspond to grid cell number, elevation and Manning n-Values.

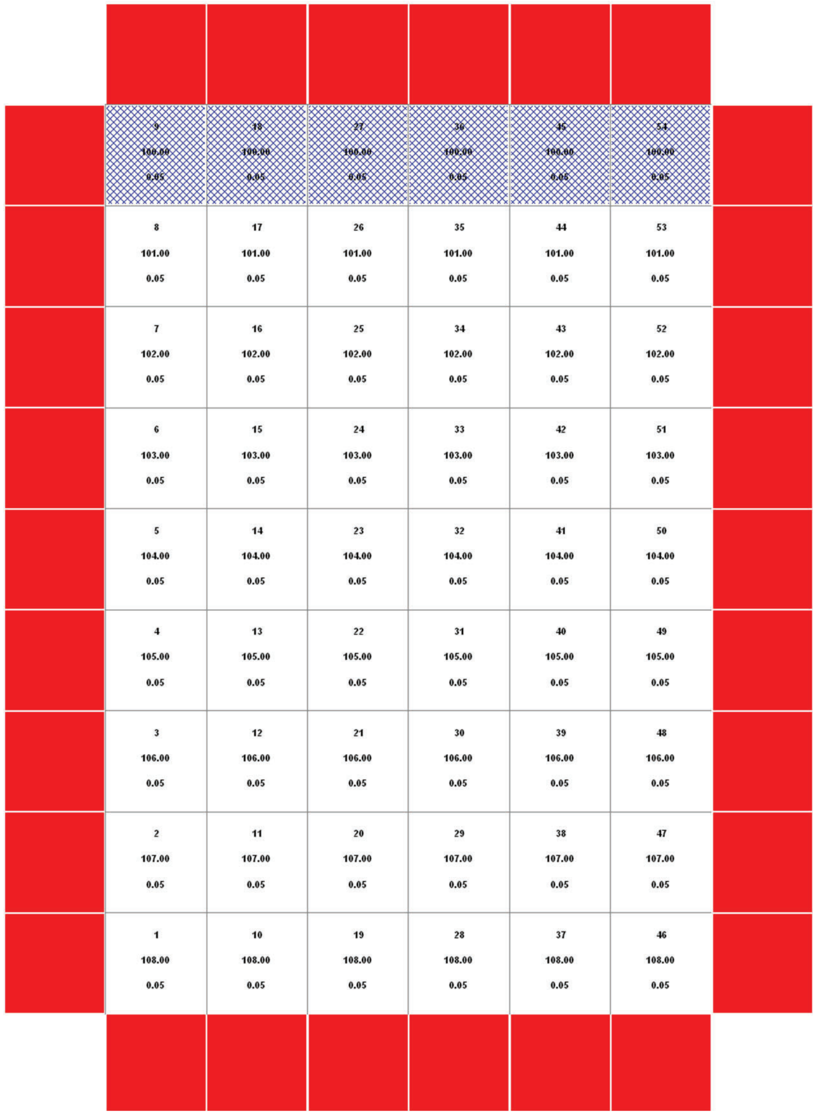

Figure 3 – Test Case 9a GDS Depiction

The total rainfall input for Test Case 9a is seven inches with 24 of the 48 cells being assigned a RAINARF parameter of 0.2. The RAINARF grid cells are shown in Figure 4 below.

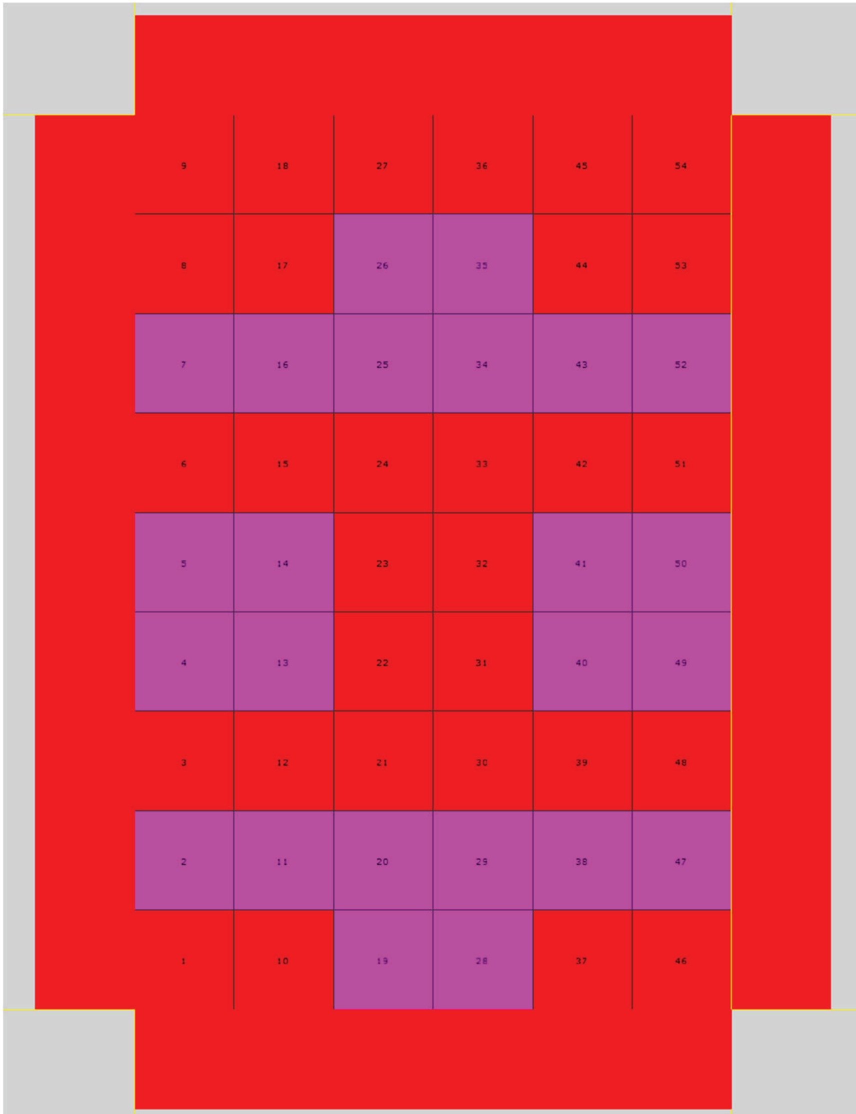

Figure 4 – Cells with RAINARF Parameter Assigned (Test Case 9a)

The FLO-2D Pro model parameters (user-assigned control variables) are shown in Figure 5 below for Test Case 9a. For this test case the simulation duration is set at 10 hours. This provides ample time for the model to reach a steady-state conditions following completion of the precipitation input (five-hour rainfall duration). The Surface Detention Parameter is set to 0.03 ft; this represents the minimum value flood depths must reach before the FLO-2D Pro flood-routing algorithm will take effect. Setting a numerically lower Surface Detention Parameter minimizes floodplain storage during the simulation and maximizes total model outflow. System Component and Physical Processes Switches are set so that only the rainfall functions are modeled in order

to isolate the effects. All other parameters are maintained from the test cases performed in Revision 0 of this report.

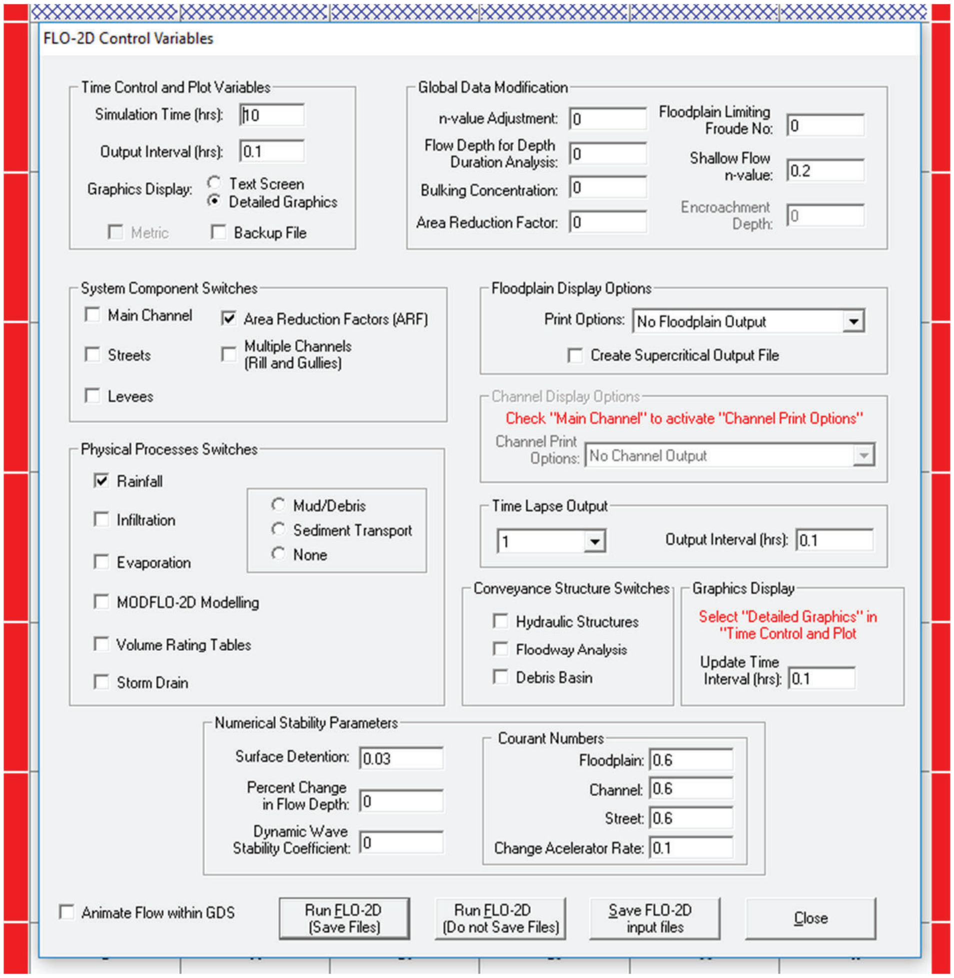

Figure 5 – Test Case 9a Control Variables

From the Figure 4 above and the Test Case 9a RAIN.DAT file (Attachment 22), 20% of the total rainfall value is experienced by 24 of the 48 grid cells while the other 24 cells experience the full rainfall (RAINARF = 1). Since the model domain is comprised of 48 grid cells, each cell being 50 ft by 50 ft, the total rainfall is determined to be:

(0.5833 ft) [(0.2) (24 grid cells) (2,500 ft^2/grid cell) + (1) (24 grid cells) (2,500 ft^2/grid cell)] =

41,997.6 ft^3

FLO-2D Pro reports volume in units of acre-ft. 1 ac-ft is equal to 43,559.9 ft^3. Therefore,

41,997.6 ft^3 = 0.9641 ac-ft

Per FLO-2D Pro SUMMARY.OUT file, total rainfall within the model domain is 0.964 acre-feet. Figure 6 below shows the relevant portion of the Test Case 9a SUMMARY.OUT file. Comparing values shows that the difference is only due to rounding associated the FLO-2D reported value. This simulation clearly satisfies the acceptance criteria specified for Test Case 9a.

```
============================================================================
                    MASS BALANCE   INFLOW - OUTFLOW VOLUME
============================================================================
                           *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                        6.9992 INCHES


                                                                  WATER

RAINFALL VOLUME                                                    0.964

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      0.964

============================================================================
                           *** SURFACE OUTFLOW (ACRE-FT) ***

RAINFALL INTERCEPTION                                        0.000 INCHES


          OVERLAND FLOW                                            WATER

WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                      0.882
                                                               ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         0.964

TOL FLOODPLAIN STORAGE                                             0.082

TOTAL SURFACE OUTFLOW AND STORAGE                                  0.964

============================================================================
```

Figure 6 – Test Case 9a SUMMARY.OUT File Excerpt

Data/input files Test Case 9a are provided in Attachment 22. Output files for Test Case 9a are provided in Attachment 23.

Test Case 9b

For Test Case 9b, conservation of mass is used to confirm the modeled precipitation (as modified through application of RAINARF values) is properly converted to outflow. This is achieved by comparing the known volume of inflow (precipitation, as determined by hand calculation) based on the rain event provided in the RAIN.DAT file for Case 9b to the FLO-2D Pro inflow report (provided in the SUMMARY.OUT file). This is then compared against the outflow report (also provided in the SUMMARY.OUT file). The model domain for Test Case 9b is the same as that of Test Case 9a; therefore, the figure is not repeated.

The total rainfall input for Test Case 9b is seven inches with 24 of the 48 cells being assigned a RAINARF parameter of 0.5. The RAINARF grid cells are the same as Test Case 9a; therefore, the figure is not repeated.

The FLO-2D Pro model parameters (user-assigned control variables) are the same as Test Case 9a, as is the simulation time. Therefore, the discussion and figure are not repeated.

From the Figure 4 above and the Test Case 9b RAIN.DAT file (Attachment 24), 50% of the total rainfall value is experienced by 24 of the 48 grid cells while the other 24 cells experience the full rainfall (RAINARF = 1). Since the model domain is comprised of 48 grid cells, each cell being 50 ft by 50 ft, the total rainfall is determined to be:

(0.5833 ft) [(0.5) (24 grid cells) (2,500 ft^2/grid cell) + (1) (24 grid cells) (2,500 ft^2/grid cell)] =

52,499.9 ft^3

FLO-2D Pro reports volume in units of acre-ft. 1 ac-ft is equal to 43,559.9 ft^3. Therefore,

52,499.9 ft^3 = 1.2052 ac-ft

Per FLO-2D Pro SUMMARY.OUT file, total rainfall within the model domain is 1.205 acre-feet. Figure 7 below shows the relevant portion of the Test Case 9b SUMMARY.OUT file. Comparing values shows that the difference is only due to rounding associated the FLO-2D reported value. This simulation clearly satisfies the acceptance criteria specified for Test Case 9b.

```
==========================================================================
                    MASS BALANCE    INFLOW - OUTFLOW VOLUME
==========================================================================
                          *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                      6.9992 INCHES


                                                              WATER

RAINFALL VOLUME                                               1.205

SURFACE WATER INFLOW HYDROGRAPH                               0.000
                                                          ---------
INFLOW HYDROGRAPHS + RAINFALL                                 1.205

==========================================================================
                          *** SURFACE OUTFLOW (ACRE-FT) ***

RAINFALL INTERCEPTION                                      0.000 INCHES


          OVERLAND FLOW                                       WATER

WATER LOST TO INTERCEPTION                                    0.000

FLOODPLAIN STORAGE                                            0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                 1.123
                                                          ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                    1.205

TOL FLOODPLAIN STORAGE                                        0.082

TOTAL SURFACE OUTFLOW AND STORAGE                             1.205

==========================================================================
```

Figure 7 – Test Case 9b SUMMARY.OUT File Excerpt

Data/input files Test Case 9b are provided in Attachment 24. Output files for Test Case 9b are provided in Attachment 25.

Test Case 9c

For Test Case 9c, conservation of mass is used to confirm the modeled precipitation (as modified through application of RAINARF values) is properly converted to outflow. This is achieved by comparing the known volume of inflow (precipitation, as determined by hand calculation) based on the rain event provided in the RAIN.DAT file for Case 9c to the FLO-2D Pro inflow report (provided in the SUMMARY.OUT file). This is then compared against the outflow report (also provided in the SUMMARY.OUT file). The model domain for Test Case 9c is the same as that of Test Case 9a; therefore, the figure is not repeated.

The total rainfall input for Test Case 9c is seven inches with 24 of the 48 cells being assigned a RAINARF parameter of 0.8. The RAINARF grid cells are the same as Test Case 9a; therefore, the figure is not repeated.

The FLO-2D Pro model parameters (user-assigned control variables) are the same as Test Case 9a, as is the simulation time. Therefore, the discussion and figure are not repeated.

From the Figure 4 above and the Test Case 9c RAIN.DAT file (Attachment 26), 80% of the total rainfall value is experienced by 24 of the 48 grid cells while the other 24 cells experience the full rainfall (RAINARF = 1). Since the model domain is comprised of 48 grid cells, each cell being 50 ft by 50 ft, the total rainfall is determined to be:

(0.5833 ft) [(0.8) (24 grid cells) (2,500 ft^2/grid cell) + (1) (24 grid cells) (2,500 ft^2/grid cell)] =

62,999.9 ft^3

FLO-2D Pro reports volume in units of acre-ft. 1 ac-ft is equal to 43,559.9 ft^3. Therefore,

62,999.9 ft^3 = 1.4462 ac-ft

Per FLO-2D Pro SUMMARY.OUT file, total rainfall within the model domain is 1.446 acre-feet. Figure 7 below shows the relevant portion of the Test Case 9c SUMMARY.OUT file. Comparing values shows that the difference is only due to rounding associated the FLO-2D reported value. This simulation clearly satisfies the acceptance criteria specified for Test Case 9b.

```
===========================================================================
                    MASS BALANCE   INFLOW - OUTFLOW VOLUME
===========================================================================
                          *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                          6.9992 INCHES

                                                                   WATER

RAINFALL VOLUME                                                    1.446

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      1.446
===========================================================================
                          *** SURFACE OUTFLOW (ACRE-FT) ***

RAINFALL INTERCEPTION                                         0.000 INCHES


          OVERLAND FLOW                                            WATER

WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                      1.365
                                                               ---------
FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         1.446

TOL FLOODPLAIN STORAGE                                             0.082

TOTAL SURFACE OUTFLOW AND STORAGE                                  1.446

===========================================================================
```

Figure 8 – Test Case 9c SUMMARY.OUT File Excerpt

Data/input files Test Case 9c are provided in Attachment 26. Output files for Test Case 9c are provided in Attachment 27.

Test Case 9d

For Test Case 9d, conservation of mass is used to confirm the modeled precipitation (as modified through application of RAINARF values) is properly applied to the selected grid cells. This is achieved by comparing the known volume of inflow (precipitation, as determined by hand calculation) based on the rain event provided in the RAIN.DAT file for Case 9d to the FLO-2D Pro final depth report (provided in the FINALDEP.OUT file). The model domain for Test Case 9d is shown in Figure 9 below. The upper blue-hatched cells represent model outflow elements. Numerical values shown correspond to grid cell number, elevation and Manning n-Values. The red octagons are the levee features used in this test case (levee “pools”).

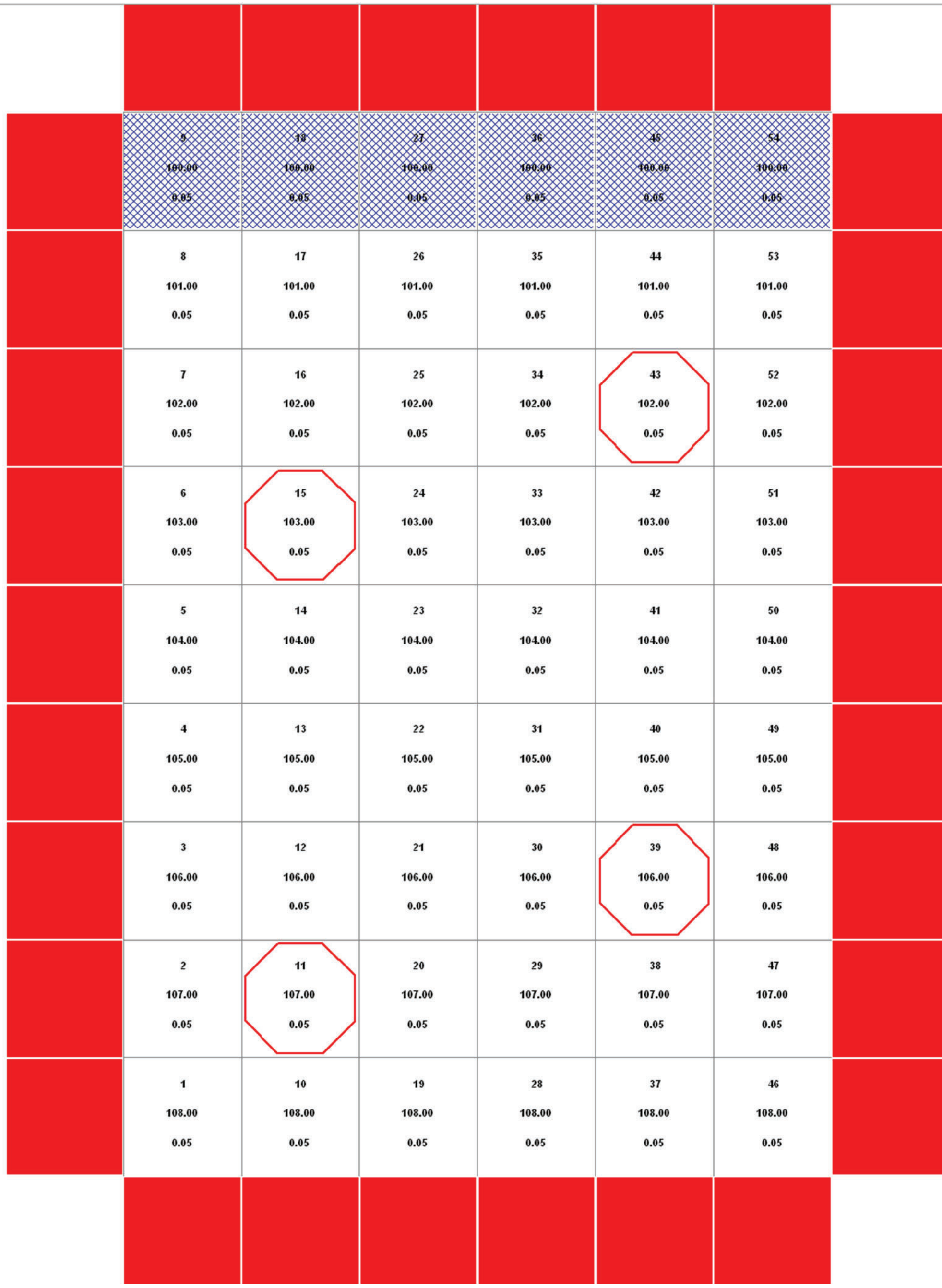

Figure 9 – Test Case 9d GDS Depiction

The rainfall input for Test Case 9d is seven inches with 24 of the 48 cells being assigned a RAINARF parameter of 0.5. The RAINARF grid cells are the same as presented in Figure 4 above. By comparison of Figure 4 and Figure 9, levee pools on grid cells 11 and 43 are subject

to the adjusted rainfall (RAINARF = 0.5) while grid cells 15 and 39 are unadjusted (RAINARF = 1).

The FLO-2D Pro model parameters (user-assigned control variables) are shown in Figure 10 below for Test Case 9d. For this test case the simulation duration is set at 10 hours. This provides ample time for the model to reach a steady-state conditions following completion of the precipitation input (five-hour rainfall duration). The Surface Detention Parameter is set to 0.03 ft; this represents the minimum value flood depths must reach before the FLO-2D Pro flood-routing algorithm will take effect. Setting a numerically lower Surface Detention Parameter minimizes floodplain storage during the simulation and maximizes total model outflow. One System Component Switch is added to reflect the modeling of levees in the Test Case 9d simulation. All other parameters are maintained from the previous test cases.

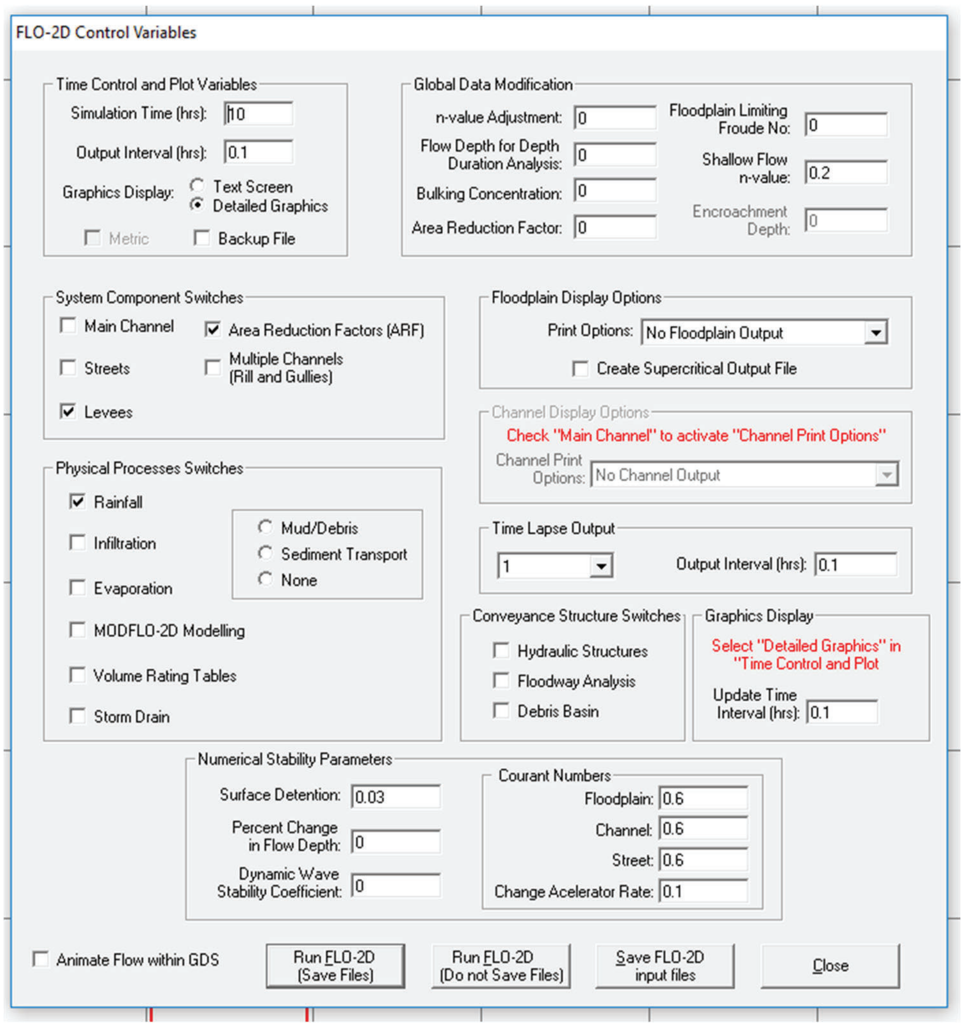

Figure 10 – Test Case 9d Control Variables

From the Test Case 9d RAIN.DAT file (Attachment 28), 50% of the total rainfall value falls on levee pool grid cells 11 and 43 (RAINARF = 0.5) while 100% of the total rainfall value falls on levee pool grid cells 15 and 39 are unadjusted (RAINARF = 1). Since this simulation uses a total rainfall of seven inches, grid cells 11 and 43 should have a final depth of 0.2917 ft and grid cells 15 and 39 should have a final depth of 0.5833 ft.

Per FLO-2D Pro FINALDEP.OUT file, total rainfall on cells 11 and 43 is 0.2916 feet which correctly corresponds to 50% of the total rainfall (7 inches = 0.5833 ft, (0.5 · 0.5833 ft = 0.2917 ft). Grid cells 15 and 39, representing levee “pools” for unadjusted rainfall grid cells, also correctly report accumulation of the full seven in rainfall. Figure 11 below provides this information as shown in the FINALDEP.OUT file. Note that grid cells 9, 18, 27, 36, 48 and 54 all report zero depth in the FINALDEP.OUT file. This is the correct model response as these six grid cells are outflow elements. All rainfall and overland flow are completely removed from the model at outflow elements.

1	250.00	1300.00	0.0295
2	250.00	1350.00	0.0297
3	250.00	1400.00	0.0294
4	250.00	1450.00	0.0298
5	250.00	1500.00	0.0299
6	250.00	1550.00	0.0294
7	250.00	1600.00	0.0296
8	250.00	1650.00	0.0300
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0298
11	300.00	1350.00	0.2916
12	300.00	1400.00	0.0294
13	300.00	1450.00	0.0295
14	300.00	1500.00	0.0300
15	300.00	1550.00	0.5833
16	300.00	1600.00	0.0299
17	300.00	1650.00	0.0298
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0296
20	350.00	1350.00	0.0296
21	350.00	1400.00	0.0294
22	350.00	1450.00	0.0293
23	350.00	1500.00	0.0300
24	350.00	1550.00	0.0294
25	350.00	1600.00	0.0294
26	350.00	1650.00	0.0299
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0294
29	400.00	1350.00	0.0296
30	400.00	1400.00	0.0293
31	400.00	1450.00	0.0299
32	400.00	1500.00	0.0297
33	400.00	1550.00	0.0298
34	400.00	1600.00	0.0295
35	400.00	1650.00	0.0299
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0298
38	450.00	1350.00	0.0298
39	450.00	1400.00	0.5833
40	450.00	1450.00	0.0300
41	450.00	1500.00	0.0299
42	450.00	1550.00	0.0296
43	450.00	1600.00	0.2916
44	450.00	1650.00	0.0296
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0296
47	500.00	1350.00	0.0298
48	500.00	1400.00	0.0295
49	500.00	1450.00	0.0295
50	500.00	1500.00	0.0294
51	500.00	1550.00	0.0299
52	500.00	1600.00	0.0297
53	500.00	1650.00	0.0300
54	500.00	1700.00	0.0000

Figure 11 – Test Case 9d FINALDEP.OUT

Data/input files Test Case 9d are provided in Attachment 27. Output files for Test Case 9d are provided in Attachment 28.

Test Case 9e

For Test Case 9e, conservation of mass is used to confirm the modeled precipitation (as modified through application of RAINARF values) is properly converted to overland runoff. This is achieved by comparing the known volume of inflow (precipitation, as determined by hand calculation) based on the rain event provided in the RAIN.DAT file for Case 9e to the FLO-2D Pro outflow element

summary report (provided in the OUTNQ.OUT file). The model domain for Test Case 9e is shown in Figure 12 below. The thin red lines represent levees. Levees heights are input as four feet above the grid cell elevation for each location. This modeling approach places the top of the levees well above the flood plain thus ensuring the levees will not be overtopped during the simulation. This is confirmed via review of the LEVEE.OUT file for Test Case 9e (Attachment 31).

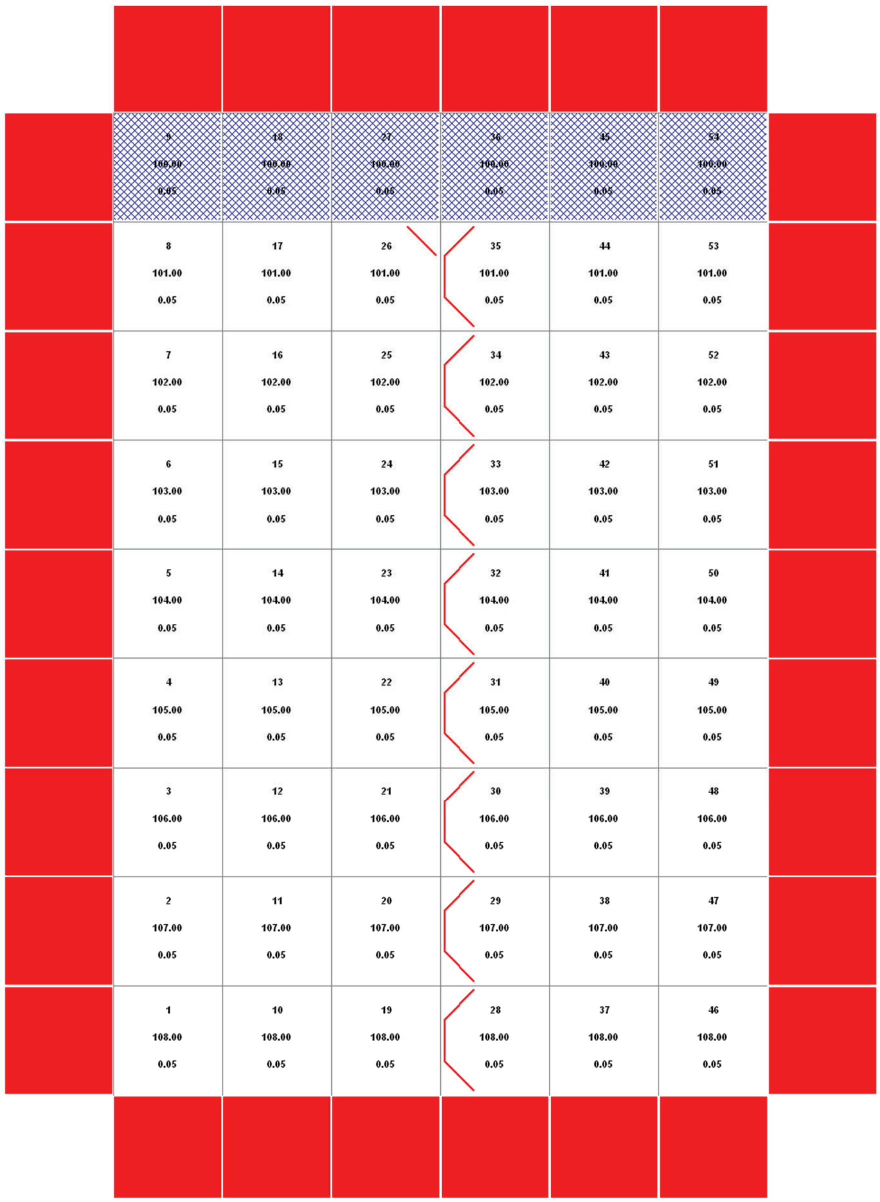

Figure 12 – Test Case 9e GDS Depiction

The FLO-2D Pro computer program determines overland flow through modeling surface water exchange between individual grid cells. Each grid cell is able to communicate with each of the

eight surrounding grid cells through each of the eight compass directions. In Figure 13 below, the central grid cell (Grid Cell 35) exchanges flow with Grid Cell 44 for the east, Cell 36 to the north, and so on. When levees are assigned (or sufficient elevation differences are present), flow exchange is prevented in that direction. When grid cells have different elevations (as is the case for Grid Cells 34 and 35) flow is in the direction of the grid cell slope. Figure 13 shows the direction of permitted flow exchange (green arrows) and flow prohibited by levee placement (orange blunted arrows).

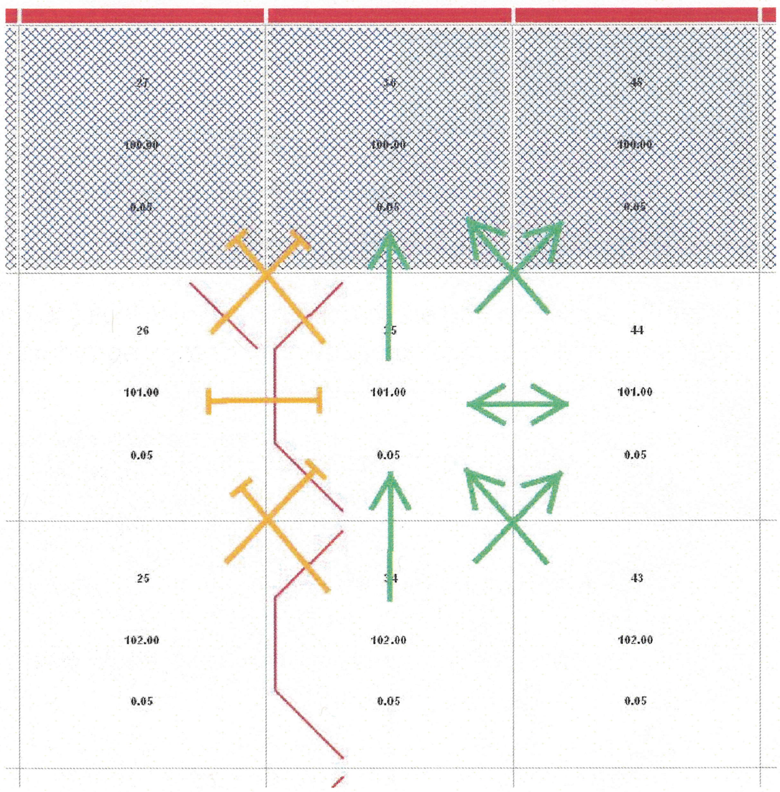

Figure 13 – Test Case 9e Grid Cell Flow Depiction

Based on these levee placements, the model domain is separated into two halves. Levees placed at Grid Cells 26 and 35 prevent flow from the eastern and western halves of the model from discharging to the western and eastern outflow element grid cells, respectively. Therefore, within Test Case 9e, outflow elements on Grid Cells 9, 18 and 27 only receive overland flow from the western half of the model domain while Grid Cells 36, 48 and 54 only receive overland flow from the eastern half of the model domain.

The rainfall input for Test Case 9e is seven inches with 24 of the 48 cells being assigned a RAINARF parameter of 0.5. The RAINARF grid cells are shown in Figure 14 below. By review of this figure and Figure 12, the adjusted cells are those located to the east of the levee wall.

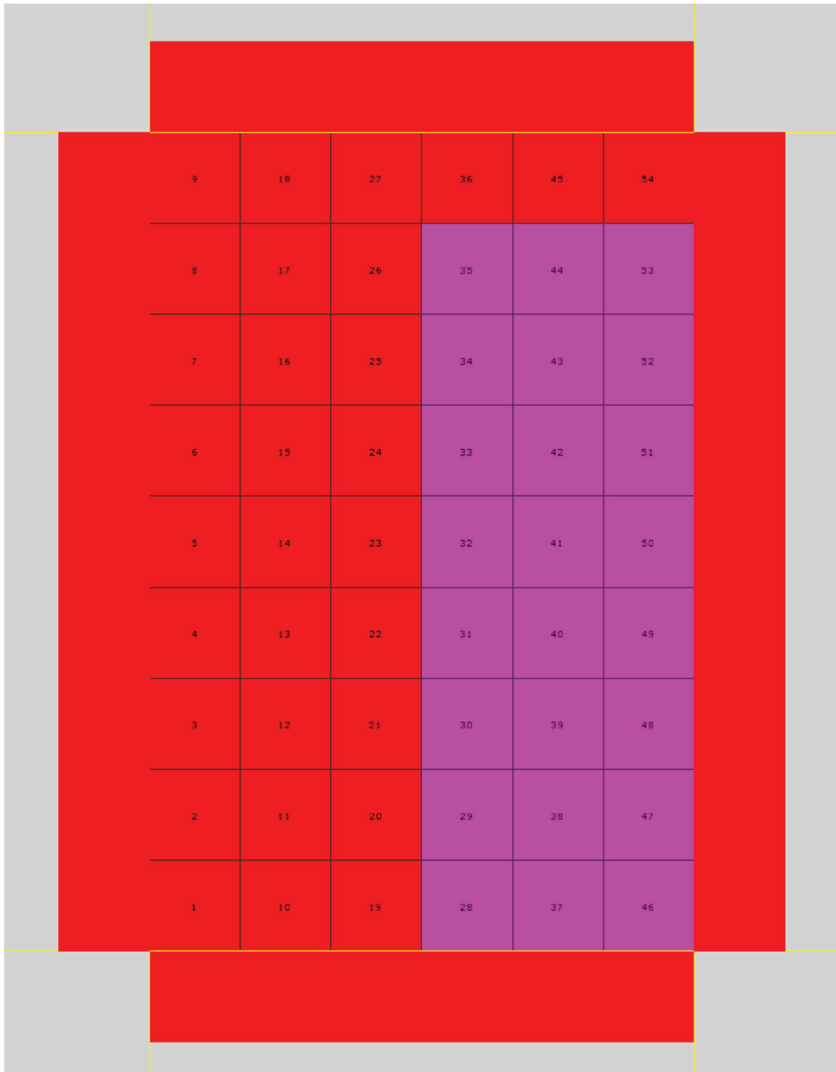

Figure 14 – Cells with RAINARF Parameter Assigned (Test Case 9e)

The FLO-2D Pro model parameters (user-assigned control variables) are shown in Figure 15 below for Test Case 9e. For this test case the simulation duration is set at 10 hours. This provides ample time for the model to reach a steady-state conditions following completion of the precipitation input (five-hour rainfall duration). The Surface Detention Parameter is set to 0.03 ft; this represents the minimum value flood depths must reach before the FLO-2D Pro flood-routing algorithm will take effect. Setting a numerically lower Surface Detention Parameter minimizes floodplain storage during the simulation and maximizes total model outflow. One System Component Switch is enabled to reflect the modeling of levees in the Test Case 9e simulation. All other parameters are maintained from the previous test cases.

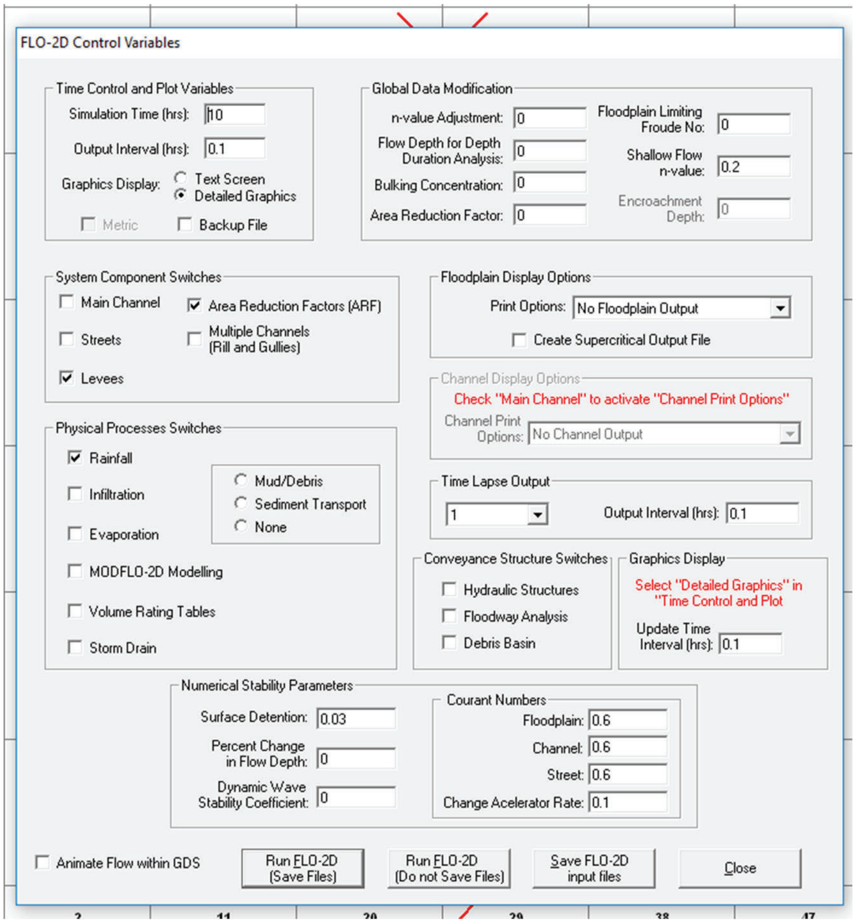

Figure 15 – Test Case 9e Control Variables

From the Test Case 9e RAIN.DAT file (Attachment 30), 50% of the total rainfall value falls on eastern grid cells (RAINARF = 0.5) while 100% of the total rainfall value falls on the cells west of the levee wall (RAINARF = 1). Since this simulation uses a total rainfall of seven inches, grid cells located in the eastern portion of the model domain experience 0.2917 ft of precipitation while grid cells west of the levee wall experience 0.5833 ft. Since the model domain is divided by the levee wall into two equal halves, the total precipitation volume on the eastern and western portions are:

(50 ft)(50 ft)(24 grid cells)(0.2917 ft/grid cell) = 17,502 ft^3 (East)

(50 ft)(50 ft)(24 grid cells)(0.5833 ft/grid cell) = 34,998 ft^3 (West)

From the FLO-2D Pro OUTNQ.OUT file, the outflow element time series are obtained. The data is presented in this output file as outflow discharge (cubic feet per second, CFS) relative to each analytical time step (0.1 hr as shown in Figure 15). This data is plotted in Figure 16 below which shows that the outflow elements for the western portion of the model domain (Grid Cells 9, 18 and 27) experience higher flow rates than those of the eastern portion of the model domain (Grid Cells 36, 45 and 54). This is the expected model response given the RAINARF assignments in the RAIN.DAT file used for Test Case 9e (Attachment 30).

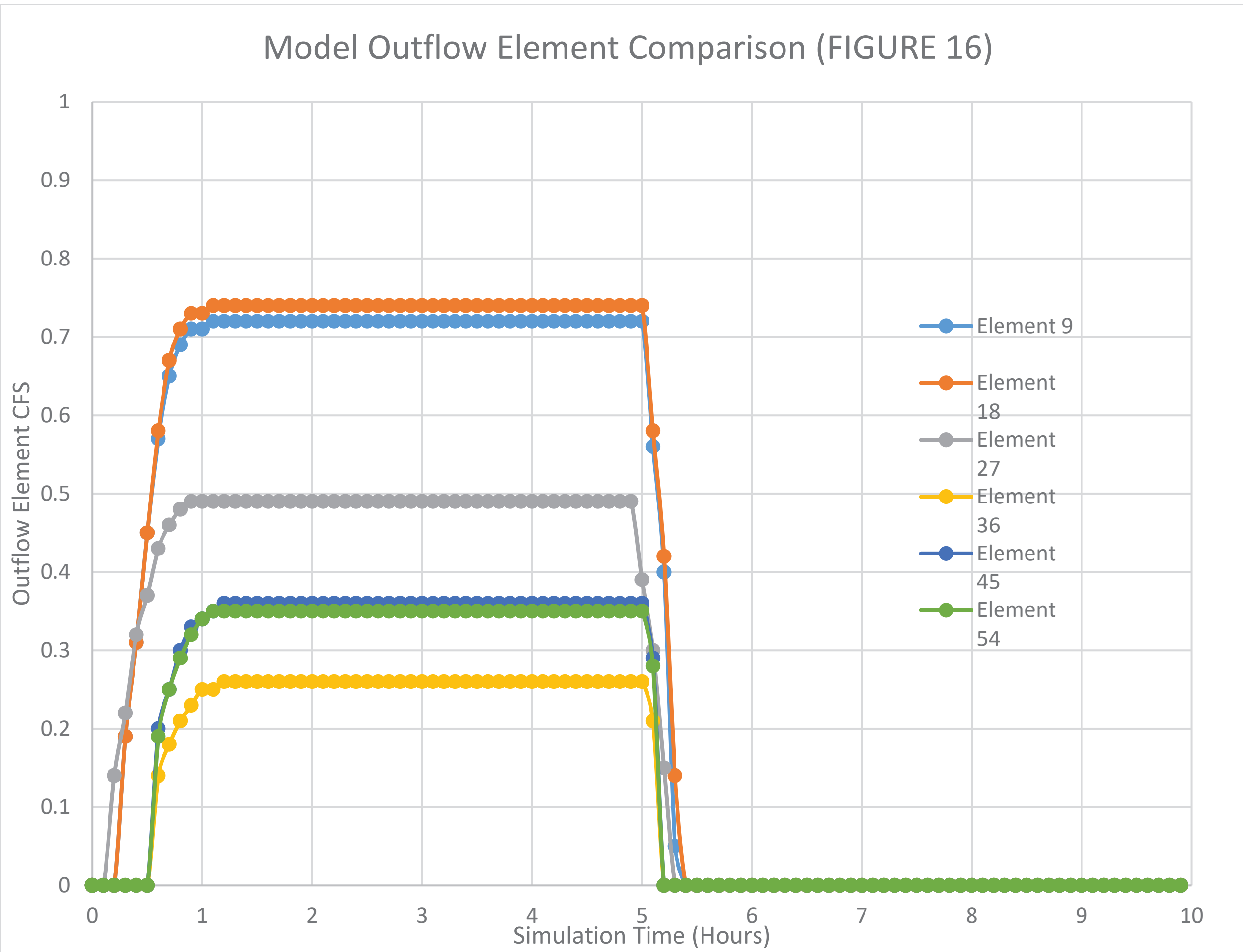

Figure 16 – Test Case 9e Outflow Element Comparison

From this data, the total outflow per grid cell can also be determined. This is accomplished by converting the CFS values to hourly values per timestep, then adding a given timestep result to the cumulative outflow of the proceeding timesteps. The resulting data is presented in Figure 17 below. From this figure, the performance of each outflow element relative to the model domain and rainfall data is evident. Outflow elements draining the western portion of the model

experience higher total outflows (and flow rates) than those of the eastern portion of the model domain.

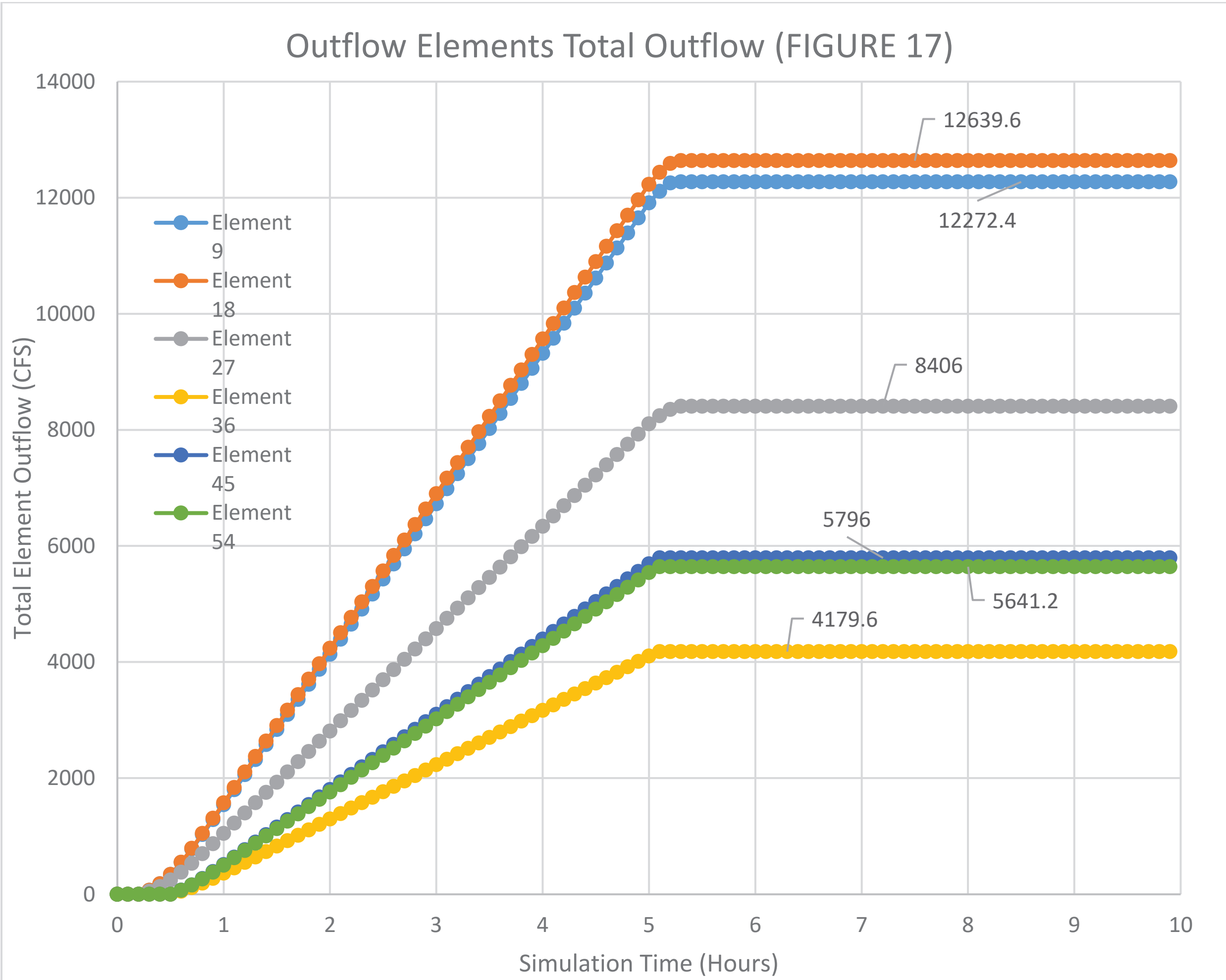

Figure 17 – Outflow Element Outflow Totals (Test Case 9e)

Figures 18 and 19 below show the individual and cumulative outflows of the Test Case 9e simulation for the western and eastern portions of the model domain, respectively. From these figures, the total outflow of the western portion of the simulation is 33,318 CFS. The total outflow of the eastern portion of the simulation is 15,616.8 CFS.

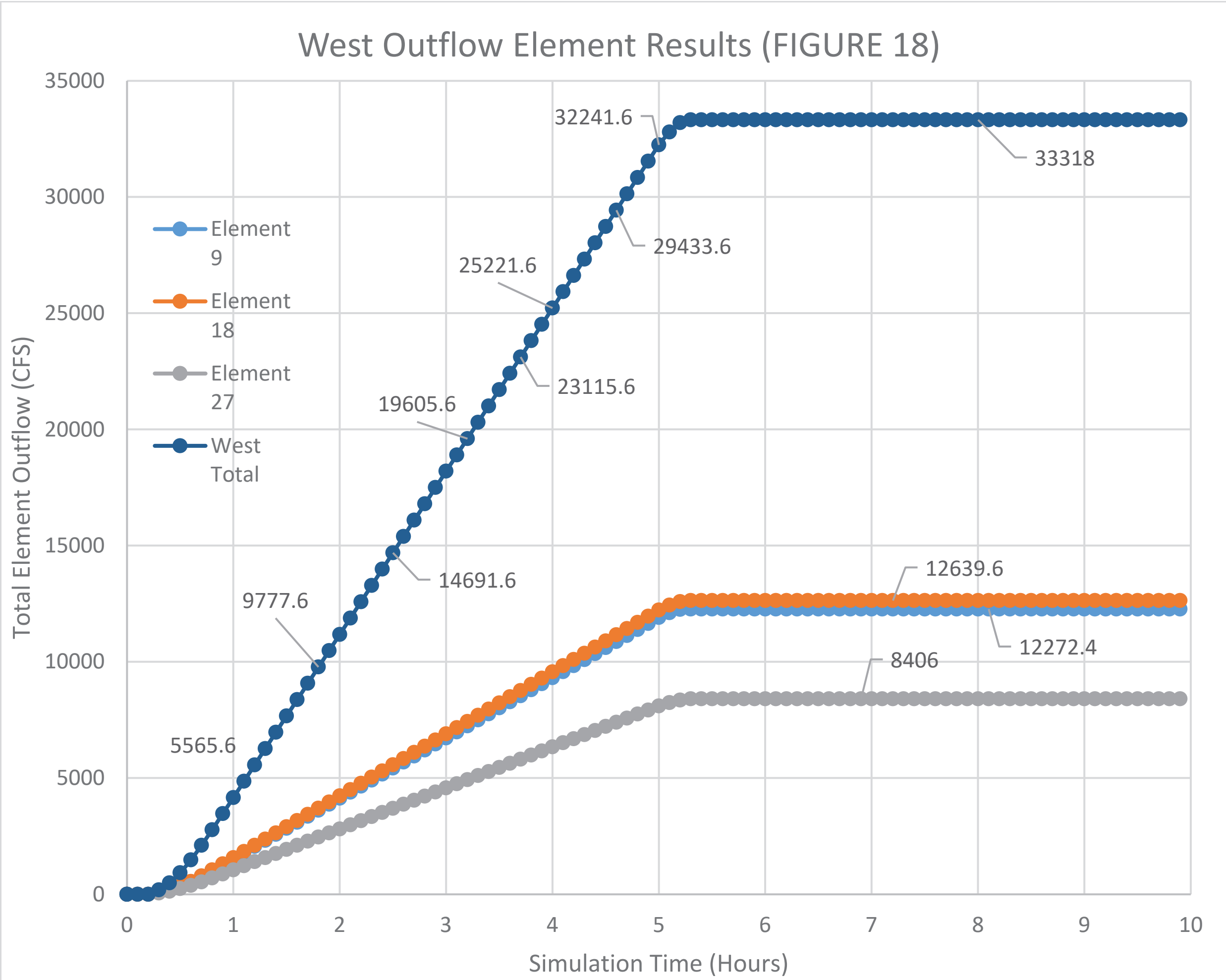

Figure 18 – West Outflow Element Results (Test Case 9e)

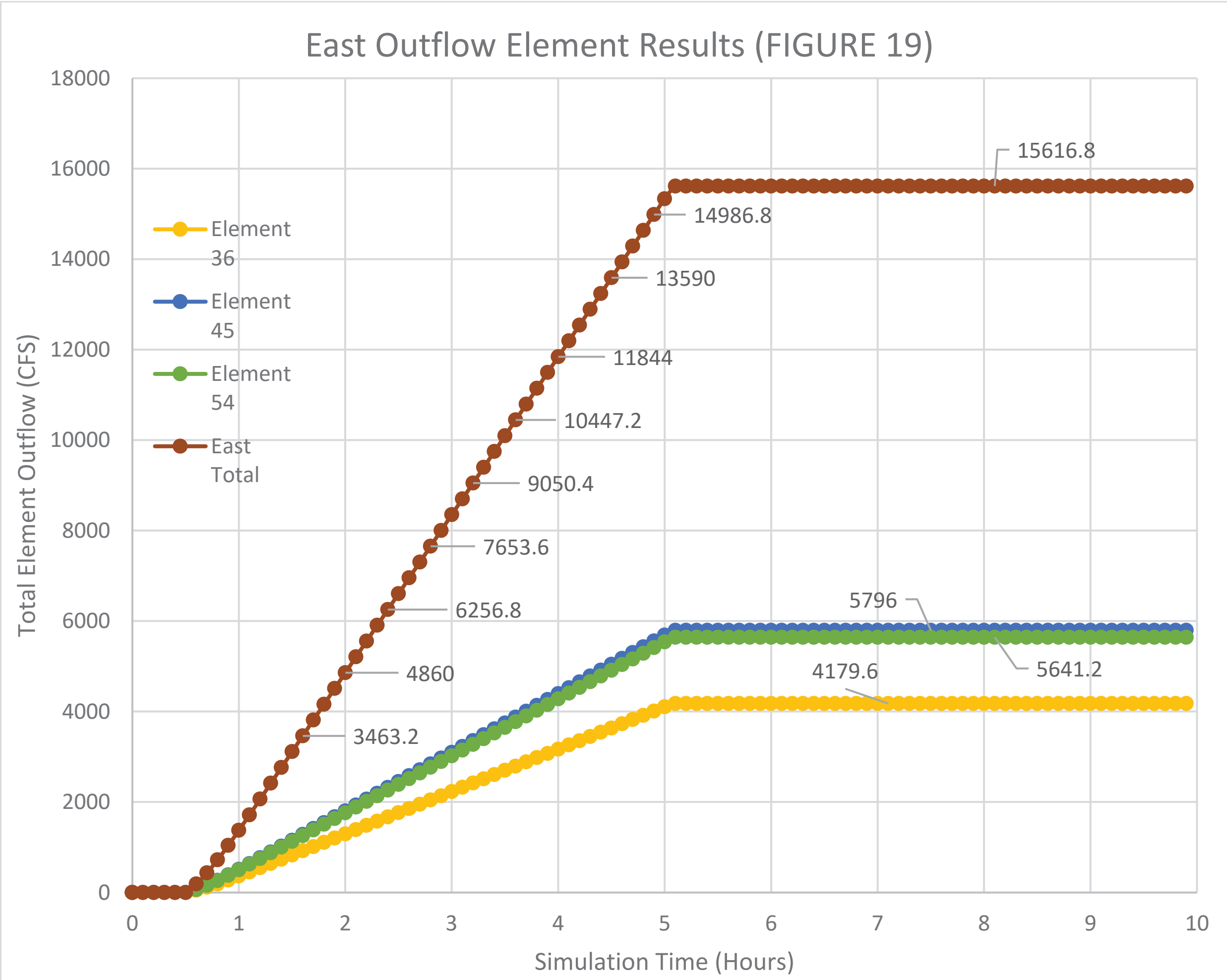

Figure 19 – East Outflow Element Results (Test Case 9e)

As discussed previously, FLO-2D Pro requires the user to assign a Surface Detention Parameter for simulations. The Surface Detention Parameter represents the minimum value flood depths must reach before the FLO-2D Pro flood-routing algorithm will take effect. Because of this, grid cells will not return to a zero-depth condition during a simulation as the flood-routing algorithm will not compute cell to cell flow below this setting (0.03 ft for Test Case 9e). Consequently, final simulation results will always contain flow depth if the cell was assigned rainfall. In this case, the final depth will be approximately equal to the Surface Detention Parameter when the simulation duration is sufficient to permit the model to reach equilibrium and the cells of interest have positive drainage (deeper final depths will be present in topographically depressed areas of storage volumes such as the levee “pools” modeled in Test Case 9d). The Test Case 9e final depth output data is obtained from the FINALDEP.OUT file and presented in Table 1 below. Total model storage for the eastern and western portions of the model, as well as the entire model domain, are provided at the end of Table 1.

Table 1 – Test Case 9e Final Grid Cell Storage Values

	Grid Cell	Final Depth (ft)	Grid Cell Area (ft2)	Stored Volume (ft3)
West Portion of Model (Test Case 9e)	1	0.0296	2500	74
	2	0.0298	2500	74.5
	3	0.0299	2500	74.75
	4	0.03	2500	75
	5	0.0297	2500	74.25
	6	0.0294	2500	73.5
	7	0.0298	2500	74.5
	8	0.0295	2500	73.75
	9	0	2500	0
	10	0.0294	2500	73.5
	11	0.0296	2500	74
	12	0.0294	2500	73.5
	13	0.03	2500	75
	14	0.0295	2500	73.75
	15	0.0298	2500	74.5
	16	0.0296	2500	74
	17	0.0298	2500	74.5
	18	0	2500	0
	19	0.0295	2500	73.75
	20	0.03	2500	75
	21	0.0297	2500	74.25
	22	0.0295	2500	73.75
	23	0.0299	2500	74.75
	24	0.0297	2500	74.25
	25	0.0295	2500	73.75
	26	0.0297	2500	74.25
	27	0	2500	0
East Portion of Model (Test Case 9e)	28	0.0299	2500	74.75
	29	0.0296	2500	74
	30	0.0296	2500	74
	31	0.0297	2500	74.25
	32	0.0295	2500	73.75
	33	0.0296	2500	74
	34	0.0295	2500	73.75
	35	0.0296	2500	74
	36	0	2500	0
	37	0.0296	2500	74
	38	0.0294	2500	73.5
	39	0.0297	2500	74.25
	40	0.0297	2500	74.25
	41	0.0298	2500	74.5
	42	0.0299	2500	74.75
	43	0.0295	2500	73.75
	44	0.0298	2500	74.5
	45	0	2500	0
	46	0.0298	2500	74.5
	47	0.0298	2500	74.5
	48	0.03	2500	75
	49	0.0298	2500	74.5
	50	0.0298	2500	74.5
	51	0.0295	2500	73.75
	52	0.0296	2500	74
	53	0.0296	2500	74
	54	0	2500	0
West Domain Storage (ft3)				1780.75
East Domain Storage (ft3)				1780.75
Total Stored Volume (ft3)				3561.5

Comparing the known total rainfall input (previously determined to the total outflow and storage values,

Western total Outflow = 33,318 ft^3

Western Total Storage = 1780.75 ft^3

Total (West) = 35,098.75 ft^3

Eastern total Outflow = 15,616.8 ft^3

Eastern Total Storage = 1780.75 ft^3

Total (East) = 17,397.75 ft^3

Compared to the known total rainfall per the RAIN.DAT file for the eastern portion of the model domain, 34,998 ft^3, the percent difference is determined to be

(35,098.75 - 34,998) / 34,998 = 0.0029 = 0.29%

Compared to the known total rainfall per the RAIN.DAT file for the western portion of the model domain, 17,502 ft^3, the percent difference is determined to be

(17,397.75 - 17,502) / 17,502 = 0.0059 = 0.59%

Based on the above evaluation, the simulation for Test Case 9e satisfies the acceptance criteria of less than or equal to a 1% percent difference. Additionally, the results from Test Case 9e show that application of the RAINARF parameter has effectively no impact on the accuracy of the computer simulation as the comparison between both adjusted and unadjusted rainfall to runoff transformations show very accurate correlation between the known rainfall input and total output and storage. Based on the percent differences above, the acceptance criteria for Test Case 9e are satisfied.

Data/input files Test Case 9e are provided in Attachment 31. Output files for Test Case 9e are provided in Attachment 31.

Test Case 9f

For Test Case 9f, the model for Test Case 9e is modified (FPLAIN.DAT) via the Grid Developer System (GDS) interface for FLO-2D Pro. The Test Case 9f model domain is modified via the assignment of Area Reduction Factors (ARFs), Width Reduction Factors (WRFs) and additional levees. The model domain for Test Case 9f is shown in Figure 20 below. Grid Cells 14 and 41 are assigned an ARF of 1, representing a fully blocked grid cell. This assignment prohibits overland flow to occur through these grid cells. Given the structure of the model for this test case, water is required to flow from the southern grid cells through Grid Cells 5 and 23, and 32 and 50. The full model length levee feature from Test Case 9e is retained in this test case. Therefore water is not permitted to flow between Grid Cells 23 and 32. ARFs are also assigned to Grid Cells

5, 23, 32, and 50. For these four grid cells, the ARF parameter is set to 0.5, representing a 50% reduction in flow area.

Grid Cells 5 and 50 are also provided with levees (set at four feet above the grid cell elevations) in the northwest and northeast directions. Therefore flow through these grid cells is required to occur only in the north direction (flow east and west is blocked either by the adjacent fully blocked grid cell (ARF = 1) or the model domain boundary which function as an indefinitely high wall. Additionally, the elevation difference between Grid Cells 4 and 5, and 49 and 50 prevents north to south flow). In this single open direction Grid Cells 5 and 50 are also assigned WRFs of 0.5 which serves to limit the flow area in the northern direction.

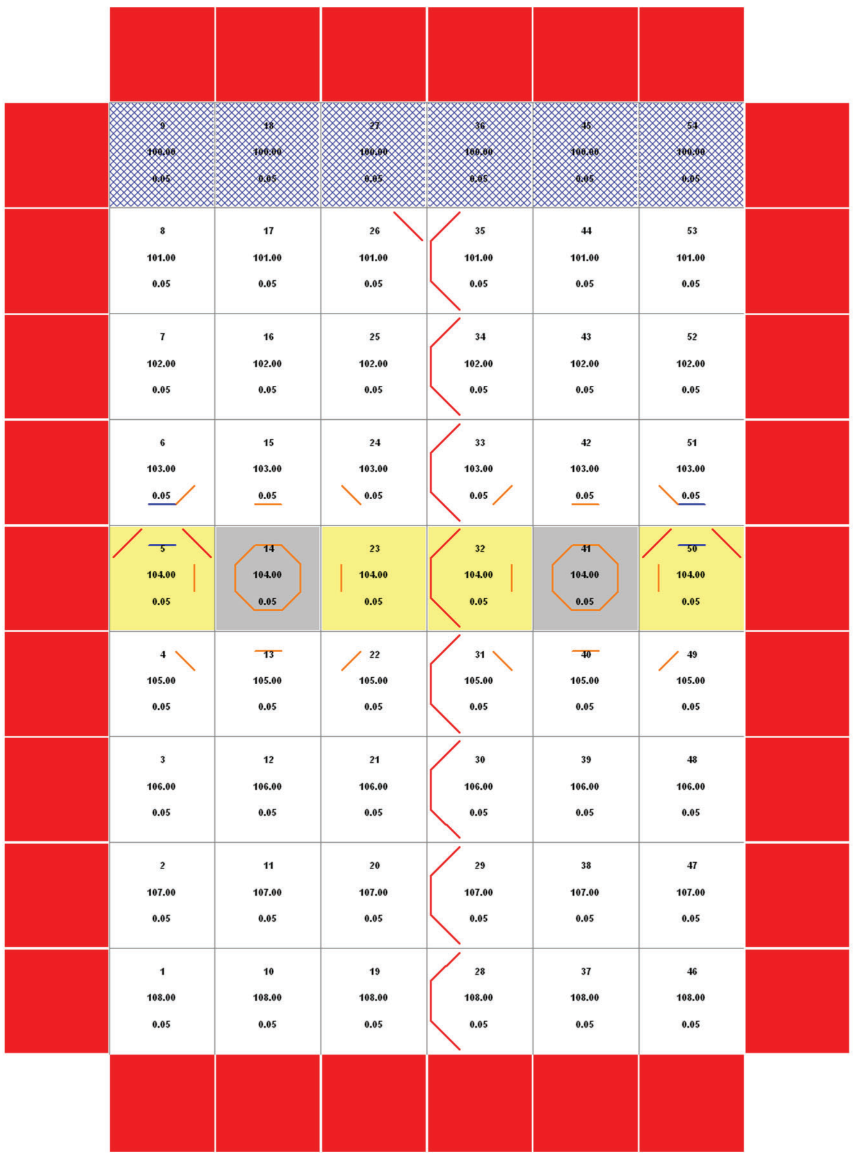

Figure 20 – Test Case 9f GDS Depiction

The RAIN.DAT file retains the time distribution and RAINARF parameters from Test Case 9e. However, the total precipitation is increased from seven inches to 20 inches. This change is made to provide a larger range in output data (larger differences in depth and velocity between the western and eastern portions of model domain). The Test Case 9f RAIN.DAT file is provided in Attachment 32.

For Test Case 9f, the validation and verification (V&V) method is qualitative. Based on results of the previous test cases in this supplement and those of Revision 0 of this report, the individual parameters are already quantitatively acceptable. For this test case, the results are visually rendered using the Mapper++ program. Observations are provided for the parameters reviewed.

The FLO-2D Pro model parameters (user-assigned control variables) are the same as for Test Case 9e (see Figure 15).

From Figure 21 the cells with the maximum floodwater depths during the simulation are determined to be 5 and 50. These are the grid cells assigned levee walls and WRFs which restrict the northern cell discharge resulting in higher reported depths. Similarly, as expected, the flow out of Grid Cells 5 and 50 to Grid Cells 6 and 51 respectively, experience the highest simulation velocities as shown in Figure 22 and as reported in the VELTIMEFP.OUT file (Attachment 33).

The time-based depth values shown in Figures 21a through 21o below also confirm the model is responding as expected to the assignment of RAINARF parameters. Both sides of the model domain respond dynamically to the precipitation input with the western portion of the model (unadjusted rainfall, RAINARF = 1) reaching given depths sooner relative to the eastern portion of the model (RAINARF = 0.5). Both portions of the model reach equilibrium at approximately 36 minutes into the simulation (Figures 21e and 21f, inflow matching outflow). Equilibrium is maintained until five hours into the simulation (corresponding to the end of the precipitation input) at which point the model responds dynamically to overland drainage effects. For approximately 30 minutes after the termination of precipitation input (5h 30m), the domain floodwater depths decrease and approach the Surface Detention Parameter value. The eastern portion of the domain (RAINARF = 0.5) reaches given depths sooner (expected given the reduced rainfall accumulation) and reaches an “empty” condition (depths correspond to the Surface Detention Parameter) prior to the unadjusted western portion of the model (Figures 21k, 21l and 21m). The minimum depths remain for the remainder of the simulation, approximately equal to the Surface Detention Parameter value used in this Test Case (Figures 21n and 21o).

Based on the above, the model is determined to function correctly based on the inputs provided and demonstrates the expected difference in dynamic response given the assigned RAINARF parameters in Test Case 9f.

Data/input files Test Case 9f are provided in Attachment 31. Output files for Test Case 9f are provided in Attachment 32.

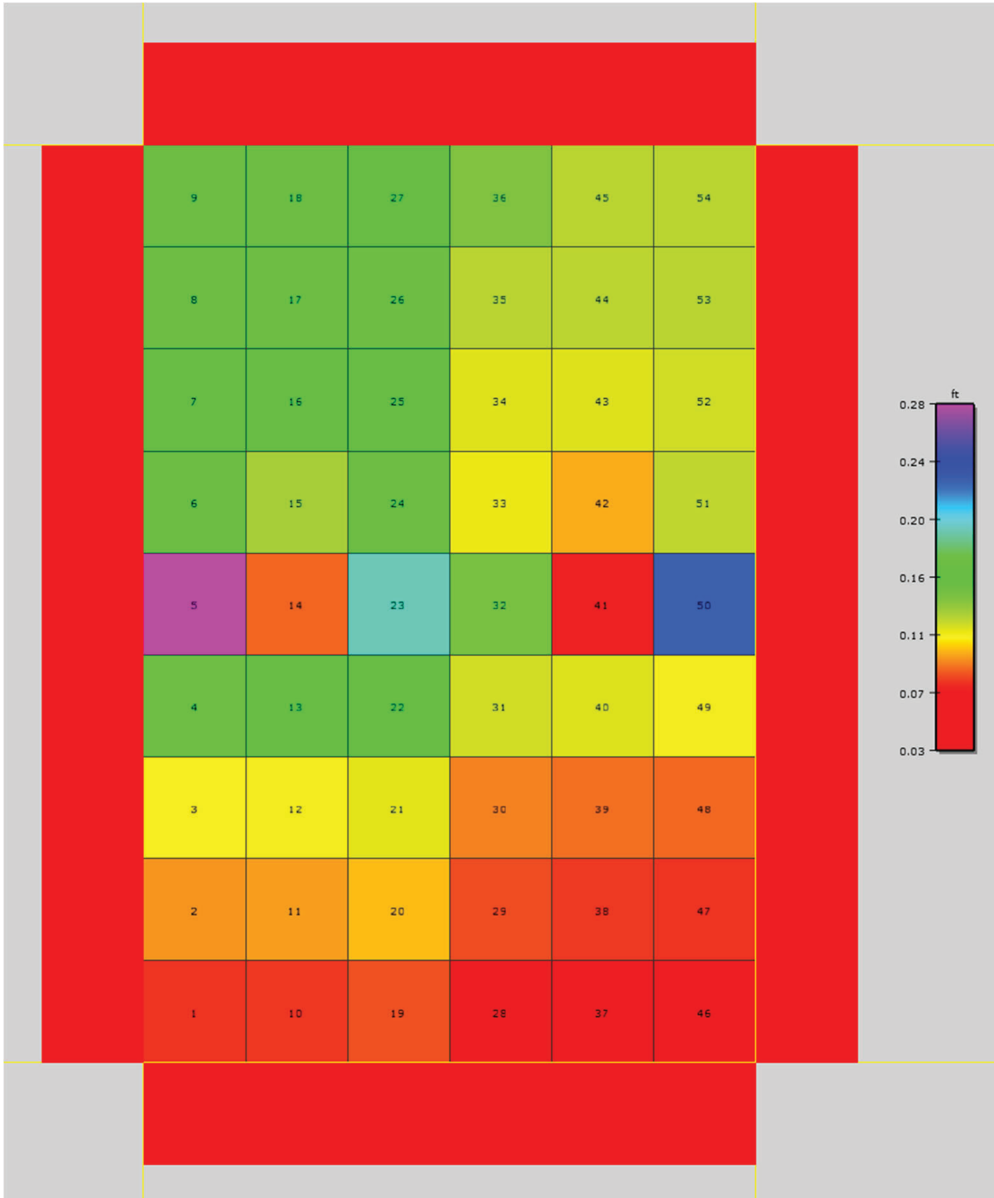

Figure 21 – Max Flow Depth for Test Case 9f

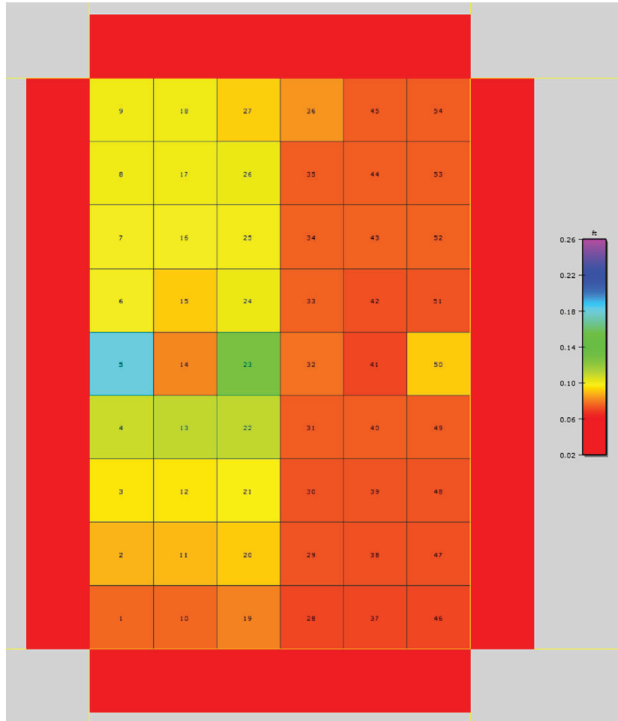

Figure 21a – Flow Depth at 0h 12m (Test Case 9f)

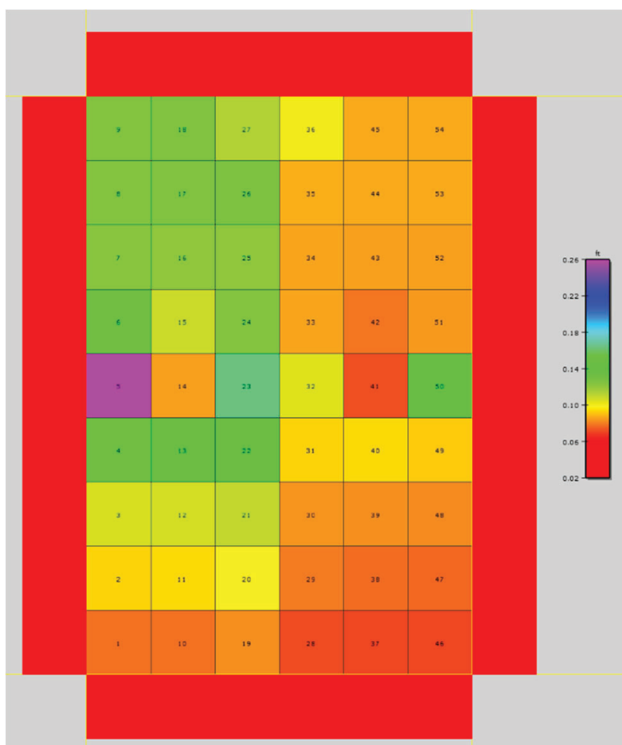

Figure 21b – Flow Depth at 0h 18m (Test Case 9f)

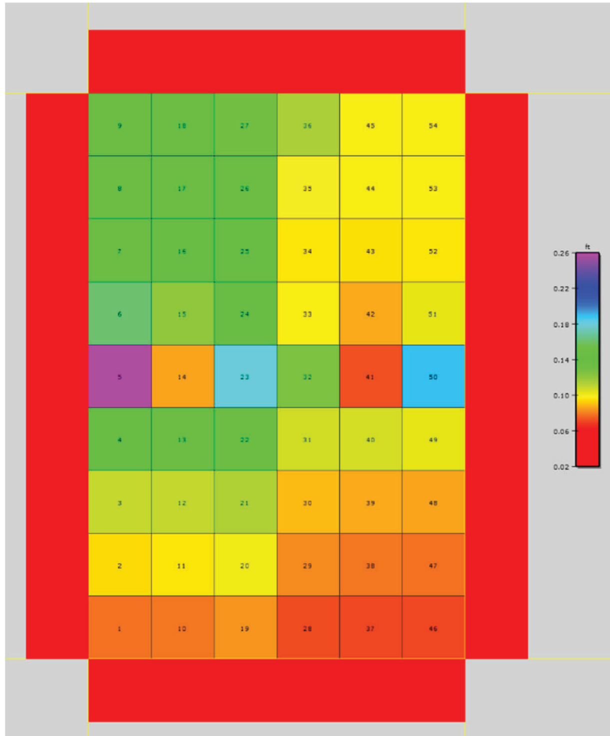

Figure 21c – Flow Depth at 0h 24m (Test Case 9f)

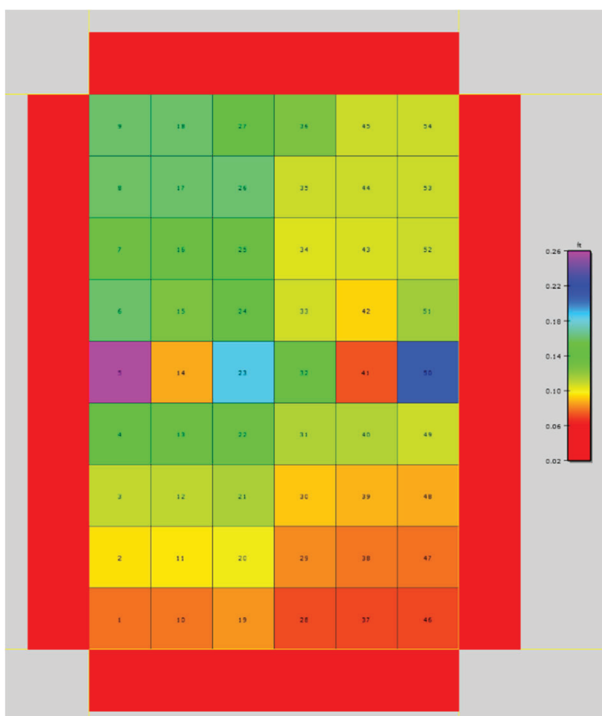

Figure 21d – Flow Depth at 0h 30m (Test Case 9f)

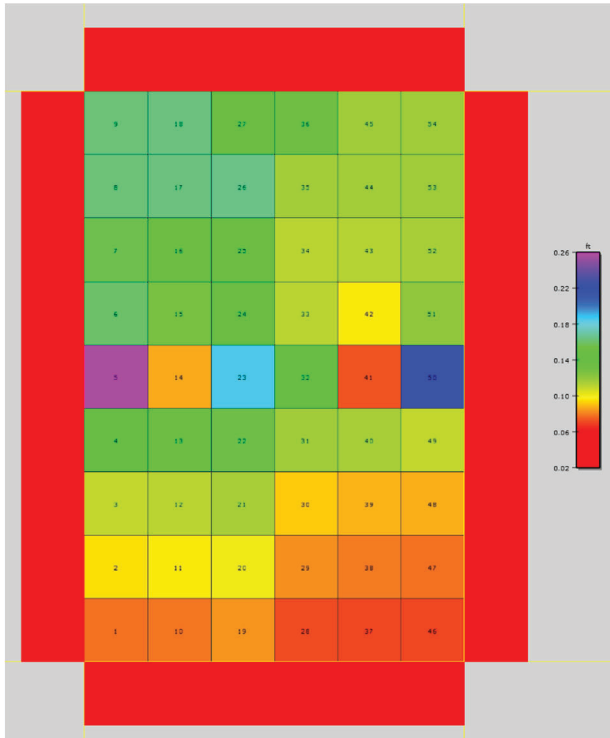

Figure 21e – Flow Depth at 0h 36m (Test Case 9f)

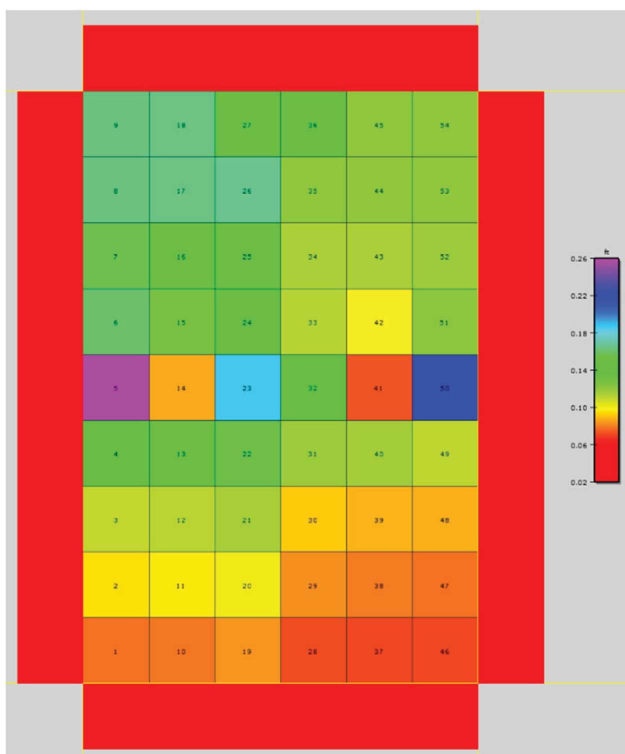

Figure 21f – Flow Depth at 0h 42m (Test Case 9f)

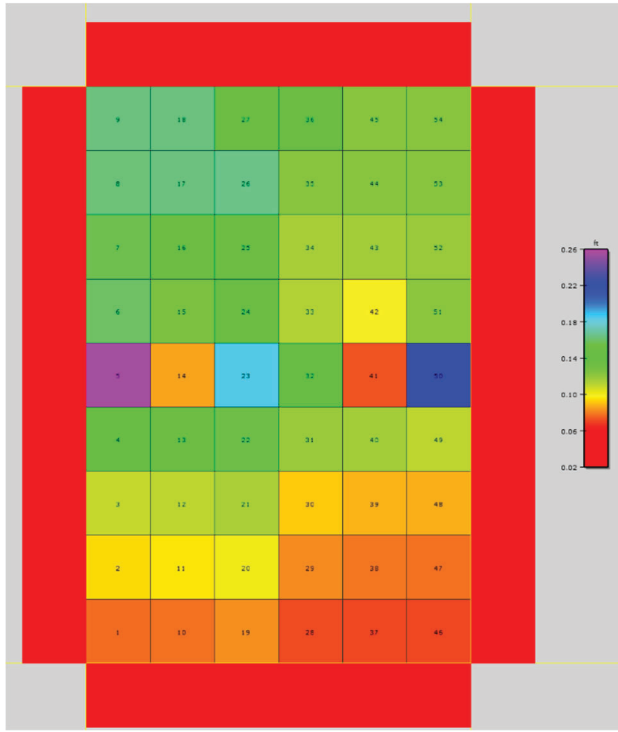

Figure 21g – Flow Depth at 5h 0m (Test Case 9f)

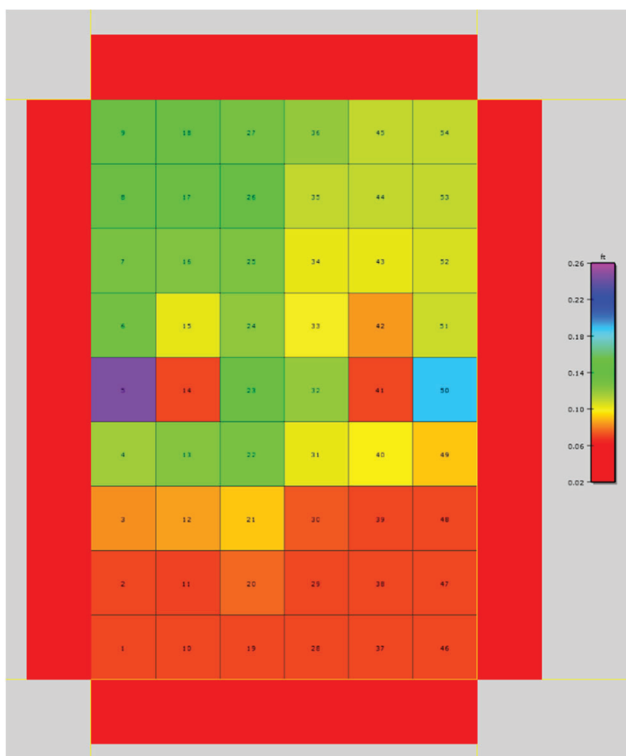

Figure 21h – Flow Depth at 5h 6m (Test Case 9f)

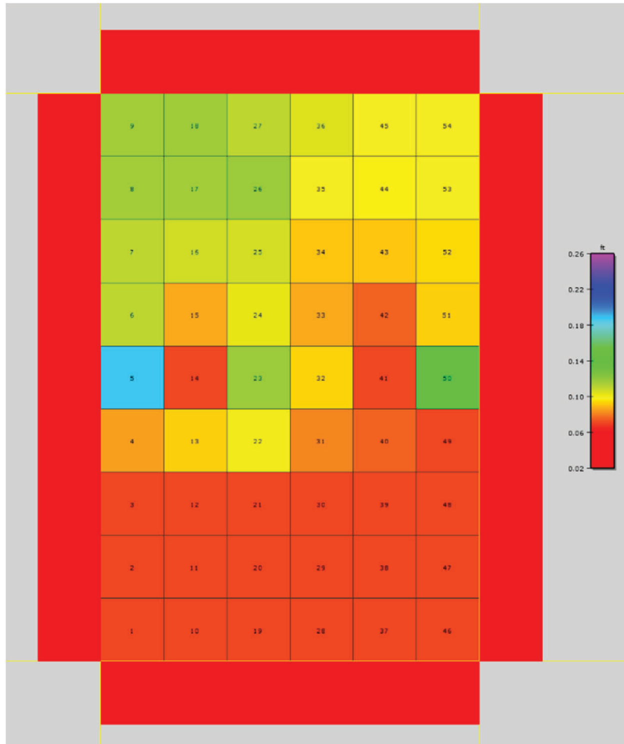

Figure 21i – Flow Depth at 5h 12m (Test Case 9f)

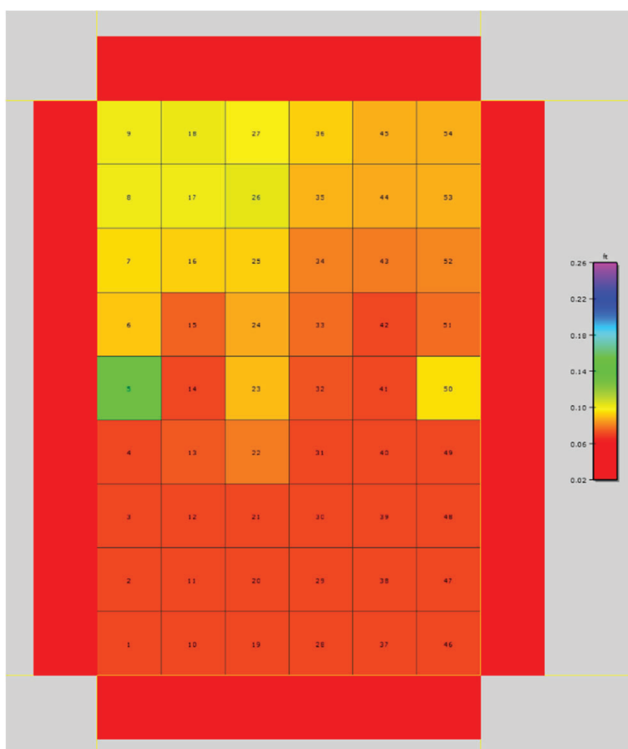

Figure 21j – Flow Depth at 5h 18m (Test Case 9f)

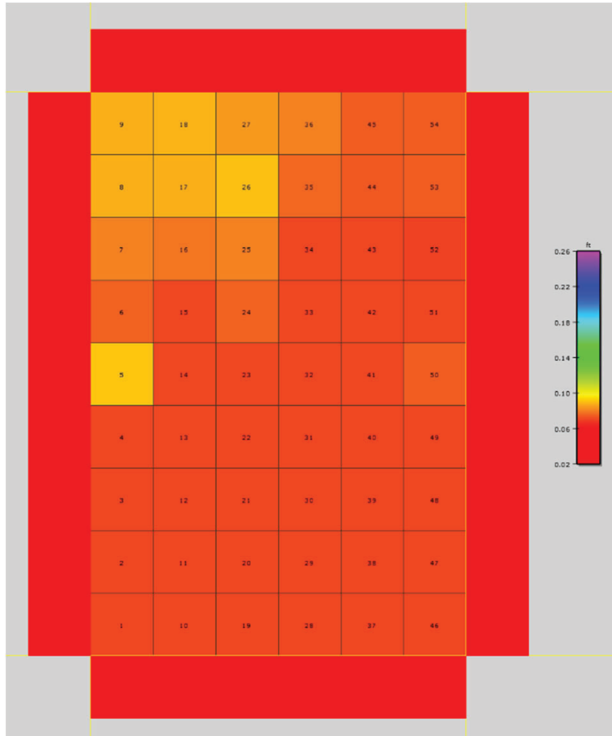

Figure 21k – Flow Depth at 5h 24m (Test Case 9f)

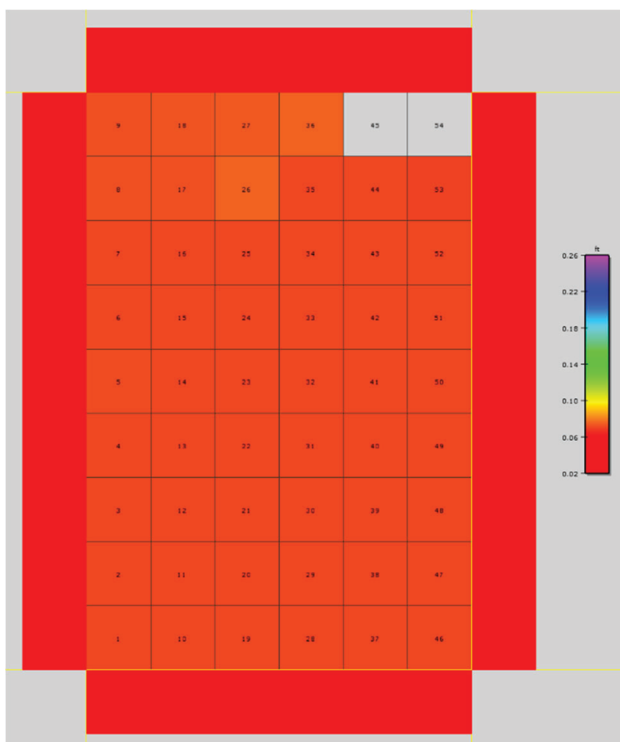

Figure 21l – Flow Depth at 5h 30m (Test Case 9f)

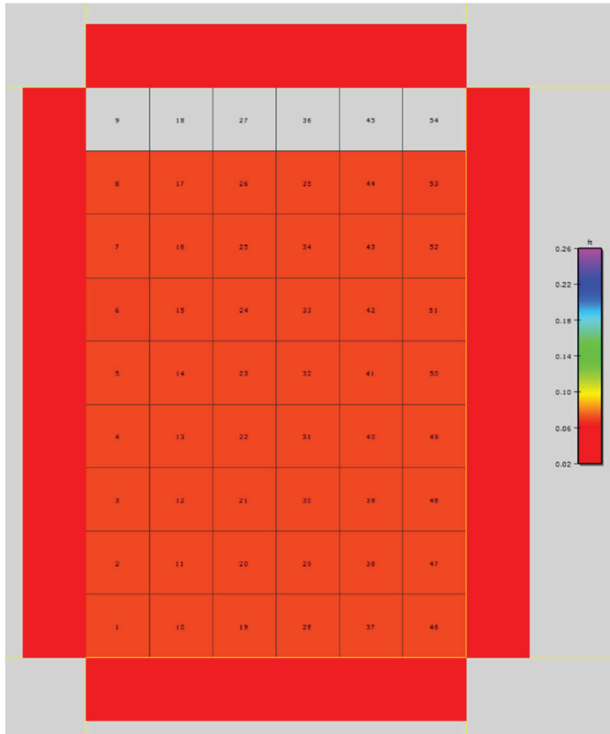

Figure 21m – Flow Depth at 5h 36m (Test Case 9f)

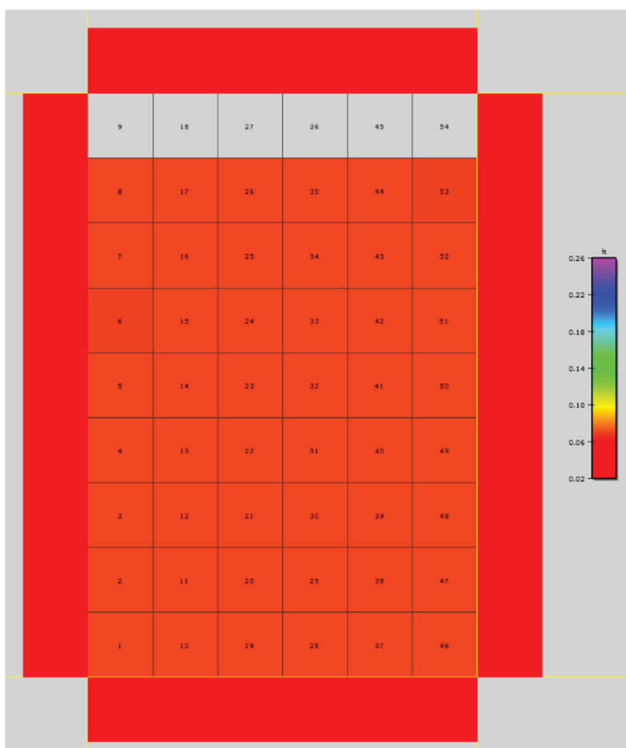

Figure 21n – Flow Depth at 8h 0m (Test Case 9f)

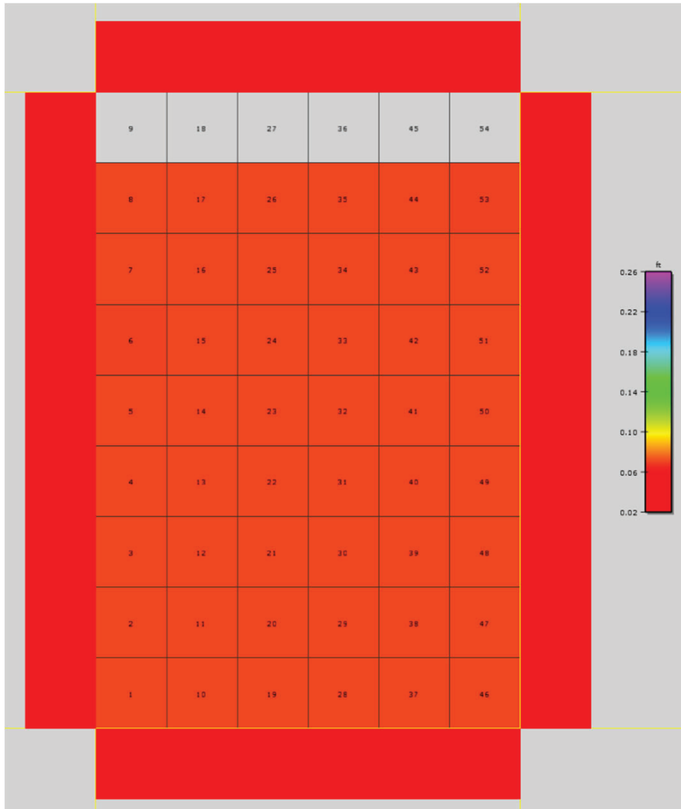

Figure 21o – Flow Depth at 10h 0m (Test Case 9f)

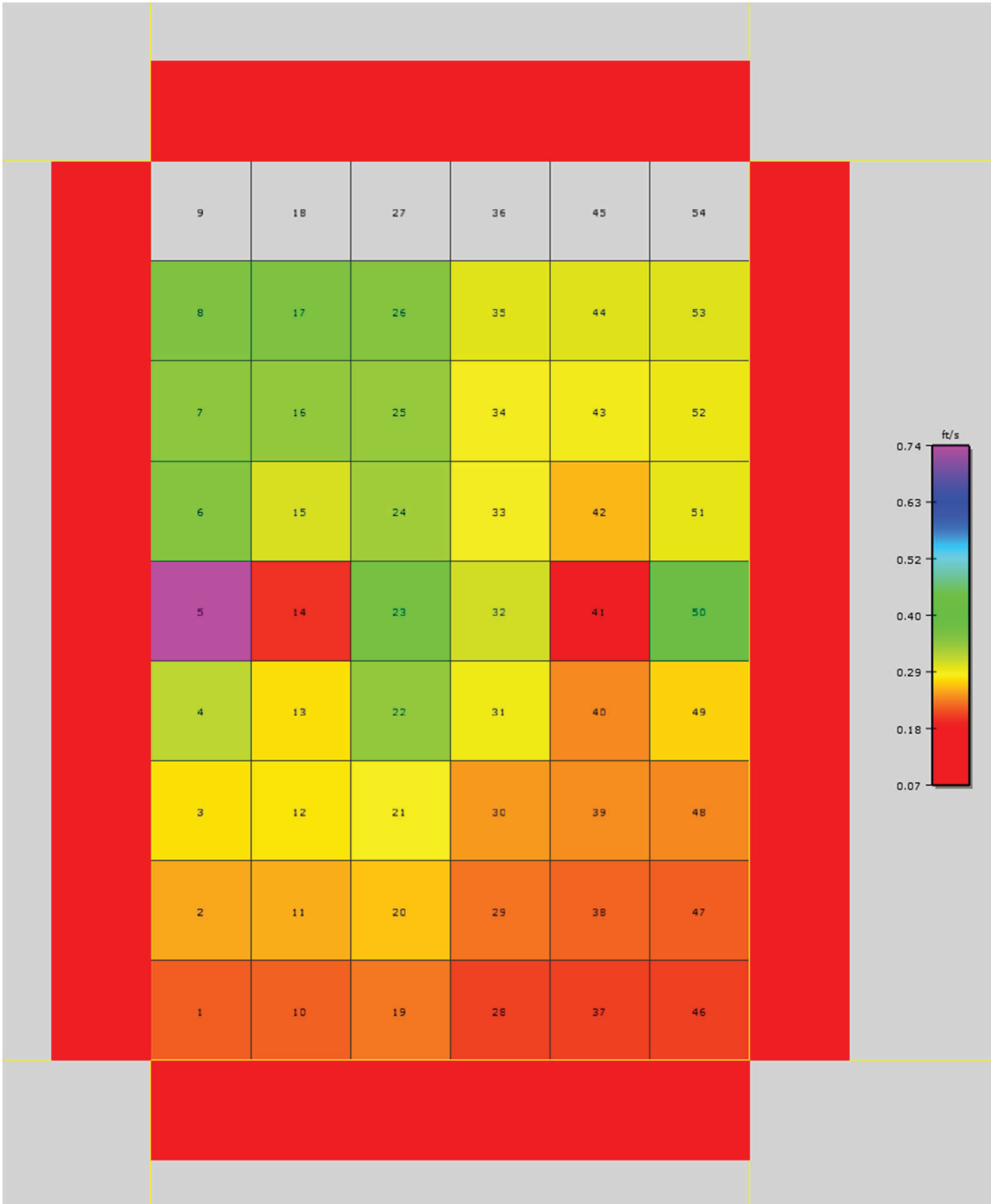

Figure 22 – Maximum Velocity Map (Test Case 9f)

Repeatability and Reproducibility

Each test case was run twice on the same computer (repeatability) to verify that the output results were within the acceptable threshold of 1% in each instance. It was found that the repeatability test yield results within 1% of each other. These results show that FLO-2D Pro has acceptable repeatability. Simulation to simulation data is provided in Attachment 34. A summary of the tabulated data is summarized below.

Test Case 9a

For this simulation, the model run was repeated using duplicate input files. Comparisons are made for the maximum depth data (from the DEPTH.OUT file), maximum elevation data (from the MAXWSELEV.OUT file) and maximum velocity (from the VELFP.OUT file). These files are selected as these represent the primary output data used in PNPP flooding calculations to determine impact on site points of interest. In all cases (every grid cell) the depth, elevation and velocity values were identical for both simulations. Additionally, review of the SUMMARY.OUT files show the same reported values in both simulations as used in the analysis of Test Case 9a (those highlighted in Figure 6).

Test Case 9b

For this simulation, the model run was repeated using duplicate input files. Comparisons are made for the maximum depth data (from the DEPTH.OUT file), maximum elevation data (from the MAXWSELEV.OUT file) and maximum velocity (from the VELFP.OUT file). These files are selected as these represent the primary output data used in PNPP flooding calculations to determine impact on site points of interest. In all cases (every grid cell) the depth, elevation and velocity values were identical for both simulations. Additionally, review of the SUMMARY.OUT files show the same reported values in both simulations as used in the analysis of Test Case 9b (those highlighted in Figure 7).

Test Case 9c

For this simulation, the model run was repeated using duplicate input files. Comparisons are made for the maximum depth data (from the DEPTH.OUT file), maximum elevation data (from the MAXWSELEV.OUT file) and maximum velocity (from the VELFP.OUT file). These files are selected as these represent the primary output data used in PNPP flooding calculations to determine impact on site points of interest. In all cases (every grid cell) the depth, elevation and velocity values were identical for both simulations. Additionally, review of the SUMMARY.OUT files show the same reported values in both simulations as used in the analysis of Test Case 9c (those highlighted in Figure 8).

Test Case 9d

For this simulation, the model run was repeated using duplicate input files. Comparisons are made for the final depth data (from the FINALDEP.OUT file) and the maximum elevation data (from the MAXWSELEV.OUT file). The FINALDEP.OUT file is used for this repeatability review

because it is the primary output data used for the V&V of Test Case 9d. The MAXWSELEV.OUT file is also selected for repeatability review because it is the primary output file used in PNPP flooding calculations (maximum water surface elevation is compared against survey data at plant exterior doors in order to determine the extent of flooded conditions). As shown in Attachment 34, the depth and WSE results are identical for every grid cell when comparing the two model runs. Note that in the Attachment 34 table for Test Case 9d, the four levee "pool" grid cells are highlighted as these are the critical cells in evaluating Test Case 9d.

Test Case 9e

For this simulation, the model run was repeated using duplicate input files. Comparisons are made for the outflow element summary data (OUTNQ.OUT file) and the final depth data (from the FINALDEP.OUT file). These files are selected as they are the primary output data used for the V&V of Test Case 9e. As shown in Attachment 34, the depth and WSE results are identical for every grid cell and each timestep when comparing the two model runs. Note that for the outflow element comparison, the outflow data is terminated at six hours. This was done for simplicity as all outflow data was zero for the remainder of the simulation. Since the precipitation input is five hours in duration, the model fully drains (except for the shallow final depth corresponding to the Surface Detention Parameter) well before the end of the simulation (ten hours). As such, no value would be added by including the zero outflow values in hours 6-10 of the simulation.

Test Case 9f

For this simulation, the model run was repeated using duplicate input files. Comparisons are made for the TIMDEP.OUT file. This file contains grid element, flow depth, velocity and velocity direction x and y, and water surface elevation for each floodplain grid element at the user specified time intervals (0.1 hour as shown in Figure 15 for Test Case 9e which was retained in Test Case 9f). This file was selected as it contains all output data used for the V&V of Test Case 9f. Due to the volume of data provided in this output file, only three timesteps are compared for this repeatability review. The timesteps are chosen as 0.1 hour, 2.5 hours and 5 hours corresponding to the initialization of the rainfall input, mid-rainfall point and rainfall termination time, respectively. As shown in Attachment 34, all parameters are identical for the two model runs for every grid cell at each of the three selected time steps.

VI. REFERENCES

No additional references are applicable to Supplement 1 of this report. Existing references provided in Revision 0 are utilized as necessary in performance of V&V activities of the RAINARF parameter.

VII. ATTACHMENTS

Attachment 20 – Input/Data Files for Test Case 9

Attachment 21 – Output Files for Test Case 9

Attachment 22 – Input/Data Files for Test Case 9a

Attachment 23 – Output Files for Test Case 9a

Attachment 24 – Input/Data Files for Test Case 9b

Attachment 25 – Output Files for Test Case 9b

Attachment 26 – Input/Data Files for Test Case 9c

Attachment 27 – Output Files for Test Case 9c

Attachment 28 – Input/Data Files for Test Case 9d

Attachment 29 – Output Files for Test Case 9d

Attachment 30 – Input/Data Files for Test Case 9e

Attachment 31 – Output Files for Test Case 9e

Attachment 32 – Input/Data Files for Test Case 9f

Attachment 33 – Output Files for Test Case 9f

Attachment 34 – Test Case Model Runs Repeatability Results

Attachment 35 – FLO-2D Revisions, Enhancements, and Bug Fixes (Updated)

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 20

Test Case 9 Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (2 Pages)

OUTFLOW.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

0	1		
7	0	0	0
R	0	0	
R	0.1	0.02	
R	0.2	0.04	
R	0.3	0.06	
R	0.4	0.08	
R	0.5	0.1	
R	0.6	0.12	
R	0.7	0.14	
R	0.8	0.16	
R	0.9	0.18	
R	1	0.2	
R	1.1	0.22	
R	1.2	0.24	
R	1.3	0.26	
R	1.4	0.28	
R	1.5	0.3	
R	1.6	0.32	
R	1.7	0.34	
R	1.8	0.36	
R	1.9	0.38	
R	2	0.4	
R	2.1	0.42	
R	2.2	0.44	
R	2.3	0.46	
R	2.4	0.48	
R	2.5	0.5	
R	2.6	0.52	
R	2.7	0.54	
R	2.8	0.56	
R	2.9	0.58	
R	3	0.6	
R	3.1	0.62	
R	3.2	0.64	
R	3.3	0.66	
R	3.4	0.68	
R	3.5	0.7	
R	3.6	0.72	
R	3.7	0.74	
R	3.8	0.76	
R	3.9	0.78	
R	4	0.8	
R	4.1	0.82	
R	4.2	0.84	
R	4.3	0.86	
R	4.4	0.88	
R	4.5	0.9	
R	4.6	0.92	
R	4.7	0.94	

```
R                4.8          0.96
R                4.9          0.98
R                5            1
```

0	9
0	18
0	27
0	36
0	45
0	54

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 21

Test Case 9 Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW

SUMMARY.OUT FILE
Pro Model - Build No. 16.06.16

0.000	1.000	0.000000	0.000000
0.100	1.803	0.000000	0.000000
0.200	2.969	0.000000	0.000000
0.300	3.678	-0.000000	0.000000
0.400	4.228	0.000000	0.000000
0.500	4.687	0.000000	0.000000
0.601	5.086	-0.000000	0.000001
0.700	5.439	0.000000	0.000001
0.801	5.758	-0.000000	0.000001
0.900	6.050	0.000000	0.000002
1.000	6.318	-0.000000	0.000002
1.101	6.569	0.000000	0.000001
1.201	6.804	0.000000	0.000001
1.300	7.024	-0.000000	0.000003
1.401	7.233	-0.000000	0.000001
1.502	7.433	0.000000	0.000003
1.602	7.622	-0.000000	0.000000
1.701	7.802	-0.000000	0.000002
1.801	7.974	-0.000000	0.000002
1.900	8.139	0.000000	0.000002
2.002	8.299	-0.000000	0.000003
2.100	8.453	0.000000	0.000003
2.201	8.600	-0.000000	0.000000
2.300	8.743	0.000000	0.000004
2.402	8.882	0.000000	0.000001
2.502	9.017	0.000000	0.000000
2.601	9.147	-0.000000	0.000002
2.701	9.273	0.000000	0.000002
2.800	9.396	0.000000	0.000002
2.901	9.516	-0.000000	0.000001
3.003	9.634	0.000000	0.000001
3.100	9.747	0.000000	0.000003
3.201	9.857	0.000000	0.000001
3.301	9.966	-0.000000	0.000002
3.402	10.072	0.000000	0.000002
3.501	10.175	-0.000000	0.000000
3.601	10.276	0.000000	0.000000
3.701	10.375	-0.000000	0.000001
3.800	10.472	0.000000	0.000003
3.900	10.566	-0.000000	0.000000
4.001	10.659	0.000000	0.000000

4.102	10.752	-0.000000	0.000001
4.202	10.842	-0.000000	0.000001
4.302	10.929	-0.000000	0.000002
4.403	11.016	-0.000000	0.000002
4.502	11.101	-0.000000	0.000002
4.601	11.183	0.000000	0.000001
4.701	11.265	0.000000	0.000000
4.802	11.346	0.000000	0.000001
4.900	11.425	-0.000000	0.000003
5.003	11.503	0.000000	0.000000
5.102	11.581	-0.000000	0.000002
5.203	11.656	-0.000000	0.000003
5.300	11.730	0.000000	0.000001
5.402	11.803	0.000000	0.000001
5.501	11.876	0.000000	0.000001
5.601	11.946	0.000000	0.000001
5.701	12.016	0.000000	0.000001
5.801	12.086	0.000000	0.000001
5.903	12.155	0.000000	0.000001
6.001	12.222	0.000000	0.000001
6.100	12.288	0.000000	0.000001
6.203	12.354	0.000000	0.000001
6.303	12.420	0.000000	0.000001
6.400	12.483	0.000000	0.000001
6.501	12.545	0.000000	0.000001
6.603	12.608	0.000000	0.000001
6.701	12.670	0.000000	0.000001
6.800	12.730	0.000000	0.000001
6.904	12.791	0.000000	0.000001
7.003	12.851	0.000000	0.000001
7.100	12.909	0.000000	0.000001
7.201	12.966	0.000000	0.000001
7.302	13.025	0.000000	0.000001
7.401	13.081	0.000000	0.000001
7.503	13.137	0.000000	0.000001
7.602	13.193	0.000000	0.000001
7.701	13.248	0.000000	0.000001
7.801	13.302	0.000000	0.000001
7.901	13.356	0.000000	0.000001
8.002	13.409	0.000000	0.000001
8.103	13.463	0.000000	0.000001
8.200	13.514	0.000000	0.000001
8.302	13.566	0.000000	0.000001
8.400	13.617	0.000000	0.000001
8.503	13.668	0.000000	0.000001
8.602	13.719	0.000000	0.000001
8.701	13.768	0.000000	0.000001
8.801	13.817	0.000000	0.000001
8.901	13.866	0.000000	0.000001
9.002	13.915	0.000000	0.000001

```
     9.102              13.963              0.000000        0.000001
     9.204              14.011              0.000000        0.000001
     9.301              14.058              0.000000        0.000001
     9.403              14.104              0.000000        0.000001
     9.501              14.150              0.000000        0.000001
     9.600              14.196              0.000000        0.000001
     9.703              14.241              0.000000        0.000001
     9.802              14.287              0.000000        0.000001
     9.902              14.331              0.000000        0.000001
    10.001              14.375              0.000000        0.000001
===================================================================================
===============================================
                     MASS BALANCE   INFLOW - OUTFLOW VOLUME
===================================================================================
===============================================
                           *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                         6.9992 INCHES


                                                                  WATER

RAINFALL VOLUME                                                    1.607

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      1.607

===================================================================================
===============================================
                           *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                         0.000 INCHES



          OVERLAND FLOW                                            WATER


WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                      1.525
                                                               ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         1.607
```

```
TOL FLOODPLAIN STORAGE                                      0.082

TOTAL SURFACE OUTFLOW AND STORAGE                           1.607


===================================================================================
===============================================
                                 *** TOTALS ***


TOTAL OUTFLOW FROM GRID SYSTEM                              1.525


TOTAL VOLUME OF OUTFLOW AND STORAGE                         1.607


  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                          3.099 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:         0.000 ACRES

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  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):           0.187
       VELOCITY (FPS OR CMS):            0.138
       FLOW AREA (FT^2 OR M^2):          1.302
       FLOW DEPTH (FT OR M):             0.053
       FLOW WIDTH (FT OR M):            24.692

  TOTAL COMPUTATIONS:                116942.



     COMPUTER RUN TIME IS :  0.00171 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/10/2021  AT:  21:19:53
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1	250.00	1300.00	0.0304
2	250.00	1350.00	0.0315
3	250.00	1400.00	0.0399
4	250.00	1450.00	0.0473
5	250.00	1500.00	0.0541
6	250.00	1550.00	0.0604
7	250.00	1600.00	0.0662
8	250.00	1650.00	0.0716
9	250.00	1700.00	0.0716
10	300.00	1300.00	0.0304
11	300.00	1350.00	0.0315
12	300.00	1400.00	0.0399
13	300.00	1450.00	0.0473
14	300.00	1500.00	0.0541
15	300.00	1550.00	0.0604
16	300.00	1600.00	0.0662
17	300.00	1650.00	0.0716
18	300.00	1700.00	0.0716
19	350.00	1300.00	0.0304
20	350.00	1350.00	0.0316
21	350.00	1400.00	0.0399
22	350.00	1450.00	0.0473
23	350.00	1500.00	0.0541
24	350.00	1550.00	0.0604
25	350.00	1600.00	0.0662
26	350.00	1650.00	0.0716
27	350.00	1700.00	0.0716
28	400.00	1300.00	0.0304
29	400.00	1350.00	0.0316
30	400.00	1400.00	0.0399
31	400.00	1450.00	0.0473
32	400.00	1500.00	0.0541
33	400.00	1550.00	0.0604
34	400.00	1600.00	0.0662
35	400.00	1650.00	0.0716
36	400.00	1700.00	0.0716
37	450.00	1300.00	0.0304
38	450.00	1350.00	0.0315
39	450.00	1400.00	0.0399
40	450.00	1450.00	0.0473
41	450.00	1500.00	0.0541
42	450.00	1550.00	0.0604
43	450.00	1600.00	0.0662
44	450.00	1650.00	0.0716
45	450.00	1700.00	0.0716
46	500.00	1300.00	0.0304
47	500.00	1350.00	0.0315
48	500.00	1400.00	0.0399
49	500.00	1450.00	0.0473
50	500.00	1500.00	0.0541

51	500.00	1550.00	0.0604
52	500.00	1600.00	0.0662
53	500.00	1650.00	0.0716
54	500.00	1700.00	0.0716

1	250.00	1300.00	0.0299
2	250.00	1350.00	0.0300
3	250.00	1400.00	0.0300
4	250.00	1450.00	0.0296
5	250.00	1500.00	0.0298
6	250.00	1550.00	0.0293
7	250.00	1600.00	0.0293
8	250.00	1650.00	0.0300
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0295
11	300.00	1350.00	0.0293
12	300.00	1400.00	0.0294
13	300.00	1450.00	0.0299
14	300.00	1500.00	0.0299
15	300.00	1550.00	0.0294
16	300.00	1600.00	0.0294
17	300.00	1650.00	0.0293
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0300
20	350.00	1350.00	0.0300
21	350.00	1400.00	0.0294
22	350.00	1450.00	0.0300
23	350.00	1500.00	0.0300
24	350.00	1550.00	0.0295
25	350.00	1600.00	0.0294
26	350.00	1650.00	0.0293
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0300
29	400.00	1350.00	0.0300
30	400.00	1400.00	0.0294
31	400.00	1450.00	0.0300
32	400.00	1500.00	0.0300
33	400.00	1550.00	0.0295
34	400.00	1600.00	0.0294
35	400.00	1650.00	0.0293
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0295
38	450.00	1350.00	0.0293
39	450.00	1400.00	0.0294
40	450.00	1450.00	0.0299
41	450.00	1500.00	0.0299
42	450.00	1550.00	0.0294
43	450.00	1600.00	0.0294
44	450.00	1650.00	0.0293
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0299
47	500.00	1350.00	0.0300
48	500.00	1400.00	0.0300
49	500.00	1450.00	0.0296
50	500.00	1500.00	0.0298

51	500.00	1550.00	0.0293
52	500.00	1600.00	0.0293
53	500.00	1650.00	0.0300
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0304
2	250.00	1350.00	107.0315
3	250.00	1400.00	106.0399
4	250.00	1450.00	105.0473
5	250.00	1500.00	104.0541
6	250.00	1550.00	103.0604
7	250.00	1600.00	102.0662
8	250.00	1650.00	101.0716
9	250.00	1700.00	100.0716
10	300.00	1300.00	108.0304
11	300.00	1350.00	107.0315
12	300.00	1400.00	106.0399
13	300.00	1450.00	105.0473
14	300.00	1500.00	104.0541
15	300.00	1550.00	103.0604
16	300.00	1600.00	102.0662
17	300.00	1650.00	101.0716
18	300.00	1700.00	100.0716
19	350.00	1300.00	108.0304
20	350.00	1350.00	107.0315
21	350.00	1400.00	106.0399
22	350.00	1450.00	105.0473
23	350.00	1500.00	104.0541
24	350.00	1550.00	103.0604
25	350.00	1600.00	102.0662
26	350.00	1650.00	101.0716
27	350.00	1700.00	100.0716
28	400.00	1300.00	108.0304
29	400.00	1350.00	107.0315
30	400.00	1400.00	106.0399
31	400.00	1450.00	105.0473
32	400.00	1500.00	104.0541
33	400.00	1550.00	103.0604
34	400.00	1600.00	102.0662
35	400.00	1650.00	101.0716
36	400.00	1700.00	100.0716
37	450.00	1300.00	108.0304
38	450.00	1350.00	107.0315
39	450.00	1400.00	106.0399
40	450.00	1450.00	105.0473
41	450.00	1500.00	104.0541
42	450.00	1550.00	103.0604
43	450.00	1600.00	102.0662
44	450.00	1650.00	101.0716
45	450.00	1700.00	100.0716
46	500.00	1300.00	108.0304
47	500.00	1350.00	107.0315
48	500.00	1400.00	106.0399
49	500.00	1450.00	105.0473
50	500.00	1500.00	104.0541

51	500.00	1550.00	103.0604
52	500.00	1600.00	102.0662
53	500.00	1650.00	101.0716
54	500.00	1700.00	100.0716

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       0.65 CFS AT TIME:     2.22
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       0.65 CFS AT TIME:     2.22
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       0.65 CFS AT TIME:     2.20
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.65 CFS AT TIME:     2.20
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       0.65 CFS AT TIME:     2.22
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       0.65 CFS AT TIME:     2.22
```

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
9	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.44
	0.60	0.55
	0.70	0.61
	0.80	0.63
	0.90	0.64
	1.00	0.65
	1.10	0.65
	1.20	0.65
	1.30	0.65
	1.40	0.65
	1.50	0.65
	1.60	0.65
	1.70	0.65
	1.80	0.65
	1.90	0.65
	2.00	0.65
	2.10	0.65
	2.20	0.65
	2.30	0.65
	2.40	0.65
	2.50	0.65
	2.60	0.65
	2.70	0.65
	2.80	0.65
	2.90	0.65
	3.00	0.65
	3.10	0.65
	3.20	0.65
	3.30	0.65
	3.40	0.65
	3.50	0.65
	3.60	0.65
	3.70	0.65
	3.80	0.65
	3.90	0.65
	4.00	0.65

4.10	0.65
4.20	0.65
4.30	0.65
4.40	0.65
4.50	0.65
4.60	0.65
4.70	0.65
4.80	0.65
4.90	0.65
5.00	0.65
5.10	0.50
5.20	0.32
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
18	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.44
	0.60	0.55
	0.70	0.61
	0.80	0.63
	0.90	0.64
	1.00	0.65
	1.10	0.65
	1.20	0.65
	1.30	0.65
	1.40	0.65
	1.50	0.65
	1.60	0.65
	1.70	0.65
	1.80	0.65
	1.90	0.65
	2.00	0.65
	2.10	0.65
	2.20	0.65
	2.30	0.65
	2.40	0.65
	2.50	0.65
	2.60	0.65
	2.70	0.65
	2.80	0.65
	2.90	0.65
	3.00	0.65
	3.10	0.65
	3.20	0.65
	3.30	0.65
	3.40	0.65
	3.50	0.65
	3.60	0.65
	3.70	0.65

3.80	0.65
3.90	0.65
4.00	0.65
4.10	0.65
4.20	0.65
4.30	0.65
4.40	0.65
4.50	0.65
4.60	0.65
4.70	0.65
4.80	0.65
4.90	0.65
5.00	0.65
5.10	0.50
5.20	0.32
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.44
	0.60	0.55
	0.70	0.61
	0.80	0.63
	0.90	0.64
	1.00	0.65
	1.10	0.65
	1.20	0.65
	1.30	0.65
	1.40	0.65
	1.50	0.65
	1.60	0.65
	1.70	0.65
	1.80	0.65
	1.90	0.65
	2.00	0.65
	2.10	0.65
	2.20	0.65
	2.30	0.65
	2.40	0.65
	2.50	0.65
	2.60	0.65
	2.70	0.65
	2.80	0.65
	2.90	0.65
	3.00	0.65
	3.10	0.65
	3.20	0.65
	3.30	0.65
	3.40	0.65

3.50	0.65
3.60	0.65
3.70	0.65
3.80	0.65
3.90	0.65
4.00	0.65
4.10	0.65
4.20	0.65
4.30	0.65
4.40	0.65
4.50	0.65
4.60	0.65
4.70	0.65
4.80	0.65
4.90	0.65
5.00	0.65
5.10	0.50
5.20	0.32
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.44
	0.60	0.55
	0.70	0.61
	0.80	0.63
	0.90	0.64
	1.00	0.65
	1.10	0.65
	1.20	0.65
	1.30	0.65
	1.40	0.65
	1.50	0.65
	1.60	0.65
	1.70	0.65
	1.80	0.65
	1.90	0.65
	2.00	0.65
	2.10	0.65
	2.20	0.65
	2.30	0.65
	2.40	0.65
	2.50	0.65
	2.60	0.65
	2.70	0.65
	2.80	0.65
	2.90	0.65
	3.00	0.65
	3.10	0.65

3.20	0.65
3.30	0.65
3.40	0.65
3.50	0.65
3.60	0.65
3.70	0.65
3.80	0.65
3.90	0.65
4.00	0.65
4.10	0.65
4.20	0.65
4.30	0.65
4.40	0.65
4.50	0.65
4.60	0.65
4.70	0.65
4.80	0.65
4.90	0.65
5.00	0.65
5.10	0.50
5.20	0.32
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.44
	0.60	0.55
	0.70	0.61
	0.80	0.63
	0.90	0.64
	1.00	0.65
	1.10	0.65
	1.20	0.65
	1.30	0.65
	1.40	0.65
	1.50	0.65
	1.60	0.65
	1.70	0.65
	1.80	0.65
	1.90	0.65
	2.00	0.65
	2.10	0.65
	2.20	0.65
	2.30	0.65
	2.40	0.65
	2.50	0.65
	2.60	0.65
	2.70	0.65
	2.80	0.65

2.90	0.65
3.00	0.65
3.10	0.65
3.20	0.65
3.30	0.65
3.40	0.65
3.50	0.65
3.60	0.65
3.70	0.65
3.80	0.65
3.90	0.65
4.00	0.65
4.10	0.65
4.20	0.65
4.30	0.65
4.40	0.65
4.50	0.65
4.60	0.65
4.70	0.65
4.80	0.65
4.90	0.65
5.00	0.65
5.10	0.50
5.20	0.32
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.44
	0.60	0.55
	0.70	0.61
	0.80	0.63
	0.90	0.64
	1.00	0.65
	1.10	0.65
	1.20	0.65
	1.30	0.65
	1.40	0.65
	1.50	0.65
	1.60	0.65
	1.70	0.65
	1.80	0.65
	1.90	0.65
	2.00	0.65
	2.10	0.65
	2.20	0.65
	2.30	0.65
	2.40	0.65
	2.50	0.65

2.60	0.65
2.70	0.65
2.80	0.65
2.90	0.65
3.00	0.65
3.10	0.65
3.20	0.65
3.30	0.65
3.40	0.65
3.50	0.65
3.60	0.65
3.70	0.65
3.80	0.65
3.90	0.65
4.00	0.65
4.10	0.65
4.20	0.65
4.30	0.65
4.40	0.65
4.50	0.65
4.60	0.65
4.70	0.65
4.80	0.65
4.90	0.65
5.00	0.65
5.10	0.50
5.20	0.32
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1021
2	250.00	1350.00	0.1038
3	250.00	1400.00	0.1220
4	250.00	1450.00	0.1369
5	250.00	1500.00	0.1497
6	250.00	1550.00	0.1611
7	250.00	1600.00	0.1713
8	250.00	1650.00	0.1810
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.1021
11	300.00	1350.00	0.1038
12	300.00	1400.00	0.1220
13	300.00	1450.00	0.1369
14	300.00	1500.00	0.1497
15	300.00	1550.00	0.1611
16	300.00	1600.00	0.1713
17	300.00	1650.00	0.1810
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.1021
20	350.00	1350.00	0.1038
21	350.00	1400.00	0.1220
22	350.00	1450.00	0.1369
23	350.00	1500.00	0.1497
24	350.00	1550.00	0.1611
25	350.00	1600.00	0.1713
26	350.00	1650.00	0.1810
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.1021
29	400.00	1350.00	0.1038
30	400.00	1400.00	0.1220
31	400.00	1450.00	0.1369
32	400.00	1500.00	0.1497
33	400.00	1550.00	0.1611
34	400.00	1600.00	0.1713
35	400.00	1650.00	0.1810
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.1021
38	450.00	1350.00	0.1038
39	450.00	1400.00	0.1220
40	450.00	1450.00	0.1369
41	450.00	1500.00	0.1497
42	450.00	1550.00	0.1611
43	450.00	1600.00	0.1713
44	450.00	1650.00	0.1810
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.1021
47	500.00	1350.00	0.1038
48	500.00	1400.00	0.1220
49	500.00	1450.00	0.1369
50	500.00	1500.00	0.1497

51	500.00	1550.00	0.1611
52	500.00	1600.00	0.1713
53	500.00	1650.00	0.1810
54	500.00	1700.00	0.0000

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 22

Test Case 9a Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (3 Pages)

OUTFLOW.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

0	1		
7	0	1	0
R	0	0	
R	0.1	0.02	
R	0.2	0.04	
R	0.3	0.06	
R	0.4	0.08	
R	0.5	0.1	
R	0.6	0.12	
R	0.7	0.14	
R	0.8	0.16	
R	0.9	0.18	
R	1	0.2	
R	1.1	0.22	
R	1.2	0.24	
R	1.3	0.26	
R	1.4	0.28	
R	1.5	0.3	
R	1.6	0.32	
R	1.7	0.34	
R	1.8	0.36	
R	1.9	0.38	
R	2	0.4	
R	2.1	0.42	
R	2.2	0.44	
R	2.3	0.46	
R	2.4	0.48	
R	2.5	0.5	
R	2.6	0.52	
R	2.7	0.54	
R	2.8	0.56	
R	2.9	0.58	
R	3	0.6	
R	3.1	0.62	
R	3.2	0.64	
R	3.3	0.66	
R	3.4	0.68	
R	3.5	0.7	
R	3.6	0.72	
R	3.7	0.74	
R	3.8	0.76	
R	3.9	0.78	
R	4	0.8	
R	4.1	0.82	
R	4.2	0.84	
R	4.3	0.86	
R	4.4	0.88	
R	4.5	0.9	
R	4.6	0.92	
R	4.7	0.94	

```
R    4.8   0.96
R    4.9   0.98
R    5     1
 1   1
 2   0.2
 3   1
 4   0.2
 5   0.2
 6   1
 7   0.2
 8   1
 9   1
 10  1
 11  0.2
 12  1
 13  0.2
 14  0.2
 15  1
 16  0.2
 17  1
 18  1
 19  0.2
 20  0.2
 21  1
 22  1
 23  1
 24  1
 25  0.2
 26  0.2
 27  1
 28  0.2
 29  0.2
 30  1
 31  1
 32  1
 33  1
 34  0.2
 35  0.2
 36  1
 37  1
 38  0.2
 39  1
 40  0.2
 41  0.2
 42  1
 43  0.2
 44  1
 45  1
 46  1
 47  0.2
```

```
48          1
49          0.2
50          0.2
51          1
52          0.2
53          1
54          1
```

0	9
0	18
0	27
0	36
0	45
0	54

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 23

Test Case 9a Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SUMMARY.OUT FILE
Pro Model - Build No. 16.06.16

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
0.000	1.000	0.000000	0.000000
0.100	1.803	-0.000000	0.000000
0.200	2.969	-0.000000	0.000000
0.300	3.678	0.000000	0.000000
0.400	4.228	-0.000000	0.000000
0.500	4.687	-0.000000	0.000000
0.601	5.086	0.000000	0.000001
0.700	5.439	0.000000	0.000001
0.801	5.758	-0.000000	0.000000
0.900	6.050	-0.000000	0.000001
1.000	6.318	-0.000000	0.000001
1.101	6.569	0.000000	0.000001
1.201	6.804	0.000000	0.000001
1.300	7.024	0.000000	0.000002
1.401	7.233	0.000000	0.000000
1.502	7.433	-0.000000	0.000002
1.602	7.622	-0.000000	0.000002
1.701	7.802	0.000000	0.000000
1.801	7.974	0.000000	0.000001
1.900	8.139	0.000000	0.000001
2.002	8.299	0.000000	0.000001
2.100	8.453	0.000000	0.000003
2.201	8.600	-0.000000	0.000000
2.300	8.743	-0.000000	0.000002
2.402	8.882	0.000000	0.000000
2.502	9.017	-0.000000	0.000000
2.601	9.147	-0.000000	0.000001
2.701	9.273	-0.000000	0.000003
2.800	9.396	-0.000000	0.000002
2.901	9.516	0.000000	0.000001
3.003	9.634	0.000000	0.000002
3.100	9.747	-0.000000	0.000002
3.201	9.857	-0.000000	0.000001
3.301	9.966	0.000000	0.000004
3.402	10.072	-0.000000	0.000003
3.501	10.175	-0.000000	0.000002
3.601	10.276	-0.000000	0.000001
3.701	10.375	0.000000	0.000002
3.800	10.472	0.000000	0.000003
3.900	10.566	-0.000000	0.000002
4.001	10.659	-0.000000	0.000001

4.102	10.752	0.000000	0.000002
4.202	10.842	-0.000000	0.000000
4.302	10.929	-0.000000	0.000003
4.403	11.016	-0.000000	0.000003
4.502	11.101	-0.000000	0.000003
4.601	11.183	-0.000000	0.000000
4.701	11.265	-0.000000	0.000002
4.802	11.346	-0.000000	0.000001
4.900	11.425	0.000000	0.000000
5.003	11.503	0.000000	0.000001
5.102	11.581	0.000000	0.000002
5.203	11.656	0.000000	0.000001
5.300	11.730	0.000000	0.000001
5.402	11.803	0.000000	0.000001
5.501	11.876	0.000000	0.000001
5.601	11.946	0.000000	0.000001
5.701	12.016	0.000000	0.000001
5.801	12.086	0.000000	0.000001
5.903	12.155	0.000000	0.000001
6.001	12.222	0.000000	0.000001
6.100	12.288	0.000000	0.000001
6.203	12.354	0.000000	0.000001
6.303	12.420	0.000000	0.000001
6.400	12.483	0.000000	0.000001
6.501	12.545	0.000000	0.000001
6.603	12.608	0.000000	0.000001
6.701	12.670	0.000000	0.000001
6.800	12.730	0.000000	0.000001
6.904	12.791	0.000000	0.000001
7.003	12.851	0.000000	0.000001
7.100	12.909	0.000000	0.000001
7.201	12.966	0.000000	0.000001
7.302	13.025	0.000000	0.000001
7.401	13.081	0.000000	0.000001
7.503	13.137	0.000000	0.000001
7.602	13.193	0.000000	0.000001
7.701	13.248	0.000000	0.000001
7.801	13.302	0.000000	0.000001
7.901	13.356	0.000000	0.000001
8.002	13.409	0.000000	0.000001
8.103	13.463	0.000000	0.000001
8.200	13.514	0.000000	0.000001
8.302	13.566	0.000000	0.000001
8.400	13.617	0.000000	0.000001
8.503	13.668	0.000000	0.000001
8.602	13.719	0.000000	0.000001
8.701	13.768	0.000000	0.000001
8.801	13.817	0.000000	0.000001
8.901	13.866	0.000000	0.000001
9.002	13.915	0.000000	0.000001

```
      9.102               13.963              0.000000        0.000001
      9.204               14.011              0.000000        0.000001
      9.301               14.058              0.000000        0.000001
      9.403               14.104              0.000000        0.000001
      9.501               14.150              0.000000        0.000001
      9.600               14.196              0.000000        0.000001
      9.703               14.241              0.000000        0.000001
      9.802               14.287              0.000000        0.000001
      9.902               14.331              0.000000        0.000001
     10.001               14.375              0.000000        0.000001
==================================================================================
===============================================
                    MASS BALANCE   INFLOW - OUTFLOW VOLUME
==================================================================================
===============================================
                          *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                         6.9992 INCHES


                                                                  WATER

RAINFALL VOLUME                                                    0.964

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      0.964

==================================================================================
===============================================
                          *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                         0.000 INCHES



          OVERLAND FLOW                                            WATER


WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                      0.882
                                                               ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         0.964
```

```
TOL FLOODPLAIN STORAGE                                              0.082

TOTAL SURFACE OUTFLOW AND STORAGE                                   0.964


==========================================================================================
================================================
                                 *** TOTALS ***



TOTAL OUTFLOW FROM GRID SYSTEM                                      0.882


TOTAL VOLUME OF OUTFLOW AND STORAGE                                 0.964


  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                                  3.099 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:                 0.000 ACRES

==========================================================================================
================================================



  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):           0.121
       VELOCITY (FPS OR CMS):            0.117
       FLOW AREA (FT^2 OR M^2):          1.014
       FLOW DEPTH (FT OR M):             0.041
       FLOW WIDTH (FT OR M):            24.797

  TOTAL COMPUTATIONS:              102494.



     COMPUTER RUN TIME IS :  0.00171 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/11/2021  AT:   3:29:47
```

1	250.00	1300.00	0.0305
2	250.00	1350.00	0.0308
3	250.00	1400.00	0.0326
4	250.00	1450.00	0.0342
5	250.00	1500.00	0.0356
6	250.00	1550.00	0.0444
7	250.00	1600.00	0.0468
8	250.00	1650.00	0.0539
9	250.00	1700.00	0.0541
10	300.00	1300.00	0.0304
11	300.00	1350.00	0.0308
12	300.00	1400.00	0.0313
13	300.00	1450.00	0.0333
14	300.00	1500.00	0.0369
15	300.00	1550.00	0.0462
16	300.00	1600.00	0.0478
17	300.00	1650.00	0.0543
18	300.00	1700.00	0.0530
19	350.00	1300.00	0.0301
20	350.00	1350.00	0.0307
21	350.00	1400.00	0.0313
22	350.00	1450.00	0.0381
23	350.00	1500.00	0.0436
24	350.00	1550.00	0.0485
25	350.00	1600.00	0.0488
26	350.00	1650.00	0.0507
27	350.00	1700.00	0.0519
28	400.00	1300.00	0.0301
29	400.00	1350.00	0.0307
30	400.00	1400.00	0.0313
31	400.00	1450.00	0.0381
32	400.00	1500.00	0.0436
33	400.00	1550.00	0.0485
34	400.00	1600.00	0.0488
35	400.00	1650.00	0.0507
36	400.00	1700.00	0.0519
37	450.00	1300.00	0.0304
38	450.00	1350.00	0.0308
39	450.00	1400.00	0.0313
40	450.00	1450.00	0.0333
41	450.00	1500.00	0.0369
42	450.00	1550.00	0.0462
43	450.00	1600.00	0.0478
44	450.00	1650.00	0.0543
45	450.00	1700.00	0.0530
46	500.00	1300.00	0.0305
47	500.00	1350.00	0.0308
48	500.00	1400.00	0.0326
49	500.00	1450.00	0.0342
50	500.00	1500.00	0.0356

51	500.00	1550.00	0.0444
52	500.00	1600.00	0.0468
53	500.00	1650.00	0.0539
54	500.00	1700.00	0.0541

1	250.00	1300.00	0.0297
2	250.00	1350.00	0.0296
3	250.00	1400.00	0.0297
4	250.00	1450.00	0.0296
5	250.00	1500.00	0.0297
6	250.00	1550.00	0.0298
7	250.00	1600.00	0.0294
8	250.00	1650.00	0.0296
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0299
11	300.00	1350.00	0.0300
12	300.00	1400.00	0.0300
13	300.00	1450.00	0.0297
14	300.00	1500.00	0.0295
15	300.00	1550.00	0.0297
16	300.00	1600.00	0.0296
17	300.00	1650.00	0.0299
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0294
20	350.00	1350.00	0.0294
21	350.00	1400.00	0.0298
22	350.00	1450.00	0.0299
23	350.00	1500.00	0.0297
24	350.00	1550.00	0.0294
25	350.00	1600.00	0.0295
26	350.00	1650.00	0.0300
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0294
29	400.00	1350.00	0.0294
30	400.00	1400.00	0.0298
31	400.00	1450.00	0.0299
32	400.00	1500.00	0.0297
33	400.00	1550.00	0.0294
34	400.00	1600.00	0.0295
35	400.00	1650.00	0.0300
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0299
38	450.00	1350.00	0.0300
39	450.00	1400.00	0.0300
40	450.00	1450.00	0.0297
41	450.00	1500.00	0.0295
42	450.00	1550.00	0.0297
43	450.00	1600.00	0.0296
44	450.00	1650.00	0.0299
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0297
47	500.00	1350.00	0.0296
48	500.00	1400.00	0.0297
49	500.00	1450.00	0.0296
50	500.00	1500.00	0.0297

51	500.00	1550.00	0.0298
52	500.00	1600.00	0.0294
53	500.00	1650.00	0.0296
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0305
2	250.00	1350.00	107.0308
3	250.00	1400.00	106.0326
4	250.00	1450.00	105.0342
5	250.00	1500.00	104.0356
6	250.00	1550.00	103.0443
7	250.00	1600.00	102.0468
8	250.00	1650.00	101.0539
9	250.00	1700.00	100.0541
10	300.00	1300.00	108.0304
11	300.00	1350.00	107.0308
12	300.00	1400.00	106.0312
13	300.00	1450.00	105.0333
14	300.00	1500.00	104.0369
15	300.00	1550.00	103.0462
16	300.00	1600.00	102.0478
17	300.00	1650.00	101.0543
18	300.00	1700.00	100.0530
19	350.00	1300.00	108.0301
20	350.00	1350.00	107.0307
21	350.00	1400.00	106.0313
22	350.00	1450.00	105.0381
23	350.00	1500.00	104.0436
24	350.00	1550.00	103.0485
25	350.00	1600.00	102.0488
26	350.00	1650.00	101.0507
27	350.00	1700.00	100.0519
28	400.00	1300.00	108.0301
29	400.00	1350.00	107.0307
30	400.00	1400.00	106.0313
31	400.00	1450.00	105.0381
32	400.00	1500.00	104.0436
33	400.00	1550.00	103.0485
34	400.00	1600.00	102.0488
35	400.00	1650.00	101.0507
36	400.00	1700.00	100.0519
37	450.00	1300.00	108.0304
38	450.00	1350.00	107.0308
39	450.00	1400.00	106.0312
40	450.00	1450.00	105.0333
41	450.00	1500.00	104.0369
42	450.00	1550.00	103.0462
43	450.00	1600.00	102.0478
44	450.00	1650.00	101.0543
45	450.00	1700.00	100.0530
46	500.00	1300.00	108.0305
47	500.00	1350.00	107.0308
48	500.00	1400.00	106.0326
49	500.00	1450.00	105.0342
50	500.00	1500.00	104.0356

51	500.00	1550.00	103.0443
52	500.00	1600.00	102.0468
53	500.00	1650.00	101.0539
54	500.00	1700.00	100.0541

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       0.40 CFS AT TIME:     3.35
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       0.39 CFS AT TIME:     3.35
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       0.37 CFS AT TIME:     3.35
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.37 CFS AT TIME:     3.35
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       0.39 CFS AT TIME:     3.35
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       0.40 CFS AT TIME:     3.35

    ELEMENT     TIME (HRS)     DISCHARGE (CFS)
        9       0.00              0.00
                0.00              0.00
                0.10              0.00
                0.20              0.00
                0.30              0.04
                0.40              0.15
                0.50              0.21
                0.60              0.25
                0.70              0.31
                0.80              0.36
                0.90              0.38
                1.00              0.39
                1.10              0.39
                1.20              0.40
                1.30              0.40
                1.40              0.40
                1.50              0.40
                1.60              0.40
                1.70              0.40
                1.80              0.40
                1.90              0.40
                2.00              0.40
                2.10              0.40
                2.20              0.40
                2.30              0.40
                2.40              0.40
                2.50              0.40
                2.60              0.40
                2.70              0.40
                2.80              0.40
                2.90              0.40
                3.00              0.40
                3.10              0.40
                3.20              0.40
                3.30              0.40
                3.40              0.40
                3.50              0.40
                3.60              0.40
                3.70              0.40
                3.80              0.40
                3.90              0.40
                4.00              0.40
```

4.10	0.40
4.20	0.40
4.30	0.40
4.40	0.40
4.50	0.40
4.60	0.40
4.70	0.40
4.80	0.40
4.90	0.40
5.00	0.40
5.10	0.30
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
18	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.06
	0.40	0.11
	0.50	0.20
	0.60	0.25
	0.70	0.30
	0.80	0.35
	0.90	0.37
	1.00	0.37
	1.10	0.38
	1.20	0.38
	1.30	0.38
	1.40	0.39
	1.50	0.39
	1.60	0.39
	1.70	0.39
	1.80	0.39
	1.90	0.39
	2.00	0.39
	2.10	0.39
	2.20	0.39
	2.30	0.39
	2.40	0.39
	2.50	0.39
	2.60	0.39
	2.70	0.39
	2.80	0.39
	2.90	0.39
	3.00	0.39
	3.10	0.39
	3.20	0.39
	3.30	0.39
	3.40	0.39
	3.50	0.39
	3.60	0.39
	3.70	0.39

3.80	0.39
3.90	0.39
4.00	0.39
4.10	0.39
4.20	0.39
4.30	0.39
4.40	0.39
4.50	0.39
4.60	0.39
4.70	0.39
4.80	0.39
4.90	0.39
5.00	0.39
5.10	0.31
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.05
	0.50	0.18
	0.60	0.24
	0.70	0.29
	0.80	0.33
	0.90	0.35
	1.00	0.36
	1.10	0.36
	1.20	0.36
	1.30	0.37
	1.40	0.37
	1.50	0.37
	1.60	0.37
	1.70	0.37
	1.80	0.37
	1.90	0.37
	2.00	0.37
	2.10	0.37
	2.20	0.37
	2.30	0.37
	2.40	0.37
	2.50	0.37
	2.60	0.37
	2.70	0.37
	2.80	0.37
	2.90	0.37
	3.00	0.37
	3.10	0.37
	3.20	0.37
	3.30	0.37
	3.40	0.37

3.50	0.37
3.60	0.37
3.70	0.37
3.80	0.37
3.90	0.37
4.00	0.37
4.10	0.37
4.20	0.37
4.30	0.37
4.40	0.37
4.50	0.37
4.60	0.37
4.70	0.37
4.80	0.37
4.90	0.37
5.00	0.37
5.10	0.31
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.05
	0.50	0.18
	0.60	0.24
	0.70	0.29
	0.80	0.33
	0.90	0.35
	1.00	0.36
	1.10	0.36
	1.20	0.36
	1.30	0.37
	1.40	0.37
	1.50	0.37
	1.60	0.37
	1.70	0.37
	1.80	0.37
	1.90	0.37
	2.00	0.37
	2.10	0.37
	2.20	0.37
	2.30	0.37
	2.40	0.37
	2.50	0.37
	2.60	0.37
	2.70	0.37
	2.80	0.37
	2.90	0.37
	3.00	0.37
	3.10	0.37

3.20	0.37
3.30	0.37
3.40	0.37
3.50	0.37
3.60	0.37
3.70	0.37
3.80	0.37
3.90	0.37
4.00	0.37
4.10	0.37
4.20	0.37
4.30	0.37
4.40	0.37
4.50	0.37
4.60	0.37
4.70	0.37
4.80	0.37
4.90	0.37
5.00	0.37
5.10	0.31
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.06
	0.40	0.11
	0.50	0.20
	0.60	0.25
	0.70	0.30
	0.80	0.35
	0.90	0.37
	1.00	0.37
	1.10	0.38
	1.20	0.38
	1.30	0.38
	1.40	0.39
	1.50	0.39
	1.60	0.39
	1.70	0.39
	1.80	0.39
	1.90	0.39
	2.00	0.39
	2.10	0.39
	2.20	0.39
	2.30	0.39
	2.40	0.39
	2.50	0.39
	2.60	0.39
	2.70	0.39
	2.80	0.39

2.90	0.39
3.00	0.39
3.10	0.39
3.20	0.39
3.30	0.39
3.40	0.39
3.50	0.39
3.60	0.39
3.70	0.39
3.80	0.39
3.90	0.39
4.00	0.39
4.10	0.39
4.20	0.39
4.30	0.39
4.40	0.39
4.50	0.39
4.60	0.39
4.70	0.39
4.80	0.39
4.90	0.39
5.00	0.39
5.10	0.31
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.15
	0.50	0.21
	0.60	0.25
	0.70	0.31
	0.80	0.36
	0.90	0.38
	1.00	0.39
	1.10	0.39
	1.20	0.40
	1.30	0.40
	1.40	0.40
	1.50	0.40
	1.60	0.40
	1.70	0.40
	1.80	0.40
	1.90	0.40
	2.00	0.40
	2.10	0.40
	2.20	0.40
	2.30	0.40
	2.40	0.40
	2.50	0.40

2.60	0.40
2.70	0.40
2.80	0.40
2.90	0.40
3.00	0.40
3.10	0.40
3.20	0.40
3.30	0.40
3.40	0.40
3.50	0.40
3.60	0.40
3.70	0.40
3.80	0.40
3.90	0.40
4.00	0.40
4.10	0.40
4.20	0.40
4.30	0.40
4.40	0.40
4.50	0.40
4.60	0.40
4.70	0.40
4.80	0.40
4.90	0.40
5.00	0.40
5.10	0.30
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1020
2	250.00	1350.00	0.1030
3	250.00	1400.00	0.1062
4	250.00	1450.00	0.1091
5	250.00	1500.00	0.1131
6	250.00	1550.00	0.1314
7	250.00	1600.00	0.1358
8	250.00	1650.00	0.1498
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.1019
11	300.00	1350.00	0.1030
12	300.00	1400.00	0.1033
13	300.00	1450.00	0.1083
14	300.00	1500.00	0.1158
15	300.00	1550.00	0.1351
16	300.00	1600.00	0.1377
17	300.00	1650.00	0.1494
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0000
20	350.00	1350.00	0.1025
21	350.00	1400.00	0.1034
22	350.00	1450.00	0.1182
23	350.00	1500.00	0.1297
24	350.00	1550.00	0.1395
25	350.00	1600.00	0.1401
26	350.00	1650.00	0.1437
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0000
29	400.00	1350.00	0.1025
30	400.00	1400.00	0.1034
31	400.00	1450.00	0.1182
32	400.00	1500.00	0.1297
33	400.00	1550.00	0.1395
34	400.00	1600.00	0.1401
35	400.00	1650.00	0.1437
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.1019
38	450.00	1350.00	0.1030
39	450.00	1400.00	0.1033
40	450.00	1450.00	0.1083
41	450.00	1500.00	0.1158
42	450.00	1550.00	0.1351
43	450.00	1600.00	0.1377
44	450.00	1650.00	0.1494
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.1020
47	500.00	1350.00	0.1030
48	500.00	1400.00	0.1062
49	500.00	1450.00	0.1091
50	500.00	1500.00	0.1131

51	500.00	1550.00	0.1314
52	500.00	1600.00	0.1358
53	500.00	1650.00	0.1498
54	500.00	1700.00	0.0000

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 24

Test Case 9b Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (3 Pages)

OUTFLOW.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

0	1		
7	0	1	0
R	0	0	
R	0.1	0.02	
R	0.2	0.04	
R	0.3	0.06	
R	0.4	0.08	
R	0.5	0.1	
R	0.6	0.12	
R	0.7	0.14	
R	0.8	0.16	
R	0.9	0.18	
R	1	0.2	
R	1.1	0.22	
R	1.2	0.24	
R	1.3	0.26	
R	1.4	0.28	
R	1.5	0.3	
R	1.6	0.32	
R	1.7	0.34	
R	1.8	0.36	
R	1.9	0.38	
R	2	0.4	
R	2.1	0.42	
R	2.2	0.44	
R	2.3	0.46	
R	2.4	0.48	
R	2.5	0.5	
R	2.6	0.52	
R	2.7	0.54	
R	2.8	0.56	
R	2.9	0.58	
R	3	0.6	
R	3.1	0.62	
R	3.2	0.64	
R	3.3	0.66	
R	3.4	0.68	
R	3.5	0.7	
R	3.6	0.72	
R	3.7	0.74	
R	3.8	0.76	
R	3.9	0.78	
R	4	0.8	
R	4.1	0.82	
R	4.2	0.84	
R	4.3	0.86	
R	4.4	0.88	
R	4.5	0.9	
R	4.6	0.92	
R	4.7	0.94	

```
R               4.8             0.96
R               4.9             0.98
R               5               1
 1              1
 1              1
 2              0.5
 3              1
 4              0.5
 5              0.5
 6              1
 7              0.5
 8              1
 9              1
 10             1
 11             0.5
 12             1
 13             0.5
 14             0.5
 15             1
 16             0.5
 17             1
 18             1
 19             0.5
 20             0.5
 21             1
 22             1
 23             1
 24             1
 25             0.5
 26             0.5
 27             1
 28             0.5
 29             0.5
 30             1
 31             1
 32             1
 33             1
 34             0.5
 35             0.5
 36             1
 37             1
 38             0.5
 39             1
 40             0.5
 41             0.5
 42             1
 43             0.5
 44             1
 45             1
 46             1
```

```
47          0.5
48          1
49          0.5
50          0.5
51          1
52          0.5
53          1
54          1
```

0	9
0	18
0	27
0	36
0	45
0	54

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 25

Test Case 9b Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW

SUMMARY.OUT FILE
Pro Model - Build No. 16.06.16

0.000	1.000	0.000000	0.000000
0.100	1.803	-0.000000	0.000000
0.200	2.969	-0.000000	0.000000
0.300	3.678	0.000000	0.000000
0.400	4.228	0.000000	0.000000
0.500	4.687	0.000000	0.000001
0.601	5.086	-0.000000	0.000001
0.700	5.439	-0.000000	0.000001
0.801	5.758	0.000000	0.000001
0.900	6.050	-0.000000	0.000001
1.000	6.318	-0.000000	0.000001
1.101	6.569	-0.000000	0.000003
1.201	6.804	-0.000000	0.000001
1.300	7.024	-0.000000	0.000001
1.401	7.233	0.000000	0.000001
1.502	7.433	0.000000	0.000000
1.602	7.622	-0.000000	0.000001
1.701	7.802	0.000000	0.000000
1.801	7.974	-0.000000	0.000002
1.900	8.139	0.000000	0.000003
2.002	8.299	-0.000000	0.000003
2.100	8.453	-0.000000	0.000002
2.201	8.600	0.000000	0.000001
2.300	8.743	-0.000000	0.000003
2.402	8.882	-0.000000	0.000002
2.502	9.017	-0.000000	0.000002
2.601	9.147	-0.000000	0.000000
2.701	9.273	0.000000	0.000004
2.800	9.396	0.000000	0.000000
2.901	9.516	-0.000000	0.000002
3.003	9.634	-0.000000	0.000001
3.100	9.747	-0.000000	0.000002
3.201	9.857	0.000000	0.000000
3.301	9.966	0.000000	0.000002
3.402	10.072	0.000000	0.000003
3.501	10.175	0.000000	0.000003
3.601	10.276	-0.000000	0.000002
3.701	10.375	0.000000	0.000002
3.800	10.472	-0.000000	0.000003
3.900	10.566	0.000000	0.000001
4.001	10.659	-0.000000	0.000003

4.102	10.752	0.000000	0.000002
4.202	10.842	0.000000	0.000000
4.302	10.929	-0.000000	0.000001
4.403	11.016	0.000000	0.000002
4.502	11.101	-0.000000	0.000002
4.601	11.183	-0.000000	0.000002
4.701	11.265	-0.000000	0.000001
4.802	11.346	-0.000000	0.000003
4.900	11.425	-0.000000	0.000005
5.003	11.503	0.000000	0.000001
5.102	11.581	-0.000000	0.000000
5.203	11.656	-0.000000	0.000001
5.300	11.730	-0.000000	0.000004
5.402	11.803	-0.000000	0.000004
5.501	11.876	-0.000000	0.000004
5.601	11.946	-0.000000	0.000004
5.701	12.016	-0.000000	0.000004
5.801	12.086	-0.000000	0.000004
5.903	12.155	-0.000000	0.000004
6.001	12.222	-0.000000	0.000004
6.100	12.288	-0.000000	0.000004
6.203	12.354	-0.000000	0.000004
6.303	12.420	-0.000000	0.000004
6.400	12.483	-0.000000	0.000004
6.501	12.545	-0.000000	0.000004
6.603	12.608	-0.000000	0.000004
6.701	12.670	-0.000000	0.000004
6.800	12.730	-0.000000	0.000004
6.904	12.791	-0.000000	0.000004
7.003	12.851	-0.000000	0.000004
7.100	12.909	-0.000000	0.000004
7.201	12.966	-0.000000	0.000004
7.302	13.025	-0.000000	0.000004
7.401	13.081	-0.000000	0.000004
7.503	13.137	-0.000000	0.000004
7.602	13.193	-0.000000	0.000004
7.701	13.248	-0.000000	0.000004
7.801	13.302	-0.000000	0.000004
7.901	13.356	-0.000000	0.000004
8.002	13.409	-0.000000	0.000004
8.103	13.463	-0.000000	0.000004
8.200	13.514	-0.000000	0.000004
8.302	13.566	-0.000000	0.000004
8.400	13.617	-0.000000	0.000004
8.503	13.668	-0.000000	0.000004
8.602	13.719	-0.000000	0.000004
8.701	13.768	-0.000000	0.000004
8.801	13.817	-0.000000	0.000004
8.901	13.866	-0.000000	0.000004
9.002	13.915	-0.000000	0.000004

```
      9.102              13.963             -0.000000        0.000004
      9.204              14.011             -0.000000        0.000004
      9.301              14.058             -0.000000        0.000004
      9.403              14.104             -0.000000        0.000004
      9.501              14.150             -0.000000        0.000004
      9.600              14.196             -0.000000        0.000004
      9.703              14.241             -0.000000        0.000004
      9.802              14.287             -0.000000        0.000004
      9.902              14.331             -0.000000        0.000004
     10.001              14.375             -0.000000        0.000004
===================================================================================
===============================================
                     MASS BALANCE   INFLOW - OUTFLOW VOLUME
===================================================================================
===============================================
                           *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                          6.9992 INCHES


                                                                   WATER

RAINFALL VOLUME                                                     1.205

SURFACE WATER INFLOW HYDROGRAPH                                     0.000
                                                                ---------
INFLOW HYDROGRAPHS + RAINFALL                                       1.205

===================================================================================
===============================================
                           *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                          0.000 INCHES



          OVERLAND FLOW                                             WATER


WATER LOST TO INTERCEPTION                                          0.000

FLOODPLAIN STORAGE                                                  0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                       1.123
                                                                ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                          1.205
```

```
TOL FLOODPLAIN STORAGE                                                   0.082

TOTAL SURFACE OUTFLOW AND STORAGE                                        1.205


==========================================================================================
===============================================
                                 *** TOTALS ***



TOTAL OUTFLOW FROM GRID SYSTEM                                           1.123


TOTAL VOLUME OF OUTFLOW AND STORAGE                                      1.205


  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                                       3.099 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:                      0.000 ACRES

==========================================================================================
===============================================



  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):           0.146
       VELOCITY (FPS OR CMS):            0.125
       FLOW AREA (FT^2 OR M^2):          1.132
       FLOW DEPTH (FT OR M):             0.046
       FLOW WIDTH (FT OR M):            24.745

  TOTAL COMPUTATIONS:              108778.



     COMPUTER RUN TIME IS :  0.00171 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/11/2021  AT:   3:33:17
```

1	250.00	1300.00	0.0304
2	250.00	1350.00	0.0308
3	250.00	1400.00	0.0355
4	250.00	1450.00	0.0391
5	250.00	1500.00	0.0433
6	250.00	1550.00	0.0510
7	250.00	1600.00	0.0547
8	250.00	1650.00	0.0610
9	250.00	1700.00	0.0610
10	300.00	1300.00	0.0304
11	300.00	1350.00	0.0309
12	300.00	1400.00	0.0347
13	300.00	1450.00	0.0390
14	300.00	1500.00	0.0440
15	300.00	1550.00	0.0518
16	300.00	1600.00	0.0552
17	300.00	1650.00	0.0609
18	300.00	1700.00	0.0604
19	350.00	1300.00	0.0302
20	350.00	1350.00	0.0309
21	350.00	1400.00	0.0338
22	350.00	1450.00	0.0414
23	350.00	1500.00	0.0475
24	350.00	1550.00	0.0529
25	350.00	1600.00	0.0557
26	350.00	1650.00	0.0592
27	350.00	1700.00	0.0598
28	400.00	1300.00	0.0302
29	400.00	1350.00	0.0309
30	400.00	1400.00	0.0338
31	400.00	1450.00	0.0414
32	400.00	1500.00	0.0475
33	400.00	1550.00	0.0529
34	400.00	1600.00	0.0557
35	400.00	1650.00	0.0592
36	400.00	1700.00	0.0598
37	450.00	1300.00	0.0304
38	450.00	1350.00	0.0309
39	450.00	1400.00	0.0347
40	450.00	1450.00	0.0390
41	450.00	1500.00	0.0440
42	450.00	1550.00	0.0518
43	450.00	1600.00	0.0552
44	450.00	1650.00	0.0609
45	450.00	1700.00	0.0604
46	500.00	1300.00	0.0304
47	500.00	1350.00	0.0308
48	500.00	1400.00	0.0355
49	500.00	1450.00	0.0391
50	500.00	1500.00	0.0433

51	500.00	1550.00	0.0510
52	500.00	1600.00	0.0547
53	500.00	1650.00	0.0610
54	500.00	1700.00	0.0610

1	250.00	1300.00	0.0297
2	250.00	1350.00	0.0296
3	250.00	1400.00	0.0293
4	250.00	1450.00	0.0298
5	250.00	1500.00	0.0300
6	250.00	1550.00	0.0294
7	250.00	1600.00	0.0295
8	250.00	1650.00	0.0295
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0299
11	300.00	1350.00	0.0297
12	300.00	1400.00	0.0295
13	300.00	1450.00	0.0296
14	300.00	1500.00	0.0298
15	300.00	1550.00	0.0293
16	300.00	1600.00	0.0300
17	300.00	1650.00	0.0299
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0296
20	350.00	1350.00	0.0294
21	350.00	1400.00	0.0296
22	350.00	1450.00	0.0293
23	350.00	1500.00	0.0299
24	350.00	1550.00	0.0298
25	350.00	1600.00	0.0296
26	350.00	1650.00	0.0295
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0296
29	400.00	1350.00	0.0294
30	400.00	1400.00	0.0296
31	400.00	1450.00	0.0293
32	400.00	1500.00	0.0299
33	400.00	1550.00	0.0298
34	400.00	1600.00	0.0296
35	400.00	1650.00	0.0295
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0299
38	450.00	1350.00	0.0297
39	450.00	1400.00	0.0295
40	450.00	1450.00	0.0296
41	450.00	1500.00	0.0298
42	450.00	1550.00	0.0293
43	450.00	1600.00	0.0300
44	450.00	1650.00	0.0299
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0297
47	500.00	1350.00	0.0296
48	500.00	1400.00	0.0293
49	500.00	1450.00	0.0298
50	500.00	1500.00	0.0300

51	500.00	1550.00	0.0294
52	500.00	1600.00	0.0295
53	500.00	1650.00	0.0295
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0304
2	250.00	1350.00	107.0308
3	250.00	1400.00	106.0355
4	250.00	1450.00	105.0391
5	250.00	1500.00	104.0433
6	250.00	1550.00	103.0510
7	250.00	1600.00	102.0547
8	250.00	1650.00	101.0610
9	250.00	1700.00	100.0610
10	300.00	1300.00	108.0304
11	300.00	1350.00	107.0309
12	300.00	1400.00	106.0347
13	300.00	1450.00	105.0390
14	300.00	1500.00	104.0440
15	300.00	1550.00	103.0518
16	300.00	1600.00	102.0552
17	300.00	1650.00	101.0609
18	300.00	1700.00	100.0604
19	350.00	1300.00	108.0302
20	350.00	1350.00	107.0309
21	350.00	1400.00	106.0338
22	350.00	1450.00	105.0414
23	350.00	1500.00	104.0475
24	350.00	1550.00	103.0529
25	350.00	1600.00	102.0557
26	350.00	1650.00	101.0592
27	350.00	1700.00	100.0598
28	400.00	1300.00	108.0302
29	400.00	1350.00	107.0309
30	400.00	1400.00	106.0338
31	400.00	1450.00	105.0414
32	400.00	1500.00	104.0475
33	400.00	1550.00	103.0529
34	400.00	1600.00	102.0557
35	400.00	1650.00	101.0592
36	400.00	1700.00	100.0598
37	450.00	1300.00	108.0304
38	450.00	1350.00	107.0309
39	450.00	1400.00	106.0347
40	450.00	1450.00	105.0390
41	450.00	1500.00	104.0440
42	450.00	1550.00	103.0518
43	450.00	1600.00	102.0552
44	450.00	1650.00	101.0609
45	450.00	1700.00	100.0604
46	500.00	1300.00	108.0304
47	500.00	1350.00	107.0308
48	500.00	1400.00	106.0355
49	500.00	1450.00	105.0391
50	500.00	1500.00	104.0433

51	500.00	1550.00	103.0510
52	500.00	1600.00	102.0547
53	500.00	1650.00	101.0610
54	500.00	1700.00	100.0610

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       0.50 CFS AT TIME:     3.01
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       0.49 CFS AT TIME:     3.01
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       0.48 CFS AT TIME:     3.02
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.48 CFS AT TIME:     3.02
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       0.49 CFS AT TIME:     3.01
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       0.50 CFS AT TIME:     3.01
```

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
9	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.20
	0.50	0.28
	0.60	0.36
	0.70	0.43
	0.80	0.46
	0.90	0.48
	1.00	0.49
	1.10	0.49
	1.20	0.49
	1.30	0.50
	1.40	0.50
	1.50	0.50
	1.60	0.50
	1.70	0.50
	1.80	0.50
	1.90	0.50
	2.00	0.50
	2.10	0.50
	2.20	0.50
	2.30	0.50
	2.40	0.50
	2.50	0.50
	2.60	0.50
	2.70	0.50
	2.80	0.50
	2.90	0.50
	3.00	0.50
	3.10	0.50
	3.20	0.50
	3.30	0.50
	3.40	0.50
	3.50	0.50
	3.60	0.50
	3.70	0.50
	3.80	0.50
	3.90	0.50
	4.00	0.50

4.10	0.50
4.20	0.50
4.30	0.50
4.40	0.50
4.50	0.50
4.60	0.50
4.70	0.50
4.80	0.50
4.90	0.50
5.00	0.50
5.10	0.38
5.20	0.18
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
18	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.06
	0.40	0.19
	0.50	0.27
	0.60	0.36
	0.70	0.42
	0.80	0.45
	0.90	0.47
	1.00	0.48
	1.10	0.48
	1.20	0.49
	1.30	0.49
	1.40	0.49
	1.50	0.49
	1.60	0.49
	1.70	0.49
	1.80	0.49
	1.90	0.49
	2.00	0.49
	2.10	0.49
	2.20	0.49
	2.30	0.49
	2.40	0.49
	2.50	0.49
	2.60	0.49
	2.70	0.49
	2.80	0.49
	2.90	0.49
	3.00	0.49
	3.10	0.49
	3.20	0.49
	3.30	0.49
	3.40	0.49
	3.50	0.49
	3.60	0.49
	3.70	0.49

3.80	0.49
3.90	0.49
4.00	0.49
4.10	0.49
4.20	0.49
4.30	0.49
4.40	0.49
4.50	0.49
4.60	0.49
4.70	0.49
4.80	0.49
4.90	0.49
5.00	0.49
5.10	0.39
5.20	0.17
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.18
	0.50	0.26
	0.60	0.35
	0.70	0.41
	0.80	0.44
	0.90	0.46
	1.00	0.47
	1.10	0.47
	1.20	0.48
	1.30	0.48
	1.40	0.48
	1.50	0.48
	1.60	0.48
	1.70	0.48
	1.80	0.48
	1.90	0.48
	2.00	0.48
	2.10	0.48
	2.20	0.48
	2.30	0.48
	2.40	0.48
	2.50	0.48
	2.60	0.48
	2.70	0.48
	2.80	0.48
	2.90	0.48
	3.00	0.48
	3.10	0.48
	3.20	0.48
	3.30	0.48
	3.40	0.48

3.50	0.48
3.60	0.48
3.70	0.48
3.80	0.48
3.90	0.48
4.00	0.48
4.10	0.48
4.20	0.48
4.30	0.48
4.40	0.48
4.50	0.48
4.60	0.48
4.70	0.48
4.80	0.48
4.90	0.48
5.00	0.48
5.10	0.39
5.20	0.18
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.18
	0.50	0.26
	0.60	0.35
	0.70	0.41
	0.80	0.44
	0.90	0.46
	1.00	0.47
	1.10	0.47
	1.20	0.48
	1.30	0.48
	1.40	0.48
	1.50	0.48
	1.60	0.48
	1.70	0.48
	1.80	0.48
	1.90	0.48
	2.00	0.48
	2.10	0.48
	2.20	0.48
	2.30	0.48
	2.40	0.48
	2.50	0.48
	2.60	0.48
	2.70	0.48
	2.80	0.48
	2.90	0.48
	3.00	0.48
	3.10	0.48

3.20	0.48
3.30	0.48
3.40	0.48
3.50	0.48
3.60	0.48
3.70	0.48
3.80	0.48
3.90	0.48
4.00	0.48
4.10	0.48
4.20	0.48
4.30	0.48
4.40	0.48
4.50	0.48
4.60	0.48
4.70	0.48
4.80	0.48
4.90	0.48
5.00	0.48
5.10	0.39
5.20	0.18
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.06
	0.40	0.19
	0.50	0.27
	0.60	0.36
	0.70	0.42
	0.80	0.45
	0.90	0.47
	1.00	0.48
	1.10	0.48
	1.20	0.49
	1.30	0.49
	1.40	0.49
	1.50	0.49
	1.60	0.49
	1.70	0.49
	1.80	0.49
	1.90	0.49
	2.00	0.49
	2.10	0.49
	2.20	0.49
	2.30	0.49
	2.40	0.49
	2.50	0.49
	2.60	0.49
	2.70	0.49
	2.80	0.49

2.90	0.49
3.00	0.49
3.10	0.49
3.20	0.49
3.30	0.49
3.40	0.49
3.50	0.49
3.60	0.49
3.70	0.49
3.80	0.49
3.90	0.49
4.00	0.49
4.10	0.49
4.20	0.49
4.30	0.49
4.40	0.49
4.50	0.49
4.60	0.49
4.70	0.49
4.80	0.49
4.90	0.49
5.00	0.49
5.10	0.39
5.20	0.17
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.20
	0.50	0.28
	0.60	0.36
	0.70	0.43
	0.80	0.46
	0.90	0.48
	1.00	0.49
	1.10	0.49
	1.20	0.49
	1.30	0.50
	1.40	0.50
	1.50	0.50
	1.60	0.50
	1.70	0.50
	1.80	0.50
	1.90	0.50
	2.00	0.50
	2.10	0.50
	2.20	0.50
	2.30	0.50
	2.40	0.50
	2.50	0.50

2.60	0.50
2.70	0.50
2.80	0.50
2.90	0.50
3.00	0.50
3.10	0.50
3.20	0.50
3.30	0.50
3.40	0.50
3.50	0.50
3.60	0.50
3.70	0.50
3.80	0.50
3.90	0.50
4.00	0.50
4.10	0.50
4.20	0.50
4.30	0.50
4.40	0.50
4.50	0.50
4.60	0.50
4.70	0.50
4.80	0.50
4.90	0.50
5.00	0.50
5.10	0.38
5.20	0.18
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1021
2	250.00	1350.00	0.1030
3	250.00	1400.00	0.1125
4	250.00	1450.00	0.1205
5	250.00	1500.00	0.1289
6	250.00	1550.00	0.1440
7	250.00	1600.00	0.1508
8	250.00	1650.00	0.1627
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.1020
11	300.00	1350.00	0.1031
12	300.00	1400.00	0.1107
13	300.00	1450.00	0.1204
14	300.00	1500.00	0.1304
15	300.00	1550.00	0.1457
16	300.00	1600.00	0.1517
17	300.00	1650.00	0.1621
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0000
20	350.00	1350.00	0.1032
21	350.00	1400.00	0.1087
22	350.00	1450.00	0.1253
23	350.00	1500.00	0.1372
24	350.00	1550.00	0.1476
25	350.00	1600.00	0.1528
26	350.00	1650.00	0.1595
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0000
29	400.00	1350.00	0.1032
30	400.00	1400.00	0.1087
31	400.00	1450.00	0.1253
32	400.00	1500.00	0.1372
33	400.00	1550.00	0.1476
34	400.00	1600.00	0.1528
35	400.00	1650.00	0.1595
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.1020
38	450.00	1350.00	0.1031
39	450.00	1400.00	0.1107
40	450.00	1450.00	0.1204
41	450.00	1500.00	0.1304
42	450.00	1550.00	0.1457
43	450.00	1600.00	0.1517
44	450.00	1650.00	0.1621
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.1021
47	500.00	1350.00	0.1030
48	500.00	1400.00	0.1125
49	500.00	1450.00	0.1205
50	500.00	1500.00	0.1289

51	500.00	1550.00	0.1440
52	500.00	1600.00	0.1508
53	500.00	1650.00	0.1627
54	500.00	1700.00	0.0000

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 26

Test Case 9c Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (2 Pages)

OUTFLOW.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

```
 0          1
 7          0          1          0
R           0          0
R           0.1        0.02
R           0.2        0.04
R           0.3        0.06
R           0.4        0.08
R           0.5        0.1
R           0.6        0.12
R           0.7        0.14
R           0.8        0.16
R           0.9        0.18
R           1          0.2
R           1.1        0.22
R           1.2        0.24
R           1.3        0.26
R           1.4        0.28
R           1.5        0.3
R           1.6        0.32
R           1.7        0.34
R           1.8        0.36
R           1.9        0.38
R           2          0.4
R           2.1        0.42
R           2.2        0.44
R           2.3        0.46
R           2.4        0.48
R           2.5        0.5
R           2.6        0.52
R           2.7        0.54
R           2.8        0.56
R           2.9        0.58
R           3          0.6
R           3.1        0.62
R           3.2        0.64
R           3.3        0.66
R           3.4        0.68
R           3.5        0.7
R           3.6        0.72
R           3.7        0.74
R           3.8        0.76
R           3.9        0.78
R           4          0.8
R           4.1        0.82
R           4.2        0.84
R           4.3        0.86
R           4.4        0.88
R           4.5        0.9
R           4.6        0.92
R           4.7        0.94
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R               4.8             0.96
R               4.9             0.98
R               5               1
 1              1
 2              0.8
 3              1
 4              0.8
 5              0.8
 6              1
 7              0.8
 8              1
 9              1
 10             1
 11             0.8
 12             1
 13             0.8
 14             0.8
 15             1
 16             0.8
 17             1
 18             1
 19             0.8
 20             0.8
 21             1
 22             1
 23             1
 24             1
 25             0.8
 26             0.8
 27             1
 28             0.8
 29             0.8
 30             1
 31             1
 32             1
 33             1
 34             0.8
 35             0.8
 36             1
 37             1
 38             0.8
 39             1
 40             0.8
 41             0.8
 42             1
 43             0.8
 44             1
 45             1
 46             1
 47             0.8
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48	1
49	0.8
50	0.8
51	1
52	0.8
53	1
54	1

0	9
0	18
0	27
0	36
0	45
0	54

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 27

Test Case 9c Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SUMMARY.OUT FILE
Pro Model - Build No. 16.06.16

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
0.000	1.000	0.000000	0.000000
0.100	1.803	0.000000	0.000000
0.200	2.969	0.000000	0.000000
0.300	3.678	0.000000	0.000000
0.400	4.228	0.000000	0.000000
0.500	4.687	0.000000	0.000000
0.601	5.086	-0.000000	0.000001
0.700	5.439	0.000000	0.000001
0.801	5.758	-0.000000	0.000001
0.900	6.050	0.000000	0.000001
1.000	6.318	0.000000	0.000002
1.101	6.569	0.000000	0.000002
1.201	6.804	0.000000	0.000002
1.300	7.024	-0.000000	0.000002
1.401	7.233	0.000000	0.000003
1.502	7.433	0.000000	0.000003
1.602	7.622	0.000000	0.000001
1.701	7.802	-0.000000	0.000002
1.801	7.974	-0.000000	0.000002
1.900	8.139	0.000000	0.000001
2.002	8.299	-0.000000	0.000000
2.100	8.453	0.000000	0.000001
2.201	8.600	0.000000	0.000003
2.300	8.743	0.000000	0.000004
2.402	8.882	-0.000000	0.000000
2.502	9.017	0.000000	0.000003
2.601	9.147	-0.000000	0.000004
2.701	9.273	-0.000000	0.000002
2.800	9.396	-0.000000	0.000002
2.901	9.516	0.000000	0.000003
3.003	9.634	0.000000	0.000000
3.100	9.747	0.000000	0.000002
3.201	9.857	0.000000	0.000002
3.301	9.966	0.000000	0.000001
3.402	10.072	0.000000	0.000001
3.501	10.175	-0.000000	0.000003
3.601	10.276	0.000000	0.000001
3.701	10.375	0.000000	0.000001
3.800	10.472	0.000000	0.000001
3.900	10.566	-0.000000	0.000002
4.001	10.659	0.000000	0.000001

4.102	10.752	0.000000	0.000005
4.202	10.842	-0.000000	0.000000
4.302	10.929	0.000000	0.000003
4.403	11.016	0.000000	0.000003
4.502	11.101	-0.000000	0.000003
4.601	11.183	-0.000000	0.000004
4.701	11.265	0.000000	0.000003
4.802	11.346	-0.000000	0.000003
4.900	11.425	0.000000	0.000002
5.003	11.503	-0.000000	0.000004
5.102	11.581	0.000000	0.000002
5.203	11.656	-0.000000	0.000004
5.300	11.730	-0.000000	0.000001
5.402	11.803	-0.000000	0.000001
5.501	11.876	-0.000000	0.000001
5.601	11.946	-0.000000	0.000001
5.701	12.016	-0.000000	0.000001
5.801	12.086	-0.000000	0.000001
5.903	12.155	-0.000000	0.000001
6.001	12.222	-0.000000	0.000001
6.100	12.288	-0.000000	0.000001
6.203	12.354	-0.000000	0.000001
6.303	12.420	-0.000000	0.000001
6.400	12.483	-0.000000	0.000001
6.501	12.545	-0.000000	0.000001
6.603	12.608	-0.000000	0.000001
6.701	12.670	-0.000000	0.000001
6.800	12.730	-0.000000	0.000001
6.904	12.791	-0.000000	0.000001
7.003	12.851	-0.000000	0.000001
7.100	12.909	-0.000000	0.000001
7.201	12.966	-0.000000	0.000001
7.302	13.025	-0.000000	0.000001
7.401	13.081	-0.000000	0.000001
7.503	13.137	-0.000000	0.000001
7.602	13.193	-0.000000	0.000001
7.701	13.248	-0.000000	0.000001
7.801	13.302	-0.000000	0.000001
7.901	13.356	-0.000000	0.000001
8.002	13.409	-0.000000	0.000001
8.103	13.463	-0.000000	0.000001
8.200	13.514	-0.000000	0.000001
8.302	13.566	-0.000000	0.000001
8.400	13.617	-0.000000	0.000001
8.503	13.668	-0.000000	0.000001
8.602	13.719	-0.000000	0.000001
8.701	13.768	-0.000000	0.000001
8.801	13.817	-0.000000	0.000001
8.901	13.866	-0.000000	0.000001
9.002	13.915	-0.000000	0.000001

9.102	13.963	-0.000000	0.000001
9.204	14.011	-0.000000	0.000001
9.301	14.058	-0.000000	0.000001
9.403	14.104	-0.000000	0.000001
9.501	14.150	-0.000000	0.000001
9.600	14.196	-0.000000	0.000001
9.703	14.241	-0.000000	0.000001
9.802	14.287	-0.000000	0.000001
9.902	14.331	-0.000000	0.000001
10.001	14.375	-0.000000	0.000001

```
====================================================================================
===============================================
                     MASS BALANCE   INFLOW - OUTFLOW VOLUME
====================================================================================
===============================================
                           *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                          6.9992 INCHES


                                                                   WATER

RAINFALL VOLUME                                                     1.446

SURFACE WATER INFLOW HYDROGRAPH                                     0.000
                                                                ---------
INFLOW HYDROGRAPHS + RAINFALL                                       1.446

====================================================================================
===============================================
                           *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                          0.000 INCHES



          OVERLAND FLOW                                             WATER


WATER LOST TO INTERCEPTION                                          0.000

FLOODPLAIN STORAGE                                                  0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                       1.365
                                                                ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                          1.446
```

```
TOL FLOODPLAIN STORAGE                                          0.082

TOTAL SURFACE OUTFLOW AND STORAGE                               1.446


==================================================================================
===============================================
                                 *** TOTALS ***



TOTAL OUTFLOW FROM GRID SYSTEM                                  1.365


TOTAL VOLUME OF OUTFLOW AND STORAGE                             1.446

  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                              3.099 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:             0.000 ACRES

==================================================================================
===============================================



  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):           0.171
       VELOCITY (FPS OR CMS):            0.133
       FLOW AREA (FT^2 OR M^2):          1.236
       FLOW DEPTH (FT OR M):             0.051
       FLOW WIDTH (FT OR M):            24.715

  TOTAL COMPUTATIONS:                114152.



     COMPUTER RUN TIME IS :  0.00183 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/11/2021  AT:   3:36:29
```

1	250.00	1300.00	0.0304
2	250.00	1350.00	0.0311
3	250.00	1400.00	0.0383
4	250.00	1450.00	0.0442
5	250.00	1500.00	0.0500
6	250.00	1550.00	0.0566
7	250.00	1600.00	0.0617
8	250.00	1650.00	0.0674
9	250.00	1700.00	0.0674
10	300.00	1300.00	0.0304
11	300.00	1350.00	0.0310
12	300.00	1400.00	0.0380
13	300.00	1450.00	0.0443
14	300.00	1500.00	0.0505
15	300.00	1550.00	0.0571
16	300.00	1600.00	0.0620
17	300.00	1650.00	0.0674
18	300.00	1700.00	0.0673
19	350.00	1300.00	0.0303
20	350.00	1350.00	0.0310
21	350.00	1400.00	0.0377
22	350.00	1450.00	0.0449
23	350.00	1500.00	0.0513
24	350.00	1550.00	0.0575
25	350.00	1600.00	0.0622
26	350.00	1650.00	0.0669
27	350.00	1700.00	0.0671
28	400.00	1300.00	0.0303
29	400.00	1350.00	0.0310
30	400.00	1400.00	0.0377
31	400.00	1450.00	0.0449
32	400.00	1500.00	0.0513
33	400.00	1550.00	0.0575
34	400.00	1600.00	0.0622
35	400.00	1650.00	0.0669
36	400.00	1700.00	0.0671
37	450.00	1300.00	0.0304
38	450.00	1350.00	0.0310
39	450.00	1400.00	0.0380
40	450.00	1450.00	0.0443
41	450.00	1500.00	0.0505
42	450.00	1550.00	0.0571
43	450.00	1600.00	0.0620
44	450.00	1650.00	0.0674
45	450.00	1700.00	0.0673
46	500.00	1300.00	0.0304
47	500.00	1350.00	0.0311
48	500.00	1400.00	0.0383
49	500.00	1450.00	0.0442
50	500.00	1500.00	0.0500

51	500.00	1550.00	0.0566
52	500.00	1600.00	0.0617
53	500.00	1650.00	0.0674
54	500.00	1700.00	0.0674

1	250.00	1300.00	0.0293
2	250.00	1350.00	0.0297
3	250.00	1400.00	0.0294
4	250.00	1450.00	0.0297
5	250.00	1500.00	0.0293
6	250.00	1550.00	0.0295
7	250.00	1600.00	0.0298
8	250.00	1650.00	0.0300
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0296
11	300.00	1350.00	0.0294
12	300.00	1400.00	0.0293
13	300.00	1450.00	0.0297
14	300.00	1500.00	0.0295
15	300.00	1550.00	0.0297
16	300.00	1600.00	0.0299
17	300.00	1650.00	0.0294
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0293
20	350.00	1350.00	0.0296
21	350.00	1400.00	0.0298
22	350.00	1450.00	0.0296
23	350.00	1500.00	0.0296
24	350.00	1550.00	0.0297
25	350.00	1600.00	0.0300
26	350.00	1650.00	0.0294
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0293
29	400.00	1350.00	0.0296
30	400.00	1400.00	0.0298
31	400.00	1450.00	0.0296
32	400.00	1500.00	0.0296
33	400.00	1550.00	0.0297
34	400.00	1600.00	0.0300
35	400.00	1650.00	0.0294
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0296
38	450.00	1350.00	0.0294
39	450.00	1400.00	0.0293
40	450.00	1450.00	0.0297
41	450.00	1500.00	0.0295
42	450.00	1550.00	0.0297
43	450.00	1600.00	0.0299
44	450.00	1650.00	0.0294
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0293
47	500.00	1350.00	0.0297
48	500.00	1400.00	0.0294
49	500.00	1450.00	0.0297
50	500.00	1500.00	0.0293

51	500.00	1550.00	0.0295
52	500.00	1600.00	0.0298
53	500.00	1650.00	0.0300
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0304
2	250.00	1350.00	107.0311
3	250.00	1400.00	106.0383
4	250.00	1450.00	105.0442
5	250.00	1500.00	104.0500
6	250.00	1550.00	103.0566
7	250.00	1600.00	102.0617
8	250.00	1650.00	101.0674
9	250.00	1700.00	100.0674
10	300.00	1300.00	108.0304
11	300.00	1350.00	107.0310
12	300.00	1400.00	106.0380
13	300.00	1450.00	105.0443
14	300.00	1500.00	104.0505
15	300.00	1550.00	103.0571
16	300.00	1600.00	102.0620
17	300.00	1650.00	101.0674
18	300.00	1700.00	100.0673
19	350.00	1300.00	108.0303
20	350.00	1350.00	107.0310
21	350.00	1400.00	106.0377
22	350.00	1450.00	105.0449
23	350.00	1500.00	104.0513
24	350.00	1550.00	103.0575
25	350.00	1600.00	102.0622
26	350.00	1650.00	101.0669
27	350.00	1700.00	100.0671
28	400.00	1300.00	108.0303
29	400.00	1350.00	107.0310
30	400.00	1400.00	106.0377
31	400.00	1450.00	105.0449
32	400.00	1500.00	104.0513
33	400.00	1550.00	103.0575
34	400.00	1600.00	102.0622
35	400.00	1650.00	101.0669
36	400.00	1700.00	100.0671
37	450.00	1300.00	108.0304
38	450.00	1350.00	107.0310
39	450.00	1400.00	106.0380
40	450.00	1450.00	105.0443
41	450.00	1500.00	104.0505
42	450.00	1550.00	103.0571
43	450.00	1600.00	102.0620
44	450.00	1650.00	101.0674
45	450.00	1700.00	100.0673
46	500.00	1300.00	108.0304
47	500.00	1350.00	107.0311
48	500.00	1400.00	106.0383
49	500.00	1450.00	105.0442
50	500.00	1500.00	104.0500

51	500.00	1550.00	103.0566
52	500.00	1600.00	102.0617
53	500.00	1650.00	101.0674
54	500.00	1700.00	100.0674

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       0.59 CFS AT TIME:     4.54
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       0.58 CFS AT TIME:     4.53
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       0.58 CFS AT TIME:     4.53
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.58 CFS AT TIME:     4.53
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       0.58 CFS AT TIME:     4.53
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       0.59 CFS AT TIME:     4.54
```

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
9	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.17
	0.40	0.26
	0.50	0.37
	0.60	0.48
	0.70	0.54
	0.80	0.57
	0.90	0.58
	1.00	0.58
	1.10	0.59
	1.20	0.59
	1.30	0.59
	1.40	0.59
	1.50	0.59
	1.60	0.59
	1.70	0.59
	1.80	0.59
	1.90	0.59
	2.00	0.59
	2.10	0.59
	2.20	0.59
	2.30	0.59
	2.40	0.59
	2.50	0.59
	2.60	0.59
	2.70	0.59
	2.80	0.59
	2.90	0.59
	3.00	0.59
	3.10	0.59
	3.20	0.59
	3.30	0.59
	3.40	0.59
	3.50	0.59
	3.60	0.59
	3.70	0.59
	3.80	0.59
	3.90	0.59
	4.00	0.59

4.10	0.59
4.20	0.59
4.30	0.59
4.40	0.59
4.50	0.59
4.60	0.59
4.70	0.59
4.80	0.59
4.90	0.59
5.00	0.59
5.10	0.45
5.20	0.28
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
18	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.16
	0.40	0.26
	0.50	0.37
	0.60	0.47
	0.70	0.54
	0.80	0.57
	0.90	0.58
	1.00	0.58
	1.10	0.58
	1.20	0.58
	1.30	0.58
	1.40	0.58
	1.50	0.58
	1.60	0.58
	1.70	0.58
	1.80	0.58
	1.90	0.58
	2.00	0.58
	2.10	0.58
	2.20	0.58
	2.30	0.58
	2.40	0.58
	2.50	0.58
	2.60	0.58
	2.70	0.58
	2.80	0.58
	2.90	0.58
	3.00	0.58
	3.10	0.58
	3.20	0.58
	3.30	0.58
	3.40	0.58
	3.50	0.58
	3.60	0.58
	3.70	0.58

3.80	0.58
3.90	0.58
4.00	0.58
4.10	0.58
4.20	0.58
4.30	0.58
4.40	0.58
4.50	0.58
4.60	0.58
4.70	0.58
4.80	0.58
4.90	0.58
5.00	0.58
5.10	0.45
5.20	0.27
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.16
	0.40	0.26
	0.50	0.37
	0.60	0.47
	0.70	0.53
	0.80	0.56
	0.90	0.57
	1.00	0.58
	1.10	0.58
	1.20	0.58
	1.30	0.58
	1.40	0.58
	1.50	0.58
	1.60	0.58
	1.70	0.58
	1.80	0.58
	1.90	0.58
	2.00	0.58
	2.10	0.58
	2.20	0.58
	2.30	0.58
	2.40	0.58
	2.50	0.58
	2.60	0.58
	2.70	0.58
	2.80	0.58
	2.90	0.58
	3.00	0.58
	3.10	0.58
	3.20	0.58
	3.30	0.58
	3.40	0.58

3.50	0.58
3.60	0.58
3.70	0.58
3.80	0.58
3.90	0.58
4.00	0.58
4.10	0.58
4.20	0.58
4.30	0.58
4.40	0.58
4.50	0.58
4.60	0.58
4.70	0.58
4.80	0.58
4.90	0.58
5.00	0.58
5.10	0.46
5.20	0.27
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.16
	0.40	0.26
	0.50	0.37
	0.60	0.47
	0.70	0.53
	0.80	0.56
	0.90	0.57
	1.00	0.58
	1.10	0.58
	1.20	0.58
	1.30	0.58
	1.40	0.58
	1.50	0.58
	1.60	0.58
	1.70	0.58
	1.80	0.58
	1.90	0.58
	2.00	0.58
	2.10	0.58
	2.20	0.58
	2.30	0.58
	2.40	0.58
	2.50	0.58
	2.60	0.58
	2.70	0.58
	2.80	0.58
	2.90	0.58
	3.00	0.58
	3.10	0.58

3.20	0.58
3.30	0.58
3.40	0.58
3.50	0.58
3.60	0.58
3.70	0.58
3.80	0.58
3.90	0.58
4.00	0.58
4.10	0.58
4.20	0.58
4.30	0.58
4.40	0.58
4.50	0.58
4.60	0.58
4.70	0.58
4.80	0.58
4.90	0.58
5.00	0.58
5.10	0.46
5.20	0.27
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.16
	0.40	0.26
	0.50	0.37
	0.60	0.47
	0.70	0.54
	0.80	0.57
	0.90	0.58
	1.00	0.58
	1.10	0.58
	1.20	0.58
	1.30	0.58
	1.40	0.58
	1.50	0.58
	1.60	0.58
	1.70	0.58
	1.80	0.58
	1.90	0.58
	2.00	0.58
	2.10	0.58
	2.20	0.58
	2.30	0.58
	2.40	0.58
	2.50	0.58
	2.60	0.58
	2.70	0.58
	2.80	0.58

2.90	0.58
3.00	0.58
3.10	0.58
3.20	0.58
3.30	0.58
3.40	0.58
3.50	0.58
3.60	0.58
3.70	0.58
3.80	0.58
3.90	0.58
4.00	0.58
4.10	0.58
4.20	0.58
4.30	0.58
4.40	0.58
4.50	0.58
4.60	0.58
4.70	0.58
4.80	0.58
4.90	0.58
5.00	0.58
5.10	0.45
5.20	0.27
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.17
	0.40	0.26
	0.50	0.37
	0.60	0.48
	0.70	0.54
	0.80	0.57
	0.90	0.58
	1.00	0.58
	1.10	0.59
	1.20	0.59
	1.30	0.59
	1.40	0.59
	1.50	0.59
	1.60	0.59
	1.70	0.59
	1.80	0.59
	1.90	0.59
	2.00	0.59
	2.10	0.59
	2.20	0.59
	2.30	0.59
	2.40	0.59
	2.50	0.59

2.60	0.59
2.70	0.59
2.80	0.59
2.90	0.59
3.00	0.59
3.10	0.59
3.20	0.59
3.30	0.59
3.40	0.59
3.50	0.59
3.60	0.59
3.70	0.59
3.80	0.59
3.90	0.59
4.00	0.59
4.10	0.59
4.20	0.59
4.30	0.59
4.40	0.59
4.50	0.59
4.60	0.59
4.70	0.59
4.80	0.59
4.90	0.59
5.00	0.59
5.10	0.45
5.20	0.28
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1022
2	250.00	1350.00	0.1032
3	250.00	1400.00	0.1187
4	250.00	1450.00	0.1308
5	250.00	1500.00	0.1419
6	250.00	1550.00	0.1544
7	250.00	1600.00	0.1634
8	250.00	1650.00	0.1739
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.1021
11	300.00	1350.00	0.1031
12	300.00	1400.00	0.1178
13	300.00	1450.00	0.1309
14	300.00	1500.00	0.1429
15	300.00	1550.00	0.1552
16	300.00	1600.00	0.1639
17	300.00	1650.00	0.1738
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0000
20	350.00	1350.00	0.1032
21	350.00	1400.00	0.1171
22	350.00	1450.00	0.1322
23	350.00	1500.00	0.1446
24	350.00	1550.00	0.1561
25	350.00	1600.00	0.1645
26	350.00	1650.00	0.1730
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0000
29	400.00	1350.00	0.1032
30	400.00	1400.00	0.1171
31	400.00	1450.00	0.1322
32	400.00	1500.00	0.1446
33	400.00	1550.00	0.1561
34	400.00	1600.00	0.1645
35	400.00	1650.00	0.1730
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.1021
38	450.00	1350.00	0.1031
39	450.00	1400.00	0.1178
40	450.00	1450.00	0.1309
41	450.00	1500.00	0.1429
42	450.00	1550.00	0.1552
43	450.00	1600.00	0.1639
44	450.00	1650.00	0.1738
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.1022
47	500.00	1350.00	0.1032
48	500.00	1400.00	0.1187
49	500.00	1450.00	0.1308
50	500.00	1500.00	0.1419

51	500.00	1550.00	0.1544
52	500.00	1600.00	0.1634
53	500.00	1650.00	0.1739
54	500.00	1700.00	0.0000

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 28

Test Case 9d Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (3 Pages)

OUTFLOW.DAT (1 Page)

LEVEE.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

0	1		
7	0	1	0
R	0	0	
R	0.1	0.02	
R	0.2	0.04	
R	0.3	0.06	
R	0.4	0.08	
R	0.5	0.1	
R	0.6	0.12	
R	0.7	0.14	
R	0.8	0.16	
R	0.9	0.18	
R	1	0.2	
R	1.1	0.22	
R	1.2	0.24	
R	1.3	0.26	
R	1.4	0.28	
R	1.5	0.3	
R	1.6	0.32	
R	1.7	0.34	
R	1.8	0.36	
R	1.9	0.38	
R	2	0.4	
R	2.1	0.42	
R	2.2	0.44	
R	2.3	0.46	
R	2.4	0.48	
R	2.5	0.5	
R	2.6	0.52	
R	2.7	0.54	
R	2.8	0.56	
R	2.9	0.58	
R	3	0.6	
R	3.1	0.62	
R	3.2	0.64	
R	3.3	0.66	
R	3.4	0.68	
R	3.5	0.7	
R	3.6	0.72	
R	3.7	0.74	
R	3.8	0.76	
R	3.9	0.78	
R	4	0.8	
R	4.1	0.82	
R	4.2	0.84	
R	4.3	0.86	
R	4.4	0.88	
R	4.5	0.9	
R	4.6	0.92	
R	4.7	0.94	

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R               4.8             0.96
R               4.9             0.98
R               5               1
 1              1
 2              0.5
 3              1
 4              0.5
 5              0.5
 6              1
 7              0.5
 8              1
 9              1
 10             1
 11             0.5
 12             1
 13             0.5
 14             0.5
 15             1
 16             0.5
 17             1
 18             1
 19             0.5
 20             0.5
 21             1
 22             1
 23             1
 24             1
 25             0.5
 26             0.5
 27             1
 28             0.5
 29             0.5
 30             1
 31             1
 32             1
 33             1
 34             0.5
 35             0.5
 36             1
 37             1
 38             0.5
 39             1
 40             0.5
 41             0.5
 42             1
 43             0.5
 44             1
 45             1
 46             1
 47             0.5
```

```
48        1
49        0.5
50        0.5
51        1
52        0.5
53        1
54        1
```

0	9
0	18
0	27
0	36
0	45
0	54

```
 0            0
L             11
D             1             111.0
D             2             111.0
D             3             111.0
D             4             111.0
D             5             111.0
D             6             111.0
D             7             111.0
D             8             111.0
L             15
D             1             107.0
D             2             107.0
D             3             107.0
D             4             107.0
D             5             107.0
D             6             107.0
D             7             107.0
D             8             107.0
L             39
D             1             110.0
D             2             110.0
D             3             110.0
D             4             110.0
D             5             110.0
D             6             110.0
D             7             110.0
D             8             110.0
L             43
D             1             106.0
D             2             106.0
D             3             106.0
D             4             106.0
D             5             106.0
D             6             106.0
D             7             106.0
D             8             106.0
```

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 29

Test Case 9d Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

LEVEE.OUT (1 Page)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
SUMMARY.OUT FILE			
Pro Model - Build No. 16.06.16			
0.000	1.000	0.000000	0.000000
0.100	1.803	-0.000000	0.000000
0.200	2.969	-0.000000	0.000000
0.300	3.678	0.000000	0.000000
0.400	4.228	0.000000	0.000000
0.500	4.687	-0.000000	0.000000
0.601	5.086	-0.000000	0.000000
0.700	5.439	0.000000	0.000001
0.801	5.758	0.000000	0.000002
0.900	6.050	-0.000000	0.000001
1.000	6.318	-0.000000	0.000001
1.101	6.569	-0.000000	0.000001
1.201	6.804	0.000000	0.000001
1.300	7.024	-0.000000	0.000001
1.401	7.233	0.000000	0.000002
1.502	7.433	0.000000	0.000000
1.602	7.622	-0.000000	0.000002
1.701	7.802	0.000000	0.000001
1.801	7.974	0.000000	0.000000
1.900	8.139	0.000000	0.000002
2.002	8.299	0.000000	0.000002
2.100	8.453	-0.000000	0.000002
2.201	8.600	-0.000000	0.000002
2.300	8.743	-0.000000	0.000002
2.402	8.882	0.000000	0.000001
2.502	9.017	0.000000	0.000000
2.601	9.147	-0.000000	0.000002
2.701	9.273	0.000000	0.000002
2.800	9.396	-0.000000	0.000003
2.901	9.516	0.000000	0.000001
3.003	9.634	-0.000000	0.000002
3.100	9.747	-0.000000	0.000000
3.201	9.857	-0.000000	0.000002
3.301	9.966	0.000000	0.000002
3.402	10.072	-0.000000	0.000003
3.501	10.175	0.000000	0.000002
3.601	10.276	-0.000000	0.000001
3.701	10.375	0.000000	0.000002
3.800	10.472	-0.000000	0.000002
3.900	10.566	0.000000	0.000002
4.001	10.659	-0.000000	0.000003

4.102	10.752	-0.000000	0.000001
4.202	10.842	0.000000	0.000002
4.302	10.929	0.000000	0.000002
4.403	11.016	0.000000	0.000002
4.502	11.101	-0.000000	0.000002
4.601	11.183	0.000000	0.000000
4.701	11.265	0.000000	0.000002
4.802	11.346	0.000000	0.000000
4.900	11.425	-0.000000	0.000001
5.003	11.503	0.000000	0.000002
5.102	11.581	0.000000	0.000001
5.203	11.656	-0.000000	0.000000
5.300	11.730	-0.000000	0.000005
5.402	11.803	-0.000000	0.000005
5.501	11.876	-0.000000	0.000005
5.601	11.946	-0.000000	0.000005
5.701	12.016	-0.000000	0.000005
5.801	12.086	-0.000000	0.000005
5.903	12.155	-0.000000	0.000005
6.001	12.222	-0.000000	0.000005
6.100	12.288	-0.000000	0.000005
6.203	12.354	-0.000000	0.000005
6.303	12.420	-0.000000	0.000005
6.400	12.483	-0.000000	0.000005
6.501	12.545	-0.000000	0.000005
6.603	12.608	-0.000000	0.000005
6.701	12.670	-0.000000	0.000005
6.800	12.730	-0.000000	0.000005
6.904	12.791	-0.000000	0.000005
7.003	12.851	-0.000000	0.000005
7.100	12.909	-0.000000	0.000005
7.201	12.966	-0.000000	0.000005
7.302	13.025	-0.000000	0.000005
7.401	13.081	-0.000000	0.000005
7.503	13.137	-0.000000	0.000005
7.602	13.193	-0.000000	0.000005
7.701	13.248	-0.000000	0.000005
7.801	13.302	-0.000000	0.000005
7.901	13.356	-0.000000	0.000005
8.002	13.409	-0.000000	0.000005
8.103	13.463	-0.000000	0.000005
8.200	13.514	-0.000000	0.000005
8.302	13.566	-0.000000	0.000005
8.400	13.617	-0.000000	0.000005
8.503	13.668	-0.000000	0.000005
8.602	13.719	-0.000000	0.000005
8.701	13.768	-0.000000	0.000005
8.801	13.817	-0.000000	0.000005
8.901	13.866	-0.000000	0.000005
9.002	13.915	-0.000000	0.000005

```
      9.102               13.963              -0.000000        0.000005
      9.204               14.011              -0.000000        0.000005
      9.301               14.058              -0.000000        0.000005
      9.403               14.104              -0.000000        0.000005
      9.501               14.150              -0.000000        0.000005
      9.600               14.196              -0.000000        0.000005
      9.703               14.241              -0.000000        0.000005
      9.802               14.287              -0.000000        0.000005
      9.902               14.331              -0.000000        0.000005
     10.001               14.375              -0.000000        0.000005
==================================================================================
===============================================
                     MASS BALANCE   INFLOW - OUTFLOW VOLUME
==================================================================================
===============================================
                           *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                         6.9992 INCHES


                                                                  WATER

RAINFALL VOLUME                                                    1.205

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      1.205

==================================================================================
===============================================
                           *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                         0.000 INCHES



          OVERLAND FLOW                                            WATER


WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.175

FLOODPLAIN OUTFLOW HYDROGRAPH                                      1.030
                                                               ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         1.205
```

```
TOL FLOODPLAIN STORAGE                                          0.082

TOTAL SURFACE OUTFLOW AND STORAGE                               1.205


====================================================================================
================================================
                                 *** TOTALS ***



TOTAL OUTFLOW FROM GRID SYSTEM                                  1.030


TOTAL VOLUME OF OUTFLOW AND STORAGE                             1.205


  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                              3.099 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:             0.115 ACRES

====================================================================================
================================================


  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):           0.147
       VELOCITY (FPS OR CMS):            0.119
       FLOW AREA (FT^2 OR M^2):          1.177
       FLOW DEPTH (FT OR M):             0.047
       FLOW WIDTH (FT OR M):            25.185

  TOTAL COMPUTATIONS:                102910.



     COMPUTER RUN TIME IS :  0.00183 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/11/2021  AT:   3:42:44
```

1	250.00	1300.00	0.0304
2	250.00	1350.00	0.0315
3	250.00	1400.00	0.0345
4	250.00	1450.00	0.0382
5	250.00	1500.00	0.0532
6	250.00	1550.00	0.0693
7	250.00	1600.00	0.0522
8	250.00	1650.00	0.0575
9	250.00	1700.00	0.0578
10	300.00	1300.00	0.0306
11	300.00	1350.00	0.2916
12	300.00	1400.00	0.0321
13	300.00	1450.00	0.0381
14	300.00	1500.00	0.0571
15	300.00	1550.00	0.5833
16	300.00	1600.00	0.0479
17	300.00	1650.00	0.0580
18	300.00	1700.00	0.0584
19	350.00	1300.00	0.0302
20	350.00	1350.00	0.0309
21	350.00	1400.00	0.0331
22	350.00	1450.00	0.0414
23	350.00	1500.00	0.0566
24	350.00	1550.00	0.0656
25	350.00	1600.00	0.0547
26	350.00	1650.00	0.0597
27	350.00	1700.00	0.0575
28	400.00	1300.00	0.0302
29	400.00	1350.00	0.0309
30	400.00	1400.00	0.0385
31	400.00	1450.00	0.0382
32	400.00	1500.00	0.0464
33	400.00	1550.00	0.0681
34	400.00	1600.00	0.0774
35	400.00	1650.00	0.0547
36	400.00	1700.00	0.0565
37	450.00	1300.00	0.0304
38	450.00	1350.00	0.0334
39	450.00	1400.00	0.5833
40	450.00	1450.00	0.0336
41	450.00	1500.00	0.0413
42	450.00	1550.00	0.0672
43	450.00	1600.00	0.2916
44	450.00	1650.00	0.0552
45	450.00	1700.00	0.0568
46	500.00	1300.00	0.0304
47	500.00	1350.00	0.0329
48	500.00	1400.00	0.0457
49	500.00	1450.00	0.0375
50	500.00	1500.00	0.0408

51	500.00	1550.00	0.0612
52	500.00	1600.00	0.0719
53	500.00	1650.00	0.0607
54	500.00	1700.00	0.0579

1	250.00	1300.00	0.0295
2	250.00	1350.00	0.0297
3	250.00	1400.00	0.0294
4	250.00	1450.00	0.0298
5	250.00	1500.00	0.0299
6	250.00	1550.00	0.0294
7	250.00	1600.00	0.0296
8	250.00	1650.00	0.0300
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0298
11	300.00	1350.00	0.2916
12	300.00	1400.00	0.0294
13	300.00	1450.00	0.0295
14	300.00	1500.00	0.0300
15	300.00	1550.00	0.5833
16	300.00	1600.00	0.0299
17	300.00	1650.00	0.0298
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0296
20	350.00	1350.00	0.0296
21	350.00	1400.00	0.0294
22	350.00	1450.00	0.0293
23	350.00	1500.00	0.0300
24	350.00	1550.00	0.0294
25	350.00	1600.00	0.0294
26	350.00	1650.00	0.0299
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0294
29	400.00	1350.00	0.0296
30	400.00	1400.00	0.0293
31	400.00	1450.00	0.0299
32	400.00	1500.00	0.0297
33	400.00	1550.00	0.0298
34	400.00	1600.00	0.0295
35	400.00	1650.00	0.0299
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0298
38	450.00	1350.00	0.0298
39	450.00	1400.00	0.5833
40	450.00	1450.00	0.0300
41	450.00	1500.00	0.0299
42	450.00	1550.00	0.0296
43	450.00	1600.00	0.2916
44	450.00	1650.00	0.0296
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0296
47	500.00	1350.00	0.0298
48	500.00	1400.00	0.0295
49	500.00	1450.00	0.0295
50	500.00	1500.00	0.0294

51	500.00	1550.00	0.0299
52	500.00	1600.00	0.0297
53	500.00	1650.00	0.0300
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0304
2	250.00	1350.00	107.0315
3	250.00	1400.00	106.0345
4	250.00	1450.00	105.0382
5	250.00	1500.00	104.0532
6	250.00	1550.00	103.0693
7	250.00	1600.00	102.0522
8	250.00	1650.00	101.0575
9	250.00	1700.00	100.0578
10	300.00	1300.00	108.0306
11	300.00	1350.00	107.2916
12	300.00	1400.00	106.0321
13	300.00	1450.00	105.0381
14	300.00	1500.00	104.0571
15	300.00	1550.00	103.5833
16	300.00	1600.00	102.0479
17	300.00	1650.00	101.0580
18	300.00	1700.00	100.0584
19	350.00	1300.00	108.0302
20	350.00	1350.00	107.0309
21	350.00	1400.00	106.0331
22	350.00	1450.00	105.0414
23	350.00	1500.00	104.0566
24	350.00	1550.00	103.0656
25	350.00	1600.00	102.0547
26	350.00	1650.00	101.0597
27	350.00	1700.00	100.0575
28	400.00	1300.00	108.0302
29	400.00	1350.00	107.0309
30	400.00	1400.00	106.0385
31	400.00	1450.00	105.0382
32	400.00	1500.00	104.0464
33	400.00	1550.00	103.0681
34	400.00	1600.00	102.0774
35	400.00	1650.00	101.0547
36	400.00	1700.00	100.0565
37	450.00	1300.00	108.0304
38	450.00	1350.00	107.0334
39	450.00	1400.00	106.5833
40	450.00	1450.00	105.0336
41	450.00	1500.00	104.0413
42	450.00	1550.00	103.0672
43	450.00	1600.00	102.2916
44	450.00	1650.00	101.0552
45	450.00	1700.00	100.0568
46	500.00	1300.00	108.0304
47	500.00	1350.00	107.0329
48	500.00	1400.00	106.0457
49	500.00	1450.00	105.0375
50	500.00	1500.00	104.0408

51	500.00	1550.00	103.0612
52	500.00	1600.00	102.0719
53	500.00	1650.00	101.0607
54	500.00	1700.00	100.0579

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       0.45 CFS AT TIME:     4.99
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       0.46 CFS AT TIME:     5.00
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       0.45 CFS AT TIME:     5.00
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.43 CFS AT TIME:     4.98
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       0.43 CFS AT TIME:     2.80
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       0.46 CFS AT TIME:     2.80

    ELEMENT     TIME (HRS)     DISCHARGE (CFS)
        9       0.00              0.00
                0.00              0.00
                0.10              0.00
                0.20              0.00
                0.30              0.04
                0.40              0.18
                0.50              0.23
                0.60              0.29
                0.70              0.35
                0.80              0.41
                0.90              0.43
                1.00              0.45
                1.10              0.45
                1.20              0.45
                1.30              0.45
                1.40              0.45
                1.50              0.45
                1.60              0.45
                1.70              0.45
                1.80              0.45
                1.90              0.45
                2.00              0.45
                2.10              0.45
                2.20              0.45
                2.30              0.45
                2.40              0.45
                2.50              0.45
                2.60              0.45
                2.70              0.45
                2.80              0.45
                2.90              0.45
                3.00              0.45
                3.10              0.45
                3.20              0.45
                3.30              0.45
                3.40              0.45
                3.50              0.45
                3.60              0.45
                3.70              0.45
                3.80              0.45
                3.90              0.45
                4.00              0.45
```

4.10	0.45
4.20	0.45
4.30	0.45
4.40	0.45
4.50	0.45
4.60	0.45
4.70	0.45
4.80	0.45
4.90	0.45
5.00	0.45
5.10	0.35
5.20	0.26
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
18	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.06
	0.40	0.18
	0.50	0.24
	0.60	0.30
	0.70	0.36
	0.80	0.41
	0.90	0.44
	1.00	0.45
	1.10	0.46
	1.20	0.46
	1.30	0.46
	1.40	0.46
	1.50	0.46
	1.60	0.46
	1.70	0.46
	1.80	0.46
	1.90	0.46
	2.00	0.46
	2.10	0.46
	2.20	0.46
	2.30	0.46
	2.40	0.46
	2.50	0.46
	2.60	0.46
	2.70	0.46
	2.80	0.46
	2.90	0.46
	3.00	0.46
	3.10	0.46
	3.20	0.46
	3.30	0.46
	3.40	0.46
	3.50	0.46
	3.60	0.46
	3.70	0.46

3.80	0.46
3.90	0.46
4.00	0.46
4.10	0.46
4.20	0.46
4.30	0.46
4.40	0.46
4.50	0.46
4.60	0.46
4.70	0.46
4.80	0.46
4.90	0.46
5.00	0.46
5.10	0.36
5.20	0.27
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.17
	0.50	0.22
	0.60	0.29
	0.70	0.36
	0.80	0.40
	0.90	0.43
	1.00	0.44
	1.10	0.44
	1.20	0.45
	1.30	0.45
	1.40	0.45
	1.50	0.45
	1.60	0.45
	1.70	0.45
	1.80	0.45
	1.90	0.45
	2.00	0.45
	2.10	0.45
	2.20	0.45
	2.30	0.45
	2.40	0.45
	2.50	0.45
	2.60	0.45
	2.70	0.45
	2.80	0.45
	2.90	0.45
	3.00	0.45
	3.10	0.45
	3.20	0.45
	3.30	0.45
	3.40	0.45

3.50	0.45
3.60	0.45
3.70	0.45
3.80	0.45
3.90	0.45
4.00	0.45
4.10	0.45
4.20	0.45
4.30	0.45
4.40	0.45
4.50	0.45
4.60	0.45
4.70	0.45
4.80	0.45
4.90	0.45
5.00	0.45
5.10	0.37
5.20	0.27
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.16
	0.50	0.21
	0.60	0.28
	0.70	0.34
	0.80	0.39
	0.90	0.41
	1.00	0.42
	1.10	0.43
	1.20	0.43
	1.30	0.43
	1.40	0.43
	1.50	0.43
	1.60	0.43
	1.70	0.43
	1.80	0.43
	1.90	0.43
	2.00	0.43
	2.10	0.43
	2.20	0.43
	2.30	0.43
	2.40	0.43
	2.50	0.43
	2.60	0.43
	2.70	0.43
	2.80	0.43
	2.90	0.43
	3.00	0.43
	3.10	0.43

3.20	0.43
3.30	0.43
3.40	0.43
3.50	0.43
3.60	0.43
3.70	0.43
3.80	0.43
3.90	0.43
4.00	0.43
4.10	0.43
4.20	0.43
4.30	0.43
4.40	0.43
4.50	0.43
4.60	0.43
4.70	0.43
4.80	0.43
4.90	0.43
5.00	0.43
5.10	0.35
5.20	0.26
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.06
	0.40	0.17
	0.50	0.21
	0.60	0.27
	0.70	0.34
	0.80	0.39
	0.90	0.41
	1.00	0.42
	1.10	0.43
	1.20	0.43
	1.30	0.43
	1.40	0.43
	1.50	0.43
	1.60	0.43
	1.70	0.43
	1.80	0.43
	1.90	0.43
	2.00	0.43
	2.10	0.43
	2.20	0.43
	2.30	0.43
	2.40	0.43
	2.50	0.43
	2.60	0.43
	2.70	0.43
	2.80	0.43

2.90	0.43
3.00	0.43
3.10	0.43
3.20	0.43
3.30	0.43
3.40	0.43
3.50	0.43
3.60	0.43
3.70	0.43
3.80	0.43
3.90	0.43
4.00	0.43
4.10	0.43
4.20	0.43
4.30	0.43
4.40	0.43
4.50	0.43
4.60	0.43
4.70	0.43
4.80	0.43
4.90	0.43
5.00	0.43
5.10	0.34
5.20	0.25
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.04
	0.40	0.18
	0.50	0.22
	0.60	0.28
	0.70	0.36
	0.80	0.41
	0.90	0.44
	1.00	0.45
	1.10	0.45
	1.20	0.46
	1.30	0.46
	1.40	0.46
	1.50	0.46
	1.60	0.46
	1.70	0.46
	1.80	0.46
	1.90	0.46
	2.00	0.46
	2.10	0.46
	2.20	0.46
	2.30	0.46
	2.40	0.46
	2.50	0.46

2.60	0.46
2.70	0.46
2.80	0.46
2.90	0.46
3.00	0.46
3.10	0.46
3.20	0.46
3.30	0.46
3.40	0.46
3.50	0.46
3.60	0.46
3.70	0.46
3.80	0.46
3.90	0.46
4.00	0.46
4.10	0.46
4.20	0.46
4.30	0.46
4.40	0.46
4.50	0.46
4.60	0.46
4.70	0.46
4.80	0.46
4.90	0.46
5.00	0.46
5.10	0.36
5.20	0.26
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1021
2	250.00	1350.00	0.1040
3	250.00	1400.00	0.1111
4	250.00	1450.00	0.1182
5	250.00	1500.00	0.1472
6	250.00	1550.00	0.1634
7	250.00	1600.00	0.1461
8	250.00	1650.00	0.1564
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0722
11	300.00	1350.00	0.0000
12	300.00	1400.00	0.1055
13	300.00	1450.00	0.1176
14	300.00	1500.00	0.1097
15	300.00	1550.00	0.0000
16	300.00	1600.00	0.1377
17	300.00	1650.00	0.1573
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0000
20	350.00	1350.00	0.1032
21	350.00	1400.00	0.1073
22	350.00	1450.00	0.1246
23	350.00	1500.00	0.1540
24	350.00	1550.00	0.1620
25	350.00	1600.00	0.1508
26	350.00	1650.00	0.1586
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0000
29	400.00	1350.00	0.1029
30	400.00	1400.00	0.1192
31	400.00	1450.00	0.1186
32	400.00	1500.00	0.1341
33	400.00	1550.00	0.1742
34	400.00	1600.00	0.1734
35	400.00	1650.00	0.1511
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.1020
38	450.00	1350.00	0.0768
39	450.00	1400.00	0.0000
40	450.00	1450.00	0.1088
41	450.00	1500.00	0.1237
42	450.00	1550.00	0.1225
43	450.00	1600.00	0.0000
44	450.00	1650.00	0.1520
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.1021
47	500.00	1350.00	0.1066
48	500.00	1400.00	0.1264
49	500.00	1450.00	0.1175
50	500.00	1500.00	0.1230

51	500.00	1550.00	0.1621
52	500.00	1600.00	0.1729
53	500.00	1650.00	0.1599
54	500.00	1700.00	0.0000

```
THE LEVEE IN GRID ELEMENT AND DIRECTION WAS OVERTOPPED AT TIME:
```

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 30

Test Case 9e Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (3 Pages)

OUTFLOW.DAT (1 Page)

LEVEE.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

0	1		
7	0	1	0
R	0	0	
R	0.1	0.02	
R	0.2	0.04	
R	0.3	0.06	
R	0.4	0.08	
R	0.5	0.1	
R	0.6	0.12	
R	0.7	0.14	
R	0.8	0.16	
R	0.9	0.18	
R	1	0.2	
R	1.1	0.22	
R	1.2	0.24	
R	1.3	0.26	
R	1.4	0.28	
R	1.5	0.3	
R	1.6	0.32	
R	1.7	0.34	
R	1.8	0.36	
R	1.9	0.38	
R	2	0.4	
R	2.1	0.42	
R	2.2	0.44	
R	2.3	0.46	
R	2.4	0.48	
R	2.5	0.5	
R	2.6	0.52	
R	2.7	0.54	
R	2.8	0.56	
R	2.9	0.58	
R	3	0.6	
R	3.1	0.62	
R	3.2	0.64	
R	3.3	0.66	
R	3.4	0.68	
R	3.5	0.7	
R	3.6	0.72	
R	3.7	0.74	
R	3.8	0.76	
R	3.9	0.78	
R	4	0.8	
R	4.1	0.82	
R	4.2	0.84	
R	4.3	0.86	
R	4.4	0.88	
R	4.5	0.9	
R	4.6	0.92	
R	4.7	0.94	

```
R               4.8             0.96
R               4.9             0.98
R               5               1
 1              1
 2              1
 3              1
 4              1
 5              1
 6              1
 7              1
 8              1
 9              1
 10             1
 11             1
 12             1
 13             1
 14             1
 15             1
 16             1
 17             1
 18             1
 19             1
 20             1
 21             1
 22             1
 23             1
 24             1
 25             1
 26             1
 27             1
 28             0.5
 29             0.5
 30             0.5
 31             0.5
 32             0.5
 33             0.5
 34             0.5
 35             0.5
 36             1
 37             0.5
 38             0.5
 39             0.5
 40             0.5
 41             0.5
 42             0.5
 43             0.5
 44             0.5
 45             1
 46             0.5
 47             0.5
```

```
48              0.5
49              0.5
50              0.5
51              0.5
52              0.5
53              0.5
54              1
```

0	9
0	18
0	27
0	36
0	45
0	54

```
 0            0
L             26
D             5             105.0
L             28
D             4             112.0
D             7             112.0
D             8             112.0
L             29
D             4             111.0
D             7             111.0
D             8             111.0
L             30
D             4             110.0
D             7             110.0
D             8             110.0
L             31
D             4             109.0
D             7             109.0
D             8             109.0
L             32
D             4             108.0
D             7             108.0
D             8             108.0
L             33
D             4             107.0
D             7             107.0
D             8             107.0
L             34
D             4             106.0
D             7             106.0
D             8             106.0
L             35
D             4             105.0
D             7             105.0
D             8             105.0
```

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 31

Test Case 9e Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

LEVEE.OUT (1 Page)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SUMMARY.OUT FILE
Pro Model - Build No. 16.06.16

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
0.000	1.000	0.000000	0.000000
0.100	1.803	-0.000000	0.000000
0.200	2.969	-0.000000	0.000000
0.300	3.678	-0.000000	0.000000
0.400	4.228	-0.000000	0.000000
0.500	4.687	-0.000000	0.000001
0.601	5.086	0.000000	0.000000
0.700	5.439	0.000000	0.000001
0.801	5.758	0.000000	0.000002
0.900	6.050	-0.000000	0.000001
1.000	6.318	-0.000000	0.000000
1.101	6.569	-0.000000	0.000001
1.201	6.804	-0.000000	0.000002
1.300	7.024	0.000000	0.000001
1.401	7.233	-0.000000	0.000000
1.502	7.433	0.000000	0.000000
1.602	7.622	-0.000000	0.000002
1.701	7.802	-0.000000	0.000003
1.801	7.974	0.000000	0.000002
1.900	8.139	0.000000	0.000001
2.002	8.299	-0.000000	0.000003
2.100	8.453	0.000000	0.000002
2.201	8.600	0.000000	0.000002
2.300	8.743	0.000000	0.000003
2.402	8.882	-0.000000	0.000002
2.502	9.017	-0.000000	0.000001
2.601	9.147	-0.000000	0.000001
2.701	9.273	-0.000000	0.000004
2.800	9.396	-0.000000	0.000003
2.901	9.516	-0.000000	0.000002
3.003	9.634	0.000000	0.000004
3.100	9.747	-0.000000	0.000002
3.201	9.857	-0.000000	0.000001
3.301	9.966	0.000000	0.000001
3.402	10.072	0.000000	0.000001
3.501	10.175	-0.000000	0.000001
3.601	10.276	0.000000	0.000003
3.701	10.375	0.000000	0.000001
3.800	10.472	0.000000	0.000001
3.900	10.566	0.000000	0.000003
4.001	10.659	0.000000	0.000001

4.102	10.752	0.000000	0.000003
4.202	10.842	-0.000000	0.000002
4.302	10.929	-0.000000	0.000003
4.403	11.016	0.000000	0.000002
4.502	11.101	-0.000000	0.000001
4.601	11.183	0.000000	0.000001
4.701	11.265	-0.000000	0.000003
4.802	11.346	-0.000000	0.000003
4.900	11.425	0.000000	0.000004
5.003	11.503	-0.000000	0.000005
5.102	11.581	0.000000	0.000000
5.203	11.656	-0.000000	0.000002
5.300	11.730	-0.000000	0.000005
5.402	11.803	-0.000000	0.000000
5.501	11.876	-0.000000	0.000000
5.601	11.946	-0.000000	0.000000
5.701	12.016	-0.000000	0.000000
5.801	12.086	-0.000000	0.000000
5.903	12.155	-0.000000	0.000000
6.001	12.222	-0.000000	0.000000
6.100	12.288	-0.000000	0.000000
6.203	12.354	-0.000000	0.000000
6.303	12.420	-0.000000	0.000000
6.400	12.483	-0.000000	0.000000
6.501	12.545	-0.000000	0.000000
6.603	12.608	-0.000000	0.000000
6.701	12.670	-0.000000	0.000000
6.800	12.730	-0.000000	0.000000
6.904	12.791	-0.000000	0.000000
7.003	12.851	-0.000000	0.000000
7.100	12.909	-0.000000	0.000000
7.201	12.966	-0.000000	0.000000
7.302	13.025	-0.000000	0.000000
7.401	13.081	-0.000000	0.000000
7.503	13.137	-0.000000	0.000000
7.602	13.193	-0.000000	0.000000
7.701	13.248	-0.000000	0.000000
7.801	13.302	-0.000000	0.000000
7.901	13.356	-0.000000	0.000000
8.002	13.409	-0.000000	0.000000
8.103	13.463	-0.000000	0.000000
8.200	13.514	-0.000000	0.000000
8.302	13.566	-0.000000	0.000000
8.400	13.617	-0.000000	0.000000
8.503	13.668	-0.000000	0.000000
8.602	13.719	-0.000000	0.000000
8.701	13.768	-0.000000	0.000000
8.801	13.817	-0.000000	0.000000
8.901	13.866	-0.000000	0.000000
9.002	13.915	-0.000000	0.000000

```
      9.102              13.963             -0.000000        0.000000
      9.204              14.011             -0.000000        0.000000
      9.301              14.058             -0.000000        0.000000
      9.403              14.104             -0.000000        0.000000
      9.501              14.150             -0.000000        0.000000
      9.600              14.196             -0.000000        0.000000
      9.703              14.241             -0.000000        0.000000
      9.802              14.287             -0.000000        0.000000
      9.902              14.331             -0.000000        0.000000
     10.001              14.375             -0.000000        0.000000
==================================================================================
===============================================
                     MASS BALANCE   INFLOW - OUTFLOW VOLUME
==================================================================================
===============================================
                           *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                         6.9992 INCHES


                                                                  WATER

RAINFALL VOLUME                                                    1.205

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      1.205

==================================================================================
===============================================
                           *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                         0.000 INCHES



          OVERLAND FLOW                                            WATER


WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.082

FLOODPLAIN OUTFLOW HYDROGRAPH                                      1.123
                                                               ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         1.205
```

```
TOL FLOODPLAIN STORAGE                                          0.082

TOTAL SURFACE OUTFLOW AND STORAGE                               1.205


==================================================================================
===============================================
                                 *** TOTALS ***



TOTAL OUTFLOW FROM GRID SYSTEM                                  1.123


TOTAL VOLUME OF OUTFLOW AND STORAGE                             1.205


  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                              3.099 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:             0.000 ACRES

==================================================================================
===============================================



  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):           0.164
       VELOCITY (FPS OR CMS):            0.131
       FLOW AREA (FT^2 OR M^2):          1.192
       FLOW DEPTH (FT OR M):             0.049
       FLOW WIDTH (FT OR M):            24.737

  TOTAL COMPUTATIONS:               103076.




     COMPUTER RUN TIME IS :  0.00183 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/11/2021  AT:   4:22: 8
```

1	250.00	1300.00	0.0304
2	250.00	1350.00	0.0318
3	250.00	1400.00	0.0408
4	250.00	1450.00	0.0489
5	250.00	1500.00	0.0563
6	250.00	1550.00	0.0632
7	250.00	1600.00	0.0696
8	250.00	1650.00	0.0757
9	250.00	1700.00	0.0765
10	300.00	1300.00	0.0304
11	300.00	1350.00	0.0329
12	300.00	1400.00	0.0420
13	300.00	1450.00	0.0501
14	300.00	1500.00	0.0573
15	300.00	1550.00	0.0640
16	300.00	1600.00	0.0703
17	300.00	1650.00	0.0772
18	300.00	1700.00	0.0778
19	350.00	1300.00	0.0304
20	350.00	1350.00	0.0366
21	350.00	1400.00	0.0452
22	350.00	1450.00	0.0528
23	350.00	1500.00	0.0596
24	350.00	1550.00	0.0660
25	350.00	1600.00	0.0719
26	350.00	1650.00	0.0804
27	350.00	1700.00	0.0697
28	400.00	1300.00	0.0302
29	400.00	1350.00	0.0307
30	400.00	1400.00	0.0308
31	400.00	1450.00	0.0353
32	400.00	1500.00	0.0396
33	400.00	1550.00	0.0437
34	400.00	1600.00	0.0476
35	400.00	1650.00	0.0515
36	400.00	1700.00	0.0607
37	450.00	1300.00	0.0302
38	450.00	1350.00	0.0307
39	450.00	1400.00	0.0309
40	450.00	1450.00	0.0333
41	450.00	1500.00	0.0378
42	450.00	1550.00	0.0422
43	450.00	1600.00	0.0463
44	450.00	1650.00	0.0502
45	450.00	1700.00	0.0505
46	500.00	1300.00	0.0302
47	500.00	1350.00	0.0307
48	500.00	1400.00	0.0310
49	500.00	1450.00	0.0323
50	500.00	1500.00	0.0370

51	500.00	1550.00	0.0415
52	500.00	1600.00	0.0457
53	500.00	1650.00	0.0497
54	500.00	1700.00	0.0500

1	250.00	1300.00	0.0296
2	250.00	1350.00	0.0298
3	250.00	1400.00	0.0299
4	250.00	1450.00	0.0300
5	250.00	1500.00	0.0297
6	250.00	1550.00	0.0294
7	250.00	1600.00	0.0298
8	250.00	1650.00	0.0295
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0294
11	300.00	1350.00	0.0296
12	300.00	1400.00	0.0294
13	300.00	1450.00	0.0300
14	300.00	1500.00	0.0295
15	300.00	1550.00	0.0298
16	300.00	1600.00	0.0296
17	300.00	1650.00	0.0298
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0295
20	350.00	1350.00	0.0300
21	350.00	1400.00	0.0297
22	350.00	1450.00	0.0295
23	350.00	1500.00	0.0299
24	350.00	1550.00	0.0297
25	350.00	1600.00	0.0295
26	350.00	1650.00	0.0297
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0299
29	400.00	1350.00	0.0296
30	400.00	1400.00	0.0296
31	400.00	1450.00	0.0297
32	400.00	1500.00	0.0295
33	400.00	1550.00	0.0296
34	400.00	1600.00	0.0295
35	400.00	1650.00	0.0296
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0296
38	450.00	1350.00	0.0294
39	450.00	1400.00	0.0297
40	450.00	1450.00	0.0297
41	450.00	1500.00	0.0298
42	450.00	1550.00	0.0299
43	450.00	1600.00	0.0295
44	450.00	1650.00	0.0298
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0298
47	500.00	1350.00	0.0298
48	500.00	1400.00	0.0300
49	500.00	1450.00	0.0298
50	500.00	1500.00	0.0298

51	500.00	1550.00	0.0295
52	500.00	1600.00	0.0296
53	500.00	1650.00	0.0296
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0304
2	250.00	1350.00	107.0318
3	250.00	1400.00	106.0408
4	250.00	1450.00	105.0489
5	250.00	1500.00	104.0563
6	250.00	1550.00	103.0632
7	250.00	1600.00	102.0696
8	250.00	1650.00	101.0757
9	250.00	1700.00	100.0765
10	300.00	1300.00	108.0304
11	300.00	1350.00	107.0329
12	300.00	1400.00	106.0420
13	300.00	1450.00	105.0501
14	300.00	1500.00	104.0573
15	300.00	1550.00	103.0640
16	300.00	1600.00	102.0703
17	300.00	1650.00	101.0772
18	300.00	1700.00	100.0778
19	350.00	1300.00	108.0304
20	350.00	1350.00	107.0366
21	350.00	1400.00	106.0452
22	350.00	1450.00	105.0528
23	350.00	1500.00	104.0596
24	350.00	1550.00	103.0659
25	350.00	1600.00	102.0719
26	350.00	1650.00	101.0804
27	350.00	1700.00	100.0697
28	400.00	1300.00	108.0302
29	400.00	1350.00	107.0307
30	400.00	1400.00	106.0308
31	400.00	1450.00	105.0353
32	400.00	1500.00	104.0396
33	400.00	1550.00	103.0437
34	400.00	1600.00	102.0476
35	400.00	1650.00	101.0515
36	400.00	1700.00	100.0607
37	450.00	1300.00	108.0302
38	450.00	1350.00	107.0307
39	450.00	1400.00	106.0309
40	450.00	1450.00	105.0333
41	450.00	1500.00	104.0378
42	450.00	1550.00	103.0422
43	450.00	1600.00	102.0463
44	450.00	1650.00	101.0502
45	450.00	1700.00	100.0505
46	500.00	1300.00	108.0302
47	500.00	1350.00	107.0307
48	500.00	1400.00	106.0310
49	500.00	1450.00	105.0323
50	500.00	1500.00	104.0370

51	500.00	1550.00	103.0415
52	500.00	1600.00	102.0457
53	500.00	1650.00	101.0497
54	500.00	1700.00	100.0499

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       0.72 CFS AT TIME:     3.91
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       0.74 CFS AT TIME:     3.93
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       0.49 CFS AT TIME:     3.28
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.26 CFS AT TIME:     2.01
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       0.36 CFS AT TIME:     2.00
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       0.35 CFS AT TIME:     3.31
```

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
9	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.19
	0.40	0.31
	0.50	0.45
	0.60	0.57
	0.70	0.65
	0.80	0.69
	0.90	0.71
	1.00	0.71
	1.10	0.72
	1.20	0.72
	1.30	0.72
	1.40	0.72
	1.50	0.72
	1.60	0.72
	1.70	0.72
	1.80	0.72
	1.90	0.72
	2.00	0.72
	2.10	0.72
	2.20	0.72
	2.30	0.72
	2.40	0.72
	2.50	0.72
	2.60	0.72
	2.70	0.72
	2.80	0.72
	2.90	0.72
	3.00	0.72
	3.10	0.72
	3.20	0.72
	3.30	0.72
	3.40	0.72
	3.50	0.72
	3.60	0.72
	3.70	0.72
	3.80	0.72
	3.90	0.72
	4.00	0.72

4.10	0.72
4.20	0.72
4.30	0.72
4.40	0.72
4.50	0.72
4.60	0.72
4.70	0.72
4.80	0.72
4.90	0.72
5.00	0.72
5.10	0.56
5.20	0.40
5.30	0.05
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

```
                9.10              0.00
                9.20              0.00
                9.30              0.00
                9.40              0.00
                9.50              0.00
                9.60              0.00
                9.70              0.00
                9.80              0.00
                9.90              0.00

  ELEMENT       TIME (HRS)     DISCHARGE (CFS)
     18         0.00              0.00
                0.00              0.00
                0.10              0.00
                0.20              0.00
                0.30              0.19
                0.40              0.31
                0.50              0.45
                0.60              0.58
                0.70              0.67
                0.80              0.71
                0.90              0.73
                1.00              0.73
                1.10              0.74
                1.20              0.74
                1.30              0.74
                1.40              0.74
                1.50              0.74
                1.60              0.74
                1.70              0.74
                1.80              0.74
                1.90              0.74
                2.00              0.74
                2.10              0.74
                2.20              0.74
                2.30              0.74
                2.40              0.74
                2.50              0.74
                2.60              0.74
                2.70              0.74
                2.80              0.74
                2.90              0.74
                3.00              0.74
                3.10              0.74
                3.20              0.74
                3.30              0.74
                3.40              0.74
                3.50              0.74
                3.60              0.74
                3.70              0.74
```

3.80	0.74
3.90	0.74
4.00	0.74
4.10	0.74
4.20	0.74
4.30	0.74
4.40	0.74
4.50	0.74
4.60	0.74
4.70	0.74
4.80	0.74
4.90	0.74
5.00	0.74
5.10	0.58
5.20	0.42
5.30	0.14
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.14
	0.40	0.22
	0.50	0.32
	0.60	0.37
	0.70	0.43
	0.80	0.46
	0.90	0.48
	1.00	0.49
	1.10	0.49
	1.20	0.49
	1.30	0.49
	1.40	0.49
	1.50	0.49
	1.60	0.49
	1.70	0.49
	1.80	0.49
	1.90	0.49
	2.00	0.49
	2.10	0.49
	2.20	0.49
	2.30	0.49
	2.40	0.49
	2.50	0.49
	2.60	0.49
	2.70	0.49
	2.80	0.49
	2.90	0.49
	3.00	0.49
	3.10	0.49
	3.20	0.49
	3.30	0.49
	3.40	0.49

3.50	0.49
3.60	0.49
3.70	0.49
3.80	0.49
3.90	0.49
4.00	0.49
4.10	0.49
4.20	0.49
4.30	0.49
4.40	0.49
4.50	0.49
4.60	0.49
4.70	0.49
4.80	0.49
4.90	0.49
5.00	0.49
5.10	0.39
5.20	0.30
5.30	0.15
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.00
	0.40	0.00
	0.50	0.00
	0.60	0.14
	0.70	0.18
	0.80	0.21
	0.90	0.23
	1.00	0.25
	1.10	0.25
	1.20	0.26
	1.30	0.26
	1.40	0.26
	1.50	0.26
	1.60	0.26
	1.70	0.26
	1.80	0.26
	1.90	0.26
	2.00	0.26
	2.10	0.26
	2.20	0.26
	2.30	0.26
	2.40	0.26
	2.50	0.26
	2.60	0.26
	2.70	0.26
	2.80	0.26
	2.90	0.26
	3.00	0.26
	3.10	0.26

3.20	0.26
3.30	0.26
3.40	0.26
3.50	0.26
3.60	0.26
3.70	0.26
3.80	0.26
3.90	0.26
4.00	0.26
4.10	0.26
4.20	0.26
4.30	0.26
4.40	0.26
4.50	0.26
4.60	0.26
4.70	0.26
4.80	0.26
4.90	0.26
5.00	0.26
5.10	0.21
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.00
	0.40	0.00
	0.50	0.00
	0.60	0.20
	0.70	0.25
	0.80	0.30
	0.90	0.33
	1.00	0.34
	1.10	0.35
	1.20	0.36
	1.30	0.36
	1.40	0.36
	1.50	0.36
	1.60	0.36
	1.70	0.36
	1.80	0.36
	1.90	0.36
	2.00	0.36
	2.10	0.36
	2.20	0.36
	2.30	0.36
	2.40	0.36
	2.50	0.36
	2.60	0.36
	2.70	0.36
	2.80	0.36

2.90	0.36
3.00	0.36
3.10	0.36
3.20	0.36
3.30	0.36
3.40	0.36
3.50	0.36
3.60	0.36
3.70	0.36
3.80	0.36
3.90	0.36
4.00	0.36
4.10	0.36
4.20	0.36
4.30	0.36
4.40	0.36
4.50	0.36
4.60	0.36
4.70	0.36
4.80	0.36
4.90	0.36
5.00	0.36
5.10	0.29
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.00
	0.30	0.00
	0.40	0.00
	0.50	0.00
	0.60	0.19
	0.70	0.25
	0.80	0.29
	0.90	0.32
	1.00	0.34
	1.10	0.35
	1.20	0.35
	1.30	0.35
	1.40	0.35
	1.50	0.35
	1.60	0.35
	1.70	0.35
	1.80	0.35
	1.90	0.35
	2.00	0.35
	2.10	0.35
	2.20	0.35
	2.30	0.35
	2.40	0.35
	2.50	0.35

2.60	0.35
2.70	0.35
2.80	0.35
2.90	0.35
3.00	0.35
3.10	0.35
3.20	0.35
3.30	0.35
3.40	0.35
3.50	0.35
3.60	0.35
3.70	0.35
3.80	0.35
3.90	0.35
4.00	0.35
4.10	0.35
4.20	0.35
4.30	0.35
4.40	0.35
4.50	0.35
4.60	0.35
4.70	0.35
4.80	0.35
4.90	0.35
5.00	0.35
5.10	0.28
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1021
2	250.00	1350.00	0.1044
3	250.00	1400.00	0.1238
4	250.00	1450.00	0.1399
5	250.00	1500.00	0.1537
6	250.00	1550.00	0.1660
7	250.00	1600.00	0.1770
8	250.00	1650.00	0.1879
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.1020
11	300.00	1350.00	0.1068
12	300.00	1400.00	0.1263
13	300.00	1450.00	0.1421
14	300.00	1500.00	0.1555
15	300.00	1550.00	0.1674
16	300.00	1600.00	0.1781
17	300.00	1650.00	0.1904
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.1019
20	350.00	1350.00	0.1147
21	350.00	1400.00	0.1326
22	350.00	1450.00	0.1471
23	350.00	1500.00	0.1597
24	350.00	1550.00	0.1709
25	350.00	1600.00	0.1808
26	350.00	1650.00	0.1877
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0000
29	400.00	1350.00	0.1024
30	400.00	1400.00	0.1024
31	400.00	1450.00	0.1125
32	400.00	1500.00	0.1217
33	400.00	1550.00	0.1300
34	400.00	1600.00	0.1377
35	400.00	1650.00	0.1447
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0000
38	450.00	1350.00	0.1026
39	450.00	1400.00	0.1031
40	450.00	1450.00	0.1080
41	450.00	1500.00	0.1180
42	450.00	1550.00	0.1270
43	450.00	1600.00	0.1351
44	450.00	1650.00	0.1429
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0000
47	500.00	1350.00	0.1022
48	500.00	1400.00	0.1032
49	500.00	1450.00	0.1057
50	500.00	1500.00	0.1162

51	500.00	1550.00	0.1256
52	500.00	1600.00	0.1340
53	500.00	1650.00	0.1418
54	500.00	1700.00	0.0000

```
THE LEVEE IN GRID ELEMENT AND DIRECTION WAS OVERTOPPED AT TIME:
```

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 32

Test Case 9f Data/Input Files

FPLAIN.DAT (2 Pages)

RAIN.DAT (3 Pages)

OUTFLOW.DAT (1 Page)

LEVEE.DAT (1 Page)

ARF.DAT (1 Page)

1	2	10	0	0	0.050	108.00
2	3	11	1	0	0.050	107.00
3	4	12	2	0	0.050	106.00
4	5	13	3	0	0.050	105.00
5	6	14	4	0	0.050	104.00
6	7	15	5	0	0.050	103.00
7	8	16	6	0	0.050	102.00
8	9	17	7	0	0.050	101.00
9	0	18	8	0	0.050	100.00
10	11	19	0	1	0.050	108.00
11	12	20	10	2	0.050	107.00
12	13	21	11	3	0.050	106.00
13	14	22	12	4	0.050	105.00
14	15	23	13	5	0.050	104.00
15	16	24	14	6	0.050	103.00
16	17	25	15	7	0.050	102.00
17	18	26	16	8	0.050	101.00
18	0	27	17	9	0.050	100.00
19	20	28	0	10	0.050	108.00
20	21	29	19	11	0.050	107.00
21	22	30	20	12	0.050	106.00
22	23	31	21	13	0.050	105.00
23	24	32	22	14	0.050	104.00
24	25	33	23	15	0.050	103.00
25	26	34	24	16	0.050	102.00
26	27	35	25	17	0.050	101.00
27	0	36	26	18	0.050	100.00
28	29	37	0	19	0.050	108.00
29	30	38	28	20	0.050	107.00
30	31	39	29	21	0.050	106.00
31	32	40	30	22	0.050	105.00
32	33	41	31	23	0.050	104.00
33	34	42	32	24	0.050	103.00
34	35	43	33	25	0.050	102.00
35	36	44	34	26	0.050	101.00
36	0	45	35	27	0.050	100.00
37	38	46	0	28	0.050	108.00
38	39	47	37	29	0.050	107.00
39	40	48	38	30	0.050	106.00
40	41	49	39	31	0.050	105.00
41	42	50	40	32	0.050	104.00
42	43	51	41	33	0.050	103.00
43	44	52	42	34	0.050	102.00
44	45	53	43	35	0.050	101.00
45	0	54	44	36	0.050	100.00
46	47	0	0	37	0.050	108.00
47	48	0	46	38	0.050	107.00
48	49	0	47	39	0.050	106.00
49	50	0	48	40	0.050	105.00
50	51	0	49	41	0.050	104.00

51	52	0	50	42	0.050	103.00
52	53	0	51	43	0.050	102.00
53	54	0	52	44	0.050	101.00
54	0	0	53	45	0.050	100.00

0	1		
20	0	1	0
R	0	0	
R	0.1	0.02	
R	0.2	0.04	
R	0.3	0.06	
R	0.4	0.08	
R	0.5	0.1	
R	0.6	0.12	
R	0.7	0.14	
R	0.8	0.16	
R	0.9	0.18	
R	1	0.2	
R	1.1	0.22	
R	1.2	0.24	
R	1.3	0.26	
R	1.4	0.28	
R	1.5	0.3	
R	1.6	0.32	
R	1.7	0.34	
R	1.8	0.36	
R	1.9	0.38	
R	2	0.4	
R	2.1	0.42	
R	2.2	0.44	
R	2.3	0.46	
R	2.4	0.48	
R	2.5	0.5	
R	2.6	0.52	
R	2.7	0.54	
R	2.8	0.56	
R	2.9	0.58	
R	3	0.6	
R	3.1	0.62	
R	3.2	0.64	
R	3.3	0.66	
R	3.4	0.68	
R	3.5	0.7	
R	3.6	0.72	
R	3.7	0.74	
R	3.8	0.76	
R	3.9	0.78	
R	4	0.8	
R	4.1	0.82	
R	4.2	0.84	
R	4.3	0.86	
R	4.4	0.88	
R	4.5	0.9	
R	4.6	0.92	
R	4.7	0.94	

R	4.8	0.96
R	4.9	0.98
R	5	1
1	1	
2	1	
3	1	
4	1	
5	1	
6	1	
7	1	
8	1	
9	1	
10	1	
11	1	
12	1	
13	1	
14	1	
15	1	
16	1	
17	1	
18	1	
19	1	
20	1	
21	1	
22	1	
23	1	
24	1	
25	1	
26	1	
27	1	
28	0.5	
29	0.5	
30	0.5	
31	0.5	
32	0.5	
33	0.5	
34	0.5	
35	0.5	
36	1	
37	0.5	
38	0.5	
39	0.5	
40	0.5	
41	0.5	
42	0.5	
43	0.5	
44	0.5	
45	1	
46	0.5	
47	0.5	

```
48            0.5
49            0.5
50            0.5
51            0.5
52            0.5
53            0.5
54            1
```

0	9
0	18
0	27
0	36
0	45
0	54

0	0	
L	5	
D	5	108.0
D	8	108.0
L	26	
D	5	105.0
L	28	
D	4	112.0
D	7	112.0
D	8	112.0
L	29	
D	4	111.0
D	7	111.0
D	8	111.0
L	30	
D	4	110.0
D	7	110.0
D	8	110.0
L	31	
D	4	109.0
D	7	109.0
D	8	109.0
L	32	
D	4	108.0
D	7	108.0
D	8	108.0
L	33	
D	4	107.0
D	7	107.0
D	8	107.0
L	34	
D	4	106.0
D	7	106.0
D	8	106.0
L	35	
D	4	105.0
D	7	105.0
D	8	105.0
L	50	
D	5	108.0
D	8	108.0

```
S  0
T 14
T 41
   5 .5  .5  1  0  0  0  0  0  0
   23 .5  0  0  0  1  0  0  0  0
   32 .5  0  1  0  0  0  0  0  0
   50 .5  .5  0  0  1  0  0  0  0
   15 0  0  0  1  0  0  0  0  0
   24 0  0  0  0  0  0  0  1  0
   22 0  0  0  0  0  0  0  0  1
   13 0  1  0  0  0  0  0  0  0
   4 0  0  0  0  0  1  0  0  0
   6 0  0  0  .5  0  0  1  0  0
   42 0  0  0  1  0  0  0  0  0
   51 0  0  0  .5  0  0  0  1  0
   49 0  0  0  0  0  0  0  0  1
   40 0  1  0  0  0  0  0  0  0
   31 0  0  0  0  0  1  0  0  0
   33 0  0  0  0  0  0  1  0  0
```

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 33

Test Case 9f Output Files

SUMMARY.OUT (4 Pages)

DEPTH.OUT (2 Pages)

FINALDEP.OUT (2 Pages)

MAXWSELEV.OUT (2 Pages)

OUTNQ.OUT (13 Pages)

VELFP.OUT (2 Pages)

LEVEE.OUT (1 Page)

TIMDEP.OUT (112 Pages)

VELTIMEFP.OUT (2 Pages)

NEGATIVE VOLUME CONSERVATION (ACRE FEET)
INDICATES EXCESS VOLUME (OUTFLOW + STORAGE > INFLOW)

SUMMARY.OUT FILE
Pro Model - Build No. 16.06.16

SIMULATION TIME (HOURS)	AVERAGE TIMESTEP (SECONDS)	VOLUME CONSERVATION (ACRE FEET)	PERCENT OF INFLOW
0.000	1.000	0.000000	0.000000
0.100	1.803	0.000000	0.000000
0.200	2.969	0.000000	0.000000
0.300	3.678	-0.000000	0.000000
0.400	4.228	-0.000000	0.000001
0.500	4.687	-0.000000	0.000001
0.601	5.086	-0.000000	0.000001
0.700	5.439	-0.000000	0.000001
0.801	5.758	0.000000	0.000001
0.900	6.050	-0.000000	0.000001
1.000	6.318	-0.000000	0.000002
1.101	6.569	0.000000	0.000001
1.201	6.804	0.000000	0.000004
1.300	7.024	-0.000000	0.000002
1.401	7.233	-0.000000	0.000002
1.502	7.433	0.000000	0.000000
1.602	7.622	-0.000000	0.000002
1.701	7.802	-0.000000	0.000001
1.801	7.974	0.000000	0.000001
1.900	8.139	-0.000000	0.000002
2.002	8.299	0.000000	0.000001
2.100	8.453	0.000000	0.000001
2.201	8.600	-0.000000	0.000001
2.300	8.743	0.000000	0.000001
2.401	8.862	-0.000000	0.000002
2.502	8.873	0.000000	0.000002
2.601	8.870	0.000000	0.000003
2.702	8.877	0.000000	0.000002
2.801	8.868	0.000000	0.000003
2.902	8.868	0.000000	0.000003
3.000	8.873	-0.000000	0.000001
3.101	8.870	-0.000000	0.000002
3.202	8.877	-0.000000	0.000001
3.301	8.868	0.000000	0.000004
3.402	8.868	0.000000	0.000004
3.500	8.873	0.000000	0.000004
3.601	8.870	-0.000000	0.000002
3.702	8.877	0.000000	0.000003
3.801	8.868	0.000000	0.000000
3.902	8.868	0.000000	0.000004
4.001	8.873	0.000000	0.000000

4.102	8.870	0.000000	0.000001
4.200	8.876	0.000000	0.000002
4.301	8.869	-0.000000	0.000003
4.402	8.868	-0.000000	0.000001
4.501	8.873	-0.000000	0.000003
4.602	8.870	-0.000000	0.000003
4.700	8.876	-0.000000	0.000000
4.801	8.869	0.000000	0.000002
4.902	8.868	0.000000	0.000003
5.001	8.873	0.000000	0.000001
5.101	9.021	0.000000	0.000002
5.202	9.342	0.000000	0.000001
5.302	9.641	-0.000000	0.000002
5.401	9.918	-0.000000	0.000001
5.503	10.182	0.000000	0.000002
5.601	10.432	0.000000	0.000003
5.702	10.667	0.000000	0.000003
5.802	10.893	0.000000	0.000003
5.900	11.107	0.000000	0.000003
6.001	11.312	0.000000	0.000003
6.100	11.509	0.000000	0.000003
6.201	11.699	0.000000	0.000003
6.303	11.884	0.000000	0.000003
6.400	12.060	0.000000	0.000003
6.502	12.230	0.000000	0.000003
6.602	12.396	0.000000	0.000003
6.703	12.556	0.000000	0.000003
6.802	12.710	0.000000	0.000003
6.902	12.860	0.000000	0.000003
7.003	13.006	0.000000	0.000003
7.102	13.148	0.000000	0.000003
7.201	13.284	0.000000	0.000003
7.302	13.419	0.000000	0.000003
7.404	13.551	0.000000	0.000003
7.503	13.679	0.000000	0.000003
7.602	13.803	0.000000	0.000003
7.703	13.925	0.000000	0.000003
7.800	14.043	0.000000	0.000003
7.903	14.159	0.000000	0.000003
8.002	14.274	0.000000	0.000003
8.102	14.385	0.000000	0.000003
8.202	14.495	0.000000	0.000003
8.304	14.603	0.000000	0.000003
8.402	14.708	0.000000	0.000003
8.500	14.809	0.000000	0.000003
8.604	14.911	0.000000	0.000003
8.704	15.012	0.000000	0.000003
8.801	15.108	0.000000	0.000003
8.902	15.203	0.000000	0.000003
9.004	15.298	0.000000	0.000003

9.102	15.391	0.000000	0.000003
9.201	15.481	0.000000	0.000003
9.301	15.569	0.000000	0.000003
9.401	15.657	0.000000	0.000003
9.501	15.744	0.000000	0.000003
9.602	15.830	0.000000	0.000003
9.704	15.915	0.000000	0.000003
9.802	15.998	0.000000	0.000003
9.900	16.078	0.000000	0.000003
10.003	16.159	0.000000	0.000003

```
===================================================================================
===============================================
                    MASS BALANCE   INFLOW - OUTFLOW VOLUME
===================================================================================
===============================================
                          *** INFLOW (ACRE-FEET) ***

TOTAL POINT RAINFALL:                                        19.9943 INCHES


                                                                  WATER

RAINFALL VOLUME                                                    3.443

SURFACE WATER INFLOW HYDROGRAPH                                    0.000
                                                               ---------
INFLOW HYDROGRAPHS + RAINFALL                                      3.443

===================================================================================
===============================================
                          *** SURFACE OUTFLOW (ACRE-FT) ***


RAINFALL INTERCEPTION                                         0.000 INCHES



          OVERLAND FLOW                                            WATER


WATER LOST TO INTERCEPTION                                         0.000

FLOODPLAIN STORAGE                                                 0.079

FLOODPLAIN OUTFLOW HYDROGRAPH                                      3.364
                                                               ---------

FLOODPLAIN OUTFLOW, INTERCEPTION & STORAGE                         3.443
```

```
TOL FLOODPLAIN STORAGE                                          0.075

TOTAL SURFACE OUTFLOW AND STORAGE                               3.443


===============================================================================================================================================
                                 *** TOTALS ***



TOTAL OUTFLOW FROM GRID SYSTEM                                  3.364


TOTAL VOLUME OF OUTFLOW AND STORAGE                             3.443


  SURFACE AREA OF INUNDATION REGARDLESS OF THE TIME OF OCCURRENCE:
  (FOR FLOW DEPTHS GREATER THAN THE "TOL" VALUE TYPICALLY 0.1 FT OR 0.03 M)

THE MAXIMUM INUNDATED AREA IS:                              2.870 ACRES

THE MAXIMUM INUNDATED AREA (DEPTH > 0.5 FT) IS:             0.000 ACRES

===============================================================================================================================================


  AVERAGE GRID ELEMENT FLOW DIRECTION FLOODPLAIN HYDRAULICS:

       DISCHARGE (CFS OR CMS):          0.424
       VELOCITY (FPS OR CMS):           0.176
       FLOW AREA (FT^2 OR M^2):         2.116
       FLOW DEPTH (FT OR M):            0.089
       FLOW WIDTH (FT OR M):           24.065

  TOTAL COMPUTATIONS:              143289.



     COMPUTER RUN TIME IS :  0.00195 HRS

     THIS OUTPUT FILE WAS TERMINATED ON:   3/14/2021  AT:   1:53:21
```

1	250.00	1300.00	0.0393
2	250.00	1350.00	0.0600
3	250.00	1400.00	0.0780
4	250.00	1450.00	0.1220
5	250.00	1500.00	0.2813
6	250.00	1550.00	0.1423
7	250.00	1600.00	0.1358
8	250.00	1650.00	0.1443
9	250.00	1700.00	0.1445
10	300.00	1300.00	0.0400
11	300.00	1350.00	0.0616
12	300.00	1400.00	0.0799
13	300.00	1450.00	0.1306
14	300.00	1500.00	0.0503
15	300.00	1550.00	0.1001
16	300.00	1600.00	0.1308
17	300.00	1650.00	0.1448
18	300.00	1700.00	0.1453
19	350.00	1300.00	0.0459
20	350.00	1350.00	0.0674
21	350.00	1400.00	0.0849
22	350.00	1450.00	0.1346
23	350.00	1500.00	0.1719
24	350.00	1550.00	0.1234
25	350.00	1600.00	0.1303
26	350.00	1650.00	0.1467
27	350.00	1700.00	0.1287
28	400.00	1300.00	0.0310
29	400.00	1350.00	0.0449
30	400.00	1400.00	0.0562
31	400.00	1450.00	0.0892
32	400.00	1500.00	0.1154
33	400.00	1550.00	0.0825
34	400.00	1600.00	0.0856
35	400.00	1650.00	0.0947
36	400.00	1700.00	0.1119
37	450.00	1300.00	0.0304
38	450.00	1350.00	0.0407
39	450.00	1400.00	0.0524
40	450.00	1450.00	0.0862
41	450.00	1500.00	0.0329
42	450.00	1550.00	0.0646
43	450.00	1600.00	0.0861
44	450.00	1650.00	0.0942
45	450.00	1700.00	0.0945
46	500.00	1300.00	0.0304
47	500.00	1350.00	0.0395
48	500.00	1400.00	0.0510
49	500.00	1450.00	0.0798
50	500.00	1500.00	0.2146

51	500.00	1550.00	0.0930
52	500.00	1600.00	0.0896
53	500.00	1650.00	0.0947
54	500.00	1700.00	0.0945

1	250.00	1300.00	0.0297
2	250.00	1350.00	0.0297
3	250.00	1400.00	0.0299
4	250.00	1450.00	0.0299
5	250.00	1500.00	0.0299
6	250.00	1550.00	0.0294
7	250.00	1600.00	0.0298
8	250.00	1650.00	0.0299
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.0296
11	300.00	1350.00	0.0297
12	300.00	1400.00	0.0296
13	300.00	1450.00	0.0300
14	300.00	1500.00	0.0299
15	300.00	1550.00	0.0297
16	300.00	1600.00	0.0296
17	300.00	1650.00	0.0297
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.0297
20	350.00	1350.00	0.0300
21	350.00	1400.00	0.0296
22	350.00	1450.00	0.0298
23	350.00	1500.00	0.0297
24	350.00	1550.00	0.0297
25	350.00	1600.00	0.0298
26	350.00	1650.00	0.0296
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.0298
29	400.00	1350.00	0.0299
30	400.00	1400.00	0.0300
31	400.00	1450.00	0.0299
32	400.00	1500.00	0.0299
33	400.00	1550.00	0.0296
34	400.00	1600.00	0.0298
35	400.00	1650.00	0.0300
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.0296
38	450.00	1350.00	0.0296
39	450.00	1400.00	0.0299
40	450.00	1450.00	0.0299
41	450.00	1500.00	0.0299
42	450.00	1550.00	0.0296
43	450.00	1600.00	0.0295
44	450.00	1650.00	0.0299
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.0296
47	500.00	1350.00	0.0300
48	500.00	1400.00	0.0295
49	500.00	1450.00	0.0298
50	500.00	1500.00	0.0298

51	500.00	1550.00	0.0296
52	500.00	1600.00	0.0297
53	500.00	1650.00	0.0295
54	500.00	1700.00	0.0000

1	250.00	1300.00	108.0393
2	250.00	1350.00	107.0600
3	250.00	1400.00	106.0780
4	250.00	1450.00	105.1220
5	250.00	1500.00	104.2813
6	250.00	1550.00	103.1423
7	250.00	1600.00	102.1358
8	250.00	1650.00	101.1443
9	250.00	1700.00	100.1445
10	300.00	1300.00	108.0399
11	300.00	1350.00	107.0616
12	300.00	1400.00	106.0799
13	300.00	1450.00	105.1306
14	300.00	1500.00	104.0503
15	300.00	1550.00	103.1001
16	300.00	1600.00	102.1308
17	300.00	1650.00	101.1448
18	300.00	1700.00	100.1453
19	350.00	1300.00	108.0459
20	350.00	1350.00	107.0675
21	350.00	1400.00	106.0849
22	350.00	1450.00	105.1346
23	350.00	1500.00	104.1719
24	350.00	1550.00	103.1234
25	350.00	1600.00	102.1303
26	350.00	1650.00	101.1467
27	350.00	1700.00	100.1287
28	400.00	1300.00	108.0310
29	400.00	1350.00	107.0449
30	400.00	1400.00	106.0562
31	400.00	1450.00	105.0892
32	400.00	1500.00	104.1154
33	400.00	1550.00	103.0825
34	400.00	1600.00	102.0856
35	400.00	1650.00	101.0947
36	400.00	1700.00	100.1119
37	450.00	1300.00	108.0304
38	450.00	1350.00	107.0407
39	450.00	1400.00	106.0524
40	450.00	1450.00	105.0862
41	450.00	1500.00	104.0329
42	450.00	1550.00	103.0646
43	450.00	1600.00	102.0861
44	450.00	1650.00	101.0942
45	450.00	1700.00	100.0945
46	500.00	1300.00	108.0304
47	500.00	1350.00	107.0395
48	500.00	1400.00	106.0510
49	500.00	1450.00	105.0798
50	500.00	1500.00	104.2146

51	500.00	1550.00	103.0930
52	500.00	1600.00	102.0896
53	500.00	1650.00	101.0947
54	500.00	1700.00	100.0945

```
THE MAX Q AT OUTFLOW ELEMENT:        9  IS:       2.09 CFS AT TIME:     2.27
THE MAX Q AT OUTFLOW ELEMENT:       18  IS:       2.10 CFS AT TIME:     2.29
THE MAX Q AT OUTFLOW ELEMENT:       27  IS:       1.37 CFS AT TIME:     2.27
THE MAX Q AT OUTFLOW ELEMENT:       36  IS:       0.72 CFS AT TIME:     2.39
THE MAX Q AT OUTFLOW ELEMENT:       45  IS:       1.03 CFS AT TIME:     4.89
THE MAX Q AT OUTFLOW ELEMENT:       54  IS:       1.03 CFS AT TIME:     4.87
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ELEMENT	TIME (HRS)	DISCHARGE (CFS)
9	0.00	0.00
	0.00	0.00
	0.10	0.18
	0.20	0.56
	0.30	1.04
	0.40	1.59
	0.50	1.96
	0.60	2.06
	0.70	2.08
	0.80	2.08
	0.90	2.09
	1.00	2.09
	1.10	2.09
	1.20	2.09
	1.30	2.09
	1.40	2.09
	1.50	2.09
	1.60	2.09
	1.70	2.09
	1.80	2.09
	1.90	2.09
	2.00	2.09
	2.10	2.09
	2.20	2.09
	2.30	2.09
	2.40	2.09
	2.50	2.09
	2.60	2.09
	2.70	2.09
	2.80	2.09
	2.90	2.09
	3.00	2.09
	3.10	2.09
	3.20	2.09
	3.30	2.09
	3.40	2.09
	3.50	2.09
	3.60	2.09
	3.70	2.09
	3.80	2.09
	3.90	2.09
	4.00	2.09

4.10	2.09
4.20	2.09
4.30	2.09
4.40	2.09
4.50	2.09
4.60	2.09
4.70	2.09
4.80	2.09
4.90	2.09
5.00	2.09
5.10	1.37
5.20	0.91
5.30	0.61
5.40	0.38
5.50	0.18
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00

	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
18	0.00	0.00
	0.00	0.00
	0.10	0.18
	0.20	0.57
	0.30	1.05
	0.40	1.60
	0.50	1.97
	0.60	2.07
	0.70	2.09
	0.80	2.10
	0.90	2.10
	1.00	2.10
	1.10	2.10
	1.20	2.10
	1.30	2.10
	1.40	2.10
	1.50	2.10
	1.60	2.10
	1.70	2.10
	1.80	2.10
	1.90	2.10
	2.00	2.10
	2.10	2.10
	2.20	2.10
	2.30	2.10
	2.40	2.10
	2.50	2.10
	2.60	2.10
	2.70	2.10
	2.80	2.10
	2.90	2.10
	3.00	2.10
	3.10	2.10
	3.20	2.10
	3.30	2.10
	3.40	2.10
	3.50	2.10
	3.60	2.10
	3.70	2.10

3.80	2.10
3.90	2.10
4.00	2.10
4.10	2.10
4.20	2.10
4.30	2.10
4.40	2.10
4.50	2.10
4.60	2.10
4.70	2.10
4.80	2.10
4.90	2.10
5.00	2.10
5.10	1.39
5.20	0.92
5.30	0.61
5.40	0.39
5.50	0.19
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00

	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
27	0.00	0.00
	0.00	0.00
	0.10	0.13
	0.20	0.35
	0.30	0.66
	0.40	0.99
	0.50	1.24
	0.60	1.33
	0.70	1.36
	0.80	1.37
	0.90	1.37
	1.00	1.37
	1.10	1.37
	1.20	1.37
	1.30	1.37
	1.40	1.37
	1.50	1.37
	1.60	1.37
	1.70	1.37
	1.80	1.37
	1.90	1.37
	2.00	1.37
	2.10	1.37
	2.20	1.37
	2.30	1.37
	2.40	1.37
	2.50	1.37
	2.60	1.37
	2.70	1.37
	2.80	1.37
	2.90	1.37
	3.00	1.37
	3.10	1.37
	3.20	1.37
	3.30	1.37
	3.40	1.37

3.50	1.37
3.60	1.37
3.70	1.37
3.80	1.37
3.90	1.37
4.00	1.37
4.10	1.37
4.20	1.37
4.30	1.37
4.40	1.37
4.50	1.37
4.60	1.37
4.70	1.37
4.80	1.37
4.90	1.37
5.00	1.37
5.10	0.93
5.20	0.61
5.30	0.41
5.40	0.27
5.50	0.14
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00

	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
36	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.13
	0.30	0.25
	0.40	0.37
	0.50	0.49
	0.60	0.61
	0.70	0.68
	0.80	0.71
	0.90	0.72
	1.00	0.72
	1.10	0.72
	1.20	0.72
	1.30	0.72
	1.40	0.72
	1.50	0.72
	1.60	0.72
	1.70	0.72
	1.80	0.72
	1.90	0.72
	2.00	0.72
	2.10	0.72
	2.20	0.72
	2.30	0.72
	2.40	0.72
	2.50	0.72
	2.60	0.72
	2.70	0.72
	2.80	0.72
	2.90	0.72
	3.00	0.72
	3.10	0.72

3.20	0.72
3.30	0.72
3.40	0.72
3.50	0.72
3.60	0.72
3.70	0.72
3.80	0.72
3.90	0.72
4.00	0.72
4.10	0.72
4.20	0.72
4.30	0.72
4.40	0.72
4.50	0.72
4.60	0.72
4.70	0.72
4.80	0.72
4.90	0.72
5.00	0.72
5.10	0.54
5.20	0.39
5.30	0.27
5.40	0.15
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
45	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.19
	0.30	0.36
	0.40	0.52
	0.50	0.71
	0.60	0.88
	0.70	0.98
	0.80	1.01
	0.90	1.02
	1.00	1.03
	1.10	1.03
	1.20	1.03
	1.30	1.03
	1.40	1.03
	1.50	1.03
	1.60	1.03
	1.70	1.03
	1.80	1.03
	1.90	1.03
	2.00	1.03
	2.10	1.03
	2.20	1.03
	2.30	1.03
	2.40	1.03
	2.50	1.03
	2.60	1.03
	2.70	1.03
	2.80	1.03

2.90	1.03
3.00	1.03
3.10	1.03
3.20	1.03
3.30	1.03
3.40	1.03
3.50	1.03
3.60	1.03
3.70	1.03
3.80	1.03
3.90	1.03
4.00	1.03
4.10	1.03
4.20	1.03
4.30	1.03
4.40	1.03
4.50	1.03
4.60	1.03
4.70	1.03
4.80	1.03
4.90	1.03
5.00	1.03
5.10	0.77
5.20	0.55
5.30	0.38
5.40	0.21
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
	7.90	0.00
	8.00	0.00
	8.10	0.00
	8.20	0.00
	8.30	0.00
	8.40	0.00
	8.50	0.00
	8.60	0.00
	8.70	0.00
	8.80	0.00
	8.90	0.00
	9.00	0.00
	9.10	0.00
	9.20	0.00
	9.30	0.00
	9.40	0.00
	9.50	0.00
	9.60	0.00
	9.70	0.00
	9.80	0.00
	9.90	0.00

ELEMENT	TIME (HRS)	DISCHARGE (CFS)
54	0.00	0.00
	0.00	0.00
	0.10	0.00
	0.20	0.19
	0.30	0.35
	0.40	0.52
	0.50	0.71
	0.60	0.89
	0.70	0.98
	0.80	1.01
	0.90	1.02
	1.00	1.03
	1.10	1.03
	1.20	1.03
	1.30	1.03
	1.40	1.03
	1.50	1.03
	1.60	1.03
	1.70	1.03
	1.80	1.03
	1.90	1.03
	2.00	1.03
	2.10	1.03
	2.20	1.03
	2.30	1.03
	2.40	1.03
	2.50	1.03

2.60	1.03
2.70	1.03
2.80	1.03
2.90	1.03
3.00	1.03
3.10	1.03
3.20	1.03
3.30	1.03
3.40	1.03
3.50	1.03
3.60	1.03
3.70	1.03
3.80	1.03
3.90	1.03
4.00	1.03
4.10	1.03
4.20	1.03
4.30	1.03
4.40	1.03
4.50	1.03
4.60	1.03
4.70	1.03
4.80	1.03
4.90	1.03
5.00	1.03
5.10	0.77
5.20	0.55
5.30	0.38
5.40	0.21
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00

7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00

1	250.00	1300.00	0.1201
2	250.00	1350.00	0.1594
3	250.00	1400.00	0.1874
4	250.00	1450.00	0.2401
5	250.00	1500.00	0.7385
6	250.00	1550.00	0.2812
7	250.00	1600.00	0.2761
8	250.00	1650.00	0.2888
9	250.00	1700.00	0.0000
10	300.00	1300.00	0.1213
11	300.00	1350.00	0.1623
12	300.00	1400.00	0.1898
13	300.00	1450.00	0.1871
14	300.00	1500.00	0.0930
15	300.00	1550.00	0.2228
16	300.00	1600.00	0.2686
17	300.00	1650.00	0.2895
18	300.00	1700.00	0.0000
19	350.00	1300.00	0.1331
20	350.00	1350.00	0.1724
21	350.00	1400.00	0.1978
22	350.00	1450.00	0.2705
23	350.00	1500.00	0.3004
24	350.00	1550.00	0.2594
25	350.00	1600.00	0.2676
26	350.00	1650.00	0.2825
27	350.00	1700.00	0.0000
28	400.00	1300.00	0.1028
29	400.00	1350.00	0.1317
30	400.00	1400.00	0.1514
31	400.00	1450.00	0.2068
32	400.00	1500.00	0.2283
33	400.00	1550.00	0.1987
34	400.00	1600.00	0.2030
35	400.00	1650.00	0.2163
36	400.00	1700.00	0.0000
37	450.00	1300.00	0.1018
38	450.00	1350.00	0.1232
39	450.00	1400.00	0.1446
40	450.00	1450.00	0.1427
41	450.00	1500.00	0.0708
42	450.00	1550.00	0.1671
43	450.00	1600.00	0.2038
44	450.00	1650.00	0.2173
45	450.00	1700.00	0.0000
46	500.00	1300.00	0.1018
47	500.00	1350.00	0.1206
48	500.00	1400.00	0.1422
49	500.00	1450.00	0.1810
50	500.00	1500.00	0.3192

51	500.00	1550.00	0.2132
52	500.00	1600.00	0.2097
53	500.00	1650.00	0.2180
54	500.00	1700.00	0.0000

THE LEVEE IN GRID ELEMENT AND DIRECTION WAS OVERTOPPED AT TIME:

0.000

1	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000
7	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000
9	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000
11	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000
13	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000
29	0.000	0.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000	0.000
31	0.000	0.000	0.000	0.000	0.000
32	0.000	0.000	0.000	0.000	0.000
33	0.000	0.000	0.000	0.000	0.000
34	0.000	0.000	0.000	0.000	0.000
35	0.000	0.000	0.000	0.000	0.000
36	0.000	0.000	0.000	0.000	0.000
37	0.000	0.000	0.000	0.000	0.000
38	0.000	0.000	0.000	0.000	0.000
39	0.000	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000	0.000
41	0.000	0.000	0.000	0.000	0.000
42	0.000	0.000	0.000	0.000	0.000
43	0.000	0.000	0.000	0.000	0.000
44	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000
46	0.000	0.000	0.000	0.000	0.000
47	0.000	0.000	0.000	0.000	0.000
48	0.000	0.000	0.000	0.000	0.000
49	0.000	0.000	0.000	0.000	0.000

50	0.000	0.000	0.000	0.000	0.000
51	0.000	0.000	0.000	0.000	0.000
52	0.000	0.000	0.000	0.000	0.000
53	0.000	0.000	0.000	0.000	0.000
54	0.000	0.000	0.000	0.000	0.000
0.100					
1	0.031	0.093	0.052	0.077	108.031
2	0.033	0.097	0.054	0.080	107.033
3	0.033	0.097	0.054	0.080	106.033
4	0.034	0.105	0.000	0.105	105.034
5	0.061	0.135	0.000	0.135	104.061
6	0.035	0.101	0.058	0.082	103.035
7	0.035	0.098	0.055	0.081	102.035
8	0.034	0.098	0.055	0.081	101.034
9	0.034	0.000	0.000	0.000	100.034
10	0.031	0.069	-0.000	0.069	108.031
11	0.033	0.071	-0.000	0.071	107.033
12	0.033	0.071	0.000	0.071	106.033
13	0.034	0.055	0.000	0.055	105.034
14	0.032	0.047	-0.000	0.047	104.032
15	0.034	0.073	0.000	0.073	103.034
16	0.035	0.073	-0.000	0.073	102.035
17	0.034	0.072	-0.000	0.072	101.034
18	0.034	0.000	0.000	0.000	100.034
19	0.032	0.096	-0.055	0.078	108.032
20	0.033	0.097	-0.054	0.080	107.033
21	0.033	0.097	-0.054	0.080	106.033
22	0.034	0.106	0.000	0.106	105.034
23	0.050	0.115	-0.064	0.095	104.050
24	0.036	0.104	-0.062	0.083	103.036
25	0.035	0.098	-0.055	0.081	102.035
26	0.034	0.097	-0.055	0.081	101.034
27	0.034	0.000	0.000	0.000	100.034
28	0.017	0.000	0.000	0.000	108.017
29	0.017	0.000	0.000	0.000	107.017
30	0.017	0.000	0.000	0.000	106.017
31	0.017	0.000	0.000	0.000	105.017
32	0.031	0.080	0.044	0.066	104.031
33	0.017	0.000	0.000	0.000	103.017
34	0.017	0.000	0.000	0.000	102.017
35	0.017	0.000	0.000	0.000	101.017
36	0.034	0.000	0.000	0.000	100.034
37	0.017	0.000	0.000	0.000	108.017
38	0.017	0.000	0.000	0.000	107.017
39	0.017	0.000	0.000	0.000	106.017
40	0.017	0.000	0.000	0.000	105.017
41	0.017	0.000	0.000	0.000	104.017
42	0.017	0.000	0.000	0.000	103.017
43	0.017	0.000	0.000	0.000	102.017
44	0.017	0.000	0.000	0.000	101.017

45	0.000	0.000	0.000	0.000	0.000
46	0.017	0.000	0.000	0.000	108.017
47	0.017	0.000	0.000	0.000	107.017
48	0.017	0.000	0.000	0.000	106.017
49	0.017	0.000	0.000	0.000	105.017
50	0.032	0.090	0.000	0.090	104.032
51	0.017	0.000	0.000	0.000	103.017
52	0.017	0.000	0.000	0.000	102.017
53	0.017	0.000	0.000	0.000	101.017
54	0.000	0.000	0.000	0.000	0.000
0.200					
1	0.037	0.104	0.058	0.086	108.037
2	0.052	0.131	0.073	0.109	107.052
3	0.061	0.143	0.079	0.119	106.061
4	0.076	0.176	0.000	0.176	105.076
5	0.165	0.252	0.000	0.252	104.165
6	0.065	0.133	0.049	0.124	103.065
7	0.065	0.149	0.083	0.124	102.065
8	0.067	0.152	0.084	0.127	101.067
9	0.067	0.000	0.000	0.000	100.067
10	0.037	0.078	-0.001	0.078	108.037
11	0.053	0.098	-0.002	0.098	107.053
12	0.061	0.107	-0.002	0.107	106.061
13	0.078	0.092	-0.001	0.092	105.078
14	0.043	0.057	-0.000	0.057	104.043
15	0.056	0.101	-0.000	0.101	103.056
16	0.065	0.111	-0.000	0.111	102.065
17	0.067	0.112	-0.004	0.112	101.067
18	0.067	0.000	0.000	0.000	100.067
19	0.042	0.117	-0.070	0.094	108.042
20	0.056	0.141	-0.083	0.113	107.056
21	0.063	0.149	-0.086	0.121	106.063
22	0.078	0.185	0.000	0.185	105.078
23	0.099	0.176	-0.096	0.148	104.099
24	0.068	0.137	-0.051	0.127	103.068
25	0.066	0.154	-0.089	0.126	102.066
26	0.068	0.152	-0.089	0.124	101.068
27	0.057	0.000	0.000	0.000	100.057
28	0.030	0.092	0.051	0.076	108.030
29	0.033	0.096	0.054	0.080	107.033
30	0.033	0.097	0.054	0.080	106.033
31	0.035	0.108	0.000	0.108	105.035
32	0.039	0.103	0.057	0.086	104.039
33	0.036	0.106	0.063	0.084	103.036
34	0.036	0.100	0.056	0.083	102.036
35	0.035	0.099	0.056	0.082	101.035
36	0.046	0.000	0.000	0.000	100.046
37	0.030	0.000	0.000	0.000	108.030
38	0.032	0.070	0.000	0.070	107.032
39	0.033	0.072	0.000	0.072	106.033

40	0.035	0.056	-0.000	0.056	105.035
41	0.030	0.045	0.000	0.045	104.030
42	0.032	0.070	-0.000	0.070	103.032
43	0.036	0.074	0.000	0.074	102.036
44	0.035	0.074	0.000	0.074	101.035
45	0.035	0.000	0.000	0.000	100.035
46	0.030	0.000	0.000	0.000	108.030
47	0.032	0.095	-0.053	0.079	107.032
48	0.033	0.097	-0.054	0.080	106.033
49	0.035	0.108	0.000	0.108	105.035
50	0.056	0.129	0.000	0.129	104.056
51	0.033	0.099	-0.058	0.081	103.033
52	0.036	0.101	-0.056	0.084	102.036
53	0.035	0.100	-0.056	0.083	101.035
54	0.035	0.000	0.000	0.000	100.035
0.300					
1	0.039	0.107	0.059	0.089	108.039
2	0.058	0.140	0.078	0.117	107.058
3	0.073	0.162	0.090	0.135	106.073
4	0.105	0.213	0.000	0.213	105.105
5	0.260	0.357	0.000	0.357	104.260
6	0.105	0.182	0.073	0.167	103.105
7	0.094	0.197	0.115	0.160	102.094
8	0.096	0.195	0.108	0.162	101.096
9	0.096	0.000	0.000	0.000	100.096
10	0.039	0.080	-0.002	0.080	108.039
11	0.059	0.105	-0.003	0.105	107.059
12	0.074	0.121	-0.003	0.121	106.074
13	0.110	0.114	-0.003	0.114	105.110
14	0.048	0.060	0.000	0.060	104.048
15	0.076	0.123	0.000	0.123	103.076
16	0.092	0.140	-0.000	0.140	102.092
17	0.097	0.144	-0.006	0.144	101.097
18	0.097	0.000	0.000	0.000	100.097
19	0.045	0.123	-0.075	0.098	108.045
20	0.064	0.134	-0.047	0.125	107.064
21	0.078	0.149	-0.052	0.140	106.078
22	0.111	0.236	0.000	0.236	105.111
23	0.144	0.227	-0.123	0.191	104.144
24	0.096	0.175	-0.068	0.161	103.096
25	0.092	0.190	-0.105	0.158	102.092
26	0.098	0.199	-0.119	0.160	101.098
27	0.082	0.000	0.000	0.000	100.082
28	0.031	0.094	0.054	0.077	108.031
29	0.041	0.115	0.068	0.093	107.041
30	0.046	0.123	0.072	0.100	106.046
31	0.058	0.154	0.000	0.154	105.058
32	0.071	0.140	0.076	0.118	104.071
33	0.049	0.112	0.041	0.104	103.049
34	0.049	0.128	0.074	0.104	102.049

35	0.051	0.128	0.071	0.106	101.051
36	0.066	0.000	0.000	0.000	100.066
37	0.030	0.067	0.000	0.067	108.030
38	0.038	0.079	0.002	0.079	107.038
39	0.045	0.088	0.002	0.088	106.045
40	0.059	0.076	0.003	0.076	105.059
41	0.032	0.046	0.000	0.046	104.032
42	0.040	0.082	0.000	0.082	103.040
43	0.048	0.092	0.000	0.092	102.048
44	0.050	0.094	0.000	0.094	101.050
45	0.050	0.000	0.000	0.000	100.050
46	0.030	0.091	-0.051	0.076	108.030
47	0.037	0.105	-0.058	0.087	107.037
48	0.044	0.117	-0.065	0.098	106.044
49	0.056	0.147	0.000	0.147	105.056
50	0.122	0.204	0.000	0.204	104.122
51	0.047	0.109	-0.039	0.101	103.047
52	0.048	0.123	-0.069	0.102	102.048
53	0.050	0.127	-0.071	0.106	101.050
54	0.050	0.000	0.000	0.000	100.050
0.400					
1	0.039	0.108	0.060	0.090	108.039
2	0.059	0.143	0.079	0.119	107.059
3	0.077	0.167	0.092	0.139	106.077
4	0.117	0.232	0.000	0.232	105.117
5	0.260	0.380	0.000	0.380	104.260
6	0.141	0.226	0.095	0.204	103.141
7	0.123	0.207	0.075	0.193	102.123
8	0.124	0.232	0.129	0.193	101.124
9	0.124	0.000	0.000	0.000	100.124
10	0.040	0.081	-0.002	0.081	108.040
11	0.061	0.107	-0.003	0.107	107.061
12	0.078	0.125	-0.004	0.125	106.078
13	0.124	0.125	-0.005	0.125	105.124
14	0.049	0.061	0.000	0.061	104.049
15	0.092	0.140	0.000	0.140	103.092
16	0.117	0.165	0.004	0.165	102.117
17	0.124	0.170	-0.003	0.170	101.124
18	0.124	0.000	0.000	0.000	100.124
19	0.046	0.125	-0.076	0.099	108.046
20	0.067	0.137	-0.049	0.128	107.067
21	0.083	0.156	-0.055	0.146	106.083
22	0.127	0.260	-0.013	0.259	105.127
23	0.164	0.253	-0.138	0.213	104.164
24	0.113	0.199	-0.078	0.183	103.113
25	0.115	0.220	-0.122	0.183	102.115
26	0.124	0.232	-0.135	0.188	101.124
27	0.104	0.000	0.000	0.000	100.104
28	0.031	0.094	0.054	0.077	108.031
29	0.044	0.121	0.072	0.097	107.044

30	0.053	0.135	0.080	0.109	106.053
31	0.075	0.183	0.000	0.183	105.075
32	0.098	0.172	0.093	0.145	104.098
33	0.063	0.132	0.050	0.122	103.063
34	0.061	0.144	0.080	0.120	102.061
35	0.064	0.151	0.086	0.123	101.064
36	0.084	0.000	0.000	0.000	100.084
37	0.030	0.067	0.000	0.067	108.030
38	0.040	0.081	0.002	0.081	107.040
39	0.050	0.094	0.002	0.094	106.050
40	0.074	0.089	0.003	0.089	105.074
41	0.032	0.047	-0.000	0.047	104.032
42	0.050	0.093	-0.000	0.093	103.050
43	0.060	0.106	0.000	0.106	102.060
44	0.063	0.110	0.000	0.110	101.063
45	0.063	0.000	0.000	0.000	100.063
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.049	0.125	-0.069	0.104	106.049
49	0.070	0.167	0.000	0.167	105.070
50	0.176	0.269	0.000	0.269	104.176
51	0.069	0.136	-0.053	0.126	103.069
52	0.061	0.148	-0.086	0.121	102.061
53	0.063	0.148	-0.082	0.123	101.063
54	0.063	0.000	0.000	0.000	100.063
0.500					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.143	0.079	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.121	0.238	0.000	0.238	105.121
5	0.260	0.396	0.000	0.396	104.260
6	0.140	0.229	0.095	0.208	103.140
7	0.133	0.219	0.079	0.204	102.133
8	0.139	0.254	0.141	0.211	101.139
9	0.140	0.000	0.000	0.000	100.140
10	0.040	0.081	-0.002	0.081	108.040
11	0.061	0.108	-0.003	0.108	107.061
12	0.079	0.126	-0.004	0.126	106.079
13	0.129	0.128	-0.006	0.128	105.129
14	0.050	0.061	0.000	0.061	104.050
15	0.098	0.146	0.000	0.146	103.098
16	0.127	0.175	0.004	0.175	102.127
17	0.140	0.186	-0.006	0.186	101.140
18	0.140	0.000	0.000	0.000	100.140
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.138	-0.049	0.129	107.067
21	0.084	0.158	-0.056	0.148	106.084
22	0.132	0.268	-0.016	0.267	105.132
23	0.170	0.261	-0.142	0.219	104.170
24	0.120	0.208	-0.081	0.191	103.120

25	0.126	0.235	-0.131	0.196	102.126
26	0.141	0.256	-0.151	0.206	101.141
27	0.119	0.000	0.000	0.000	100.119
28	0.031	0.094	0.054	0.077	108.031
29	0.044	0.123	0.074	0.098	107.044
30	0.055	0.140	0.083	0.112	106.055
31	0.083	0.197	0.000	0.197	105.083
32	0.110	0.190	0.103	0.160	104.110
33	0.075	0.149	0.057	0.137	103.075
34	0.072	0.162	0.090	0.135	102.072
35	0.076	0.167	0.093	0.139	101.076
36	0.098	0.000	0.000	0.000	100.098
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.082	0.095	0.003	0.095	105.082
41	0.033	0.047	-0.000	0.047	104.033
42	0.058	0.103	-0.000	0.103	103.058
43	0.073	0.121	-0.002	0.121	102.073
44	0.076	0.124	0.001	0.124	101.076
45	0.076	0.000	0.000	0.000	100.076
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.050	0.127	-0.070	0.106	106.050
49	0.076	0.176	0.000	0.176	105.076
50	0.200	0.302	0.000	0.302	104.200
51	0.087	0.160	-0.064	0.147	103.087
52	0.076	0.149	-0.052	0.140	102.076
53	0.076	0.171	-0.098	0.140	101.076
54	0.076	0.000	0.000	0.000	100.076
0.600					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.239	0.000	0.239	105.122
5	0.259	0.394	0.000	0.394	104.259
6	0.140	0.230	0.095	0.210	103.140
7	0.135	0.221	0.079	0.206	102.135
8	0.143	0.259	0.143	0.215	101.143
9	0.143	0.000	0.000	0.000	100.143
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.130	0.129	-0.006	0.129	105.130
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.130	0.178	-0.000	0.178	102.130
17	0.144	0.190	-0.002	0.190	101.144
18	0.144	0.000	0.000	0.000	100.144
19	0.046	0.126	-0.077	0.100	108.046

20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.056	0.148	106.085
22	0.134	0.270	-0.017	0.270	105.134
23	0.171	0.264	-0.143	0.221	104.171
24	0.123	0.210	-0.083	0.193	103.123
25	0.129	0.240	-0.133	0.199	102.129
26	0.146	0.226	-0.079	0.212	101.146
27	0.125	0.000	0.000	0.000	100.125
28	0.031	0.094	0.055	0.077	108.031
29	0.045	0.123	0.074	0.099	107.045
30	0.056	0.141	0.084	0.113	106.056
31	0.087	0.203	0.010	0.203	105.087
32	0.113	0.196	0.106	0.165	104.113
33	0.080	0.157	0.060	0.145	103.080
34	0.080	0.175	0.097	0.146	102.080
35	0.086	0.182	0.102	0.151	101.086
36	0.106	0.000	0.000	0.000	100.106
37	0.030	0.067	0.000	0.067	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.085	0.097	0.003	0.097	105.085
41	0.033	0.047	-0.000	0.047	104.033
42	0.062	0.108	-0.000	0.108	103.062
43	0.081	0.130	-0.002	0.130	102.081
44	0.086	0.136	0.000	0.136	101.086
45	0.087	0.000	0.000	0.000	100.087
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.106	106.051
49	0.078	0.179	0.000	0.179	105.078
50	0.208	0.313	0.000	0.313	104.208
51	0.092	0.170	-0.068	0.156	103.092
52	0.085	0.162	-0.057	0.151	102.085
53	0.087	0.188	-0.108	0.154	101.087
54	0.087	0.000	0.000	0.000	100.087
0.700					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.393	0.000	0.393	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.135	0.221	0.079	0.207	102.135
8	0.144	0.260	0.144	0.216	101.144
9	0.144	0.000	0.000	0.000	100.144
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.130	0.129	-0.006	0.129	105.130
14	0.050	0.061	0.000	0.061	104.050

15	0.100	0.148	0.000	0.148	103.100
16	0.130	0.179	-0.000	0.179	102.130
17	0.145	0.191	-0.002	0.191	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.134	0.271	-0.017	0.270	105.134
23	0.172	0.264	-0.144	0.222	104.172
24	0.123	0.211	-0.083	0.194	103.123
25	0.130	0.241	-0.134	0.200	102.130
26	0.147	0.228	-0.079	0.214	101.146
27	0.128	0.000	0.000	0.000	100.128
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.113	106.056
31	0.088	0.206	0.011	0.206	105.088
32	0.115	0.199	0.107	0.167	104.115
33	0.081	0.160	0.061	0.147	103.081
34	0.084	0.180	0.100	0.150	102.084
35	0.092	0.191	0.106	0.159	101.092
36	0.110	0.000	0.000	0.000	100.110
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.064	0.110	-0.000	0.110	103.064
43	0.084	0.134	-0.000	0.134	102.084
44	0.091	0.141	0.000	0.141	101.091
45	0.092	0.000	0.000	0.000	100.092
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.106	106.051
49	0.079	0.180	0.000	0.180	105.079
50	0.212	0.316	0.000	0.316	104.212
51	0.093	0.172	-0.069	0.158	103.093
52	0.088	0.166	-0.058	0.155	102.088
53	0.092	0.195	-0.112	0.160	101.092
54	0.092	0.000	0.000	0.000	100.092
0.800					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.260	0.393	0.000	0.393	104.260
6	0.140	0.231	0.095	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.144	0.000	0.000	0.000	100.144

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  10       0.040       0.081      -0.002       0.081     108.040
  11       0.062       0.108      -0.003       0.108     107.062
  12       0.080       0.127      -0.005       0.127     106.080
  13       0.131       0.129      -0.006       0.129     105.131
  14       0.050       0.061       0.000       0.061     104.050
  15       0.100       0.148       0.000       0.148     103.100
  16       0.131       0.179       0.003       0.179     102.131
  17       0.145       0.192      -0.005       0.191     101.145
  18       0.145       0.000       0.000       0.000     100.145
  19       0.046       0.126      -0.077       0.100     108.046
  20       0.067       0.139      -0.050       0.129     107.067
  21       0.085       0.159      -0.057       0.148     106.085
  22       0.135       0.271      -0.017       0.270     105.135
  23       0.172       0.264      -0.144       0.222     104.172
  24       0.123       0.212      -0.083       0.194     103.123
  25       0.130       0.241      -0.134       0.201     102.130
  26       0.147       0.228      -0.079       0.214     101.147
  27       0.128       0.000       0.000       0.000     100.128
  28       0.031       0.095       0.055       0.077     108.031
  29       0.045       0.124       0.074       0.099     107.045
  30       0.056       0.142       0.085       0.114     106.056
  31       0.089       0.207       0.011       0.206     105.089
  32       0.115       0.199       0.108       0.168     104.115
  33       0.082       0.161       0.062       0.148     103.082
  34       0.085       0.182       0.101       0.151     102.085
  35       0.094       0.197       0.113       0.161     101.094
  36       0.111       0.000       0.000       0.000     100.111
  37       0.030       0.000       0.000       0.000     108.030
  38       0.041       0.082       0.002       0.082     107.041
  39       0.052       0.096       0.003       0.096     106.052
  40       0.086       0.098       0.004       0.098     105.086
  41       0.033       0.047      -0.000       0.047     104.033
  42       0.064       0.111      -0.000       0.111     103.064
  43       0.085       0.135      -0.000       0.135     102.085
  44       0.093       0.143       0.000       0.143     101.093
  45       0.094       0.000       0.000       0.000     100.094
  46       0.030       0.091      -0.051       0.076     108.030
  47       0.039       0.109      -0.060       0.090     107.039
  48       0.051       0.128      -0.071       0.106     106.051
  49       0.080       0.181       0.000       0.181     105.080
  50       0.214       0.318       0.000       0.318     104.214
  51       0.093       0.173      -0.069       0.159     103.093
  52       0.089       0.167      -0.058       0.157     102.089
  53       0.094       0.198      -0.113       0.162     101.094
  54       0.093       0.000       0.000       0.000     100.093
0.900
   1       0.039       0.108       0.060       0.090     108.039
   2       0.060       0.144       0.080       0.119     107.060
   3       0.078       0.168       0.093       0.140     106.078
   4       0.122       0.240       0.000       0.240     105.122
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5	0.259	0.392	0.000	0.392	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.082	0.161	0.062	0.149	103.082
34	0.085	0.183	0.101	0.152	102.085
35	0.094	0.198	0.114	0.162	101.094
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.064	0.111	-0.000	0.111	103.064
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.144	0.000	0.144	101.094
45	0.094	0.000	0.000	0.000	100.094
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.214	0.319	0.000	0.319	104.214
51	0.093	0.173	-0.069	0.159	103.093
52	0.089	0.168	-0.058	0.157	102.089
53	0.094	0.199	-0.114	0.163	101.094
54	0.094	0.000	0.000	0.000	100.094

1.000

1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.261	0.379	0.000	0.379	104.261
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.082	0.161	0.062	0.149	103.082
34	0.086	0.183	0.101	0.152	102.086
35	0.095	0.198	0.114	0.162	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.067	0.000	0.067	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.002	0.136	102.086
44	0.094	0.144	0.000	0.144	101.094
45	0.094	0.000	0.000	0.000	100.094
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080

50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.089	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.100					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.262	0.390	0.000	0.390	104.262
6	0.139	0.230	0.095	0.210	103.139
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.101	0.152	102.086
35	0.095	0.198	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.067	0.000	0.067	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094

45	0.094	0.000	0.000	0.000	100.094
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.200					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.732	0.000	0.732	104.258
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.067	0.000	0.067	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052

40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.300					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.256	0.731	0.000	0.731	104.256
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086

35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.067	0.000	0.067	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.400					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.390	0.000	0.390	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	-0.000	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045

30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.500					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.261	0.388	0.000	0.388	104.261
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123

25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.600					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.257	0.735	0.000	0.735	104.257
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	-0.000	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046

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  20       0.067       0.139      -0.050       0.129     107.067
  21       0.085       0.159      -0.057       0.148     106.085
  22       0.135       0.271      -0.017       0.271     105.135
  23       0.172       0.265      -0.144       0.222     104.172
  24       0.123       0.212      -0.083       0.195     103.123
  25       0.130       0.241      -0.134       0.201     102.130
  26       0.147       0.228      -0.079       0.214     101.147
  27       0.129       0.000       0.000       0.000     100.129
  28       0.031       0.094       0.054       0.077     108.031
  29       0.045       0.124       0.074       0.099     107.045
  30       0.056       0.142       0.085       0.114     106.056
  31       0.089       0.207       0.011       0.207     105.089
  32       0.115       0.200       0.108       0.168     104.115
  33       0.083       0.161       0.062       0.149     103.083
  34       0.086       0.183       0.102       0.152     102.086
  35       0.095       0.199       0.114       0.163     101.095
  36       0.112       0.000       0.000       0.000     100.112
  37       0.030       0.068       0.000       0.068     108.030
  38       0.040       0.082       0.002       0.082     107.040
  39       0.052       0.096       0.003       0.096     106.052
  40       0.086       0.098       0.004       0.098     105.086
  41       0.033       0.047      -0.000       0.047     104.033
  42       0.065       0.111      -0.000       0.111     103.065
  43       0.086       0.136      -0.000       0.136     102.086
  44       0.094       0.145       0.000       0.145     101.094
  45       0.095       0.000       0.000       0.000     100.095
  46       0.030       0.092      -0.051       0.076     108.030
  47       0.039       0.108      -0.060       0.090     107.039
  48       0.051       0.128      -0.071       0.107     106.051
  49       0.080       0.181       0.000       0.181     105.080
  50       0.215       0.319       0.000       0.319     104.215
  51       0.093       0.174      -0.069       0.159     103.093
  52       0.090       0.168      -0.059       0.157     102.090
  53       0.095       0.199      -0.114       0.163     101.095
  54       0.094       0.000       0.000       0.000     100.094
1.700
   1       0.039       0.108       0.060       0.090     108.039
   2       0.060       0.144       0.080       0.119     107.060
   3       0.078       0.168       0.093       0.140     106.078
   4       0.122       0.240       0.000       0.240     105.122
   5       0.259       0.389       0.000       0.389     104.259
   6       0.140       0.231       0.096       0.210     103.140
   7       0.136       0.221       0.079       0.207     102.136
   8       0.144       0.260       0.144       0.217     101.144
   9       0.145       0.000       0.000       0.000     100.145
  10       0.040       0.081      -0.002       0.081     108.040
  11       0.062       0.108      -0.003       0.108     107.062
  12       0.080       0.127      -0.005       0.127     106.080
  13       0.131       0.129      -0.006       0.129     105.131
  14       0.050       0.061       0.000       0.061     104.050
```

15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.800					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.389	0.000	0.389	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145

10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
1.900					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122

5	0.255	0.734	0.000	0.734	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	-0.000	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094

2.000

1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.261	0.386	0.000	0.386	104.261
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080

50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.100					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.261	0.386	0.000	0.386	104.261
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094

45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.200					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.261	0.386	0.000	0.386	104.261
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052

40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.300					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.387	0.000	0.387	104.258
6	0.141	0.231	0.096	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	-0.000	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086

35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.002	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.400					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.255	0.736	0.000	0.736	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045

30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.500					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.262	0.387	0.000	0.387	104.262
6	0.139	0.230	0.095	0.210	103.139
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123

25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.600					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.257	0.738	0.000	0.738	104.257
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046

20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.700					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.263	0.385	0.000	0.385	104.263
6	0.138	0.231	0.095	0.210	103.138
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050

15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.800					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.387	0.000	0.387	104.258
6	0.141	0.231	0.096	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145

10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
2.900					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122

5	0.255	0.737	0.000	0.737	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094

3.000

1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.388	0.000	0.388	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080

50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.100					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.257	0.738	0.000	0.738	104.257
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094

45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.200					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.263	0.385	0.000	0.385	104.263
6	0.138	0.231	0.095	0.210	103.138
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052

40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.300					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.387	0.000	0.387	104.258
6	0.141	0.231	0.096	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086

35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.400					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.255	0.737	0.000	0.737	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045

30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.500					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.388	0.000	0.388	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123

25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.095	0.055	0.077	108.031
29	0.045	0.124	0.075	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.000	0.000	0.000	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.600					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.257	0.738	0.000	0.738	104.257
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046

20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.700					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.263	0.385	0.000	0.385	104.263
6	0.138	0.231	0.095	0.210	103.138
7	0.136	0.222	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050

15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.800					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.387	0.000	0.387	104.258
6	0.141	0.231	0.096	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145

10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
3.900					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122

5	0.255	0.737	0.000	0.737	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.092	-0.051	0.076	108.030
47	0.039	0.108	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094

4.000

1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.388	0.000	0.388	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080

50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.100					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.257	0.738	0.000	0.738	104.257
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094

45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.200					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.260	0.386	0.000	0.386	104.260
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052

40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.300					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.387	0.000	0.387	104.258
6	0.141	0.231	0.096	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086

35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.400					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.255	0.737	0.000	0.737	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045

30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.500					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.259	0.388	0.000	0.388	104.259
6	0.140	0.231	0.096	0.210	103.140
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123

25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.600					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.257	0.738	0.000	0.738	104.257
6	0.141	0.230	0.094	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046

20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.700					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.260	0.386	0.000	0.386	104.260
6	0.139	0.231	0.095	0.210	103.139
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050

15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.005	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.800					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122
5	0.258	0.387	0.000	0.387	104.258
6	0.141	0.231	0.096	0.210	103.141
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145

10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.002	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.054	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.196	0.109	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	-0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.196	-0.109	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094
4.900					
1	0.039	0.108	0.060	0.090	108.039
2	0.060	0.144	0.080	0.119	107.060
3	0.078	0.168	0.093	0.140	106.078
4	0.122	0.240	0.000	0.240	105.122

5	0.255	0.737	0.000	0.737	104.255
6	0.142	0.230	0.095	0.210	103.142
7	0.136	0.221	0.079	0.207	102.136
8	0.144	0.260	0.144	0.217	101.144
9	0.145	0.000	0.000	0.000	100.145
10	0.040	0.081	-0.002	0.081	108.040
11	0.062	0.108	-0.003	0.108	107.062
12	0.080	0.127	-0.005	0.127	106.080
13	0.131	0.129	-0.006	0.129	105.131
14	0.050	0.061	0.000	0.061	104.050
15	0.100	0.148	0.000	0.148	103.100
16	0.131	0.179	0.003	0.179	102.131
17	0.145	0.192	-0.006	0.192	101.145
18	0.145	0.000	0.000	0.000	100.145
19	0.046	0.126	-0.077	0.100	108.046
20	0.067	0.139	-0.050	0.129	107.067
21	0.085	0.159	-0.057	0.148	106.085
22	0.135	0.271	-0.017	0.271	105.135
23	0.172	0.265	-0.144	0.222	104.172
24	0.123	0.212	-0.083	0.195	103.123
25	0.130	0.241	-0.134	0.201	102.130
26	0.147	0.228	-0.079	0.214	101.147
27	0.129	0.000	0.000	0.000	100.129
28	0.031	0.094	0.055	0.077	108.031
29	0.045	0.124	0.074	0.099	107.045
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.083	0.161	0.062	0.149	103.083
34	0.086	0.183	0.102	0.152	102.086
35	0.095	0.199	0.114	0.163	101.095
36	0.112	0.000	0.000	0.000	100.112
37	0.030	0.068	0.000	0.068	108.030
38	0.041	0.082	0.002	0.082	107.041
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.065	0.111	-0.000	0.111	103.065
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.095	0.000	0.000	0.000	100.095
46	0.030	0.000	0.000	0.000	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.080	0.181	0.000	0.181	105.080
50	0.215	0.319	0.000	0.319	104.215
51	0.093	0.174	-0.069	0.159	103.093
52	0.090	0.168	-0.059	0.157	102.090
53	0.095	0.199	-0.114	0.163	101.095
54	0.094	0.000	0.000	0.000	100.094

5.000

1	0.038	0.108	0.060	0.090	108.038
2	0.059	0.144	0.080	0.119	107.059
3	0.077	0.168	0.093	0.140	106.077
4	0.121	0.240	0.000	0.240	105.121
5	0.257	0.388	0.000	0.388	104.257
6	0.139	0.231	0.096	0.210	103.139
7	0.135	0.221	0.079	0.207	102.135
8	0.143	0.260	0.144	0.217	101.143
9	0.144	0.000	0.000	0.000	100.144
10	0.039	0.081	-0.002	0.081	108.039
11	0.061	0.108	-0.003	0.108	107.061
12	0.079	0.127	-0.005	0.127	106.079
13	0.130	0.129	-0.006	0.129	105.130
14	0.049	0.061	0.000	0.061	104.049
15	0.099	0.148	0.000	0.148	103.099
16	0.130	0.179	0.003	0.179	102.130
17	0.144	0.192	-0.005	0.192	101.144
18	0.144	0.000	0.000	0.000	100.144
19	0.045	0.126	-0.077	0.100	108.045
20	0.067	0.139	-0.050	0.129	107.067
21	0.084	0.159	-0.057	0.148	106.084
22	0.134	0.271	-0.017	0.271	105.134
23	0.170	0.265	-0.144	0.222	104.170
24	0.123	0.212	-0.083	0.195	103.123
25	0.129	0.241	-0.134	0.201	102.129
26	0.146	0.228	-0.079	0.214	101.146
27	0.128	0.000	0.000	0.000	100.128
28	0.031	0.094	0.054	0.077	108.031
29	0.044	0.124	0.074	0.099	107.044
30	0.056	0.142	0.085	0.114	106.056
31	0.089	0.207	0.011	0.207	105.089
32	0.115	0.200	0.108	0.168	104.115
33	0.082	0.161	0.062	0.149	103.082
34	0.085	0.183	0.102	0.152	102.085
35	0.094	0.196	0.109	0.163	101.094
36	0.111	0.000	0.000	0.000	100.111
37	0.030	0.068	0.000	0.068	108.030
38	0.040	0.082	0.002	0.082	107.040
39	0.052	0.096	0.003	0.096	106.052
40	0.086	0.098	0.004	0.098	105.086
41	0.033	0.047	-0.000	0.047	104.033
42	0.064	0.111	-0.000	0.111	103.064
43	0.086	0.136	0.000	0.136	102.086
44	0.094	0.145	0.000	0.145	101.094
45	0.094	0.000	0.000	0.000	100.094
46	0.030	0.091	-0.051	0.076	108.030
47	0.039	0.109	-0.060	0.090	107.039
48	0.051	0.128	-0.071	0.107	106.051
49	0.079	0.181	0.000	0.181	105.079

50	0.214	0.319	0.000	0.319	104.214
51	0.093	0.174	-0.069	0.159	103.093
52	0.089	0.168	-0.059	0.157	102.089
53	0.094	0.196	-0.109	0.163	101.094
54	0.094	0.000	0.000	0.000	100.094
5.100					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.045	0.127	0.070	0.105	106.045
4	0.087	0.197	0.000	0.197	105.087
5	0.245	0.358	0.000	0.358	104.245
6	0.102	0.191	0.076	0.175	103.102
7	0.100	0.185	0.064	0.174	102.100
8	0.110	0.224	0.124	0.186	101.110
9	0.110	0.000	0.000	0.000	100.110
10	0.030	0.000	0.000	0.000	108.030
11	0.029	0.071	-0.002	0.071	107.029
12	0.048	0.097	-0.004	0.097	106.048
13	0.095	0.108	-0.004	0.108	105.095
14	0.030	0.044	0.000	0.044	104.030
15	0.070	0.122	0.000	0.122	103.070
16	0.097	0.152	-0.000	0.152	102.097
17	0.110	0.165	-0.005	0.165	101.110
18	0.111	0.000	0.000	0.000	100.111
19	0.030	0.096	-0.054	0.079	108.030
20	0.037	0.113	-0.067	0.091	107.037
21	0.055	0.125	-0.045	0.117	106.055
22	0.100	0.231	-0.016	0.231	105.100
23	0.126	0.220	-0.119	0.186	104.126
24	0.092	0.180	-0.070	0.165	103.092
25	0.098	0.206	-0.114	0.171	102.098
26	0.114	0.199	-0.070	0.186	101.114
27	0.101	0.000	0.000	0.000	100.101
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.034	0.106	0.063	0.086	106.034
31	0.069	0.181	0.013	0.181	105.069
32	0.090	0.173	0.093	0.146	104.090
33	0.065	0.140	0.053	0.130	103.065
34	0.069	0.162	0.090	0.135	102.069
35	0.078	0.179	0.102	0.147	101.078
36	0.090	0.000	0.000	0.000	100.090
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.063	0.084	0.003	0.084	105.063
41	0.030	0.045	-0.000	0.045	104.030
42	0.047	0.092	-0.000	0.092	103.047
43	0.069	0.120	-0.000	0.120	102.069
44	0.078	0.130	0.000	0.130	101.078

45	0.078	0.000	0.000	0.000	100.078
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.055	0.152	0.000	0.152	105.055
50	0.175	0.284	0.000	0.284	104.175
51	0.076	0.155	-0.061	0.142	103.076
52	0.073	0.150	-0.053	0.141	102.073
53	0.078	0.179	-0.103	0.147	101.078
54	0.078	0.000	0.000	0.000	100.078
5.200					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.048	0.139	0.000	0.139	105.048
5	0.173	0.285	0.000	0.285	104.173
6	0.079	0.162	0.064	0.149	103.079
7	0.079	0.159	0.056	0.148	102.079
8	0.086	0.189	0.105	0.157	101.086
9	0.086	0.000	0.000	0.000	100.086
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.057	0.080	-0.004	0.080	105.057
14	0.030	0.044	0.000	0.044	104.030
15	0.050	0.098	0.000	0.098	103.050
16	0.075	0.127	-0.000	0.127	102.075
17	0.086	0.140	-0.001	0.140	101.086
18	0.087	0.000	0.000	0.000	100.087
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.066	0.180	-0.016	0.179	105.066
23	0.088	0.176	-0.094	0.149	104.088
24	0.069	0.147	-0.056	0.136	103.069
25	0.074	0.172	-0.095	0.143	102.074
26	0.088	0.195	-0.116	0.157	101.088
27	0.079	0.000	0.000	0.000	100.079
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.043	0.135	0.010	0.134	105.043
32	0.058	0.137	0.073	0.116	104.058
33	0.050	0.119	0.045	0.111	103.050
34	0.055	0.140	0.077	0.116	102.055
35	0.064	0.157	0.090	0.129	101.064
36	0.072	0.000	0.000	0.000	100.072
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030

40	0.036	0.056	0.003	0.056	105.036
41	0.030	0.045	-0.000	0.045	104.030
42	0.036	0.077	-0.000	0.077	103.036
43	0.055	0.104	-0.000	0.104	102.055
44	0.063	0.114	0.000	0.114	101.063
45	0.064	0.000	0.000	0.000	100.064
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.104	0.000	0.104	105.030
50	0.116	0.223	0.000	0.223	104.116
51	0.057	0.131	-0.050	0.121	103.057
52	0.059	0.152	-0.091	0.122	102.059
53	0.064	0.157	-0.090	0.129	101.064
54	0.064	0.000	0.000	0.000	100.064
5.300					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.106	0.207	0.000	0.207	104.106
6	0.055	0.128	0.049	0.119	103.055
7	0.059	0.153	0.090	0.124	102.059
8	0.067	0.161	0.089	0.134	101.067
9	0.067	0.000	0.000	0.000	100.067
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.034	0.054	-0.003	0.054	105.034
14	0.030	0.044	0.000	0.044	104.030
15	0.036	0.078	0.000	0.078	103.036
16	0.057	0.106	-0.000	0.106	102.057
17	0.067	0.119	-0.001	0.119	101.067
18	0.068	0.000	0.000	0.000	100.068
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.041	0.131	-0.010	0.130	105.041
23	0.053	0.132	-0.070	0.112	104.053
24	0.050	0.120	-0.045	0.111	103.050
25	0.057	0.144	-0.080	0.120	102.057
26	0.070	0.167	-0.099	0.134	101.070
27	0.063	0.000	0.000	0.000	100.063
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.033	0.100	0.053	0.085	104.033
33	0.038	0.114	0.069	0.091	103.038
34	0.042	0.119	0.068	0.098	102.042

35	0.052	0.137	0.080	0.112	101.052
36	0.057	0.000	0.000	0.000	100.057
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.041	0.085	0.000	0.085	102.041
44	0.050	0.099	0.000	0.099	101.050
45	0.051	0.000	0.000	0.000	100.051
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.060	0.153	0.000	0.153	104.060
51	0.038	0.099	-0.035	0.093	103.038
52	0.043	0.122	-0.071	0.100	102.043
53	0.051	0.134	-0.074	0.112	101.051
54	0.051	0.000	0.000	0.000	100.051
5.400					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.055	0.145	0.000	0.145	104.055
6	0.036	0.111	0.066	0.089	103.036
7	0.042	0.119	0.068	0.097	102.042
8	0.051	0.135	0.075	0.112	101.051
9	0.051	0.000	0.000	0.000	100.051
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.040	0.084	-0.000	0.084	102.040
17	0.051	0.100	-0.002	0.100	101.051
18	0.052	0.000	0.000	0.000	100.052
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.036	0.110	-0.066	0.088	103.036
25	0.042	0.120	-0.069	0.098	102.042
26	0.054	0.142	-0.085	0.113	101.054
27	0.047	0.000	0.000	0.000	100.047
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030

30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.037	0.111	0.064	0.091	101.037
36	0.042	0.000	0.000	0.000	100.042
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.034	0.077	0.000	0.077	101.034
45	0.035	0.000	0.000	0.000	100.035
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.035	0.111	0.000	0.111	104.035
51	0.030	0.000	0.000	0.000	103.030
52	0.029	0.000	0.000	0.000	102.029
53	0.035	0.108	-0.061	0.089	101.035
54	0.035	0.000	0.000	0.000	100.035
5.500					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.031	0.107	0.000	0.107	104.031
6	0.030	0.000	0.000	0.000	103.030
7	0.030	0.000	0.000	0.000	102.030
8	0.032	0.099	0.053	0.084	101.032
9	0.032	0.000	0.000	0.000	100.032
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.032	0.074	-0.000	0.074	101.032
18	0.033	0.000	0.000	0.000	100.033
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030

25	0.030	0.096	-0.054	0.080	102.030
26	0.036	0.109	-0.064	0.089	101.036
27	0.034	0.000	0.000	0.000	100.034
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.036	0.000	0.000	0.000	100.036
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
5.600					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030

20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
5.700					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030

15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
5.800					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000

10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
5.900					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030

5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000

6.000

1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030

50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.100					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030

45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.200					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030

40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.300					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030

35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.400					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030

30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.500					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030

25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.600					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030

20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.700					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030

15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.800					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000

10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
6.900					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030

5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000

7.000

1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030

50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.100					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030

45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.200					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030

40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.300					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030

35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.400					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030

30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.500					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030

25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.600					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030

20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.700					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030

15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.800					
1	0.030	0.095	0.051	0.080	108.030
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3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000

10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
7.900					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030

5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000

8.000

1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030

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   50      0.030      0.105      0.000      0.105    104.030
   51      0.030      0.000      0.000      0.000    103.030
   52      0.030      0.000      0.000      0.000    102.030
   53      0.029      0.000      0.000      0.000    101.029
   54      0.000      0.000      0.000      0.000      0.000
  8.100
    1      0.030      0.095      0.051      0.080    108.030
    2      0.030      0.095      0.051      0.081    107.030
    3      0.030      0.094      0.051      0.080    106.030
    4      0.030      0.103      0.000      0.103    105.030
    5      0.030      0.106      0.000      0.106    104.030
    6      0.029      0.000      0.000      0.000    103.029
    7      0.030      0.000      0.000      0.000    102.030
    8      0.030      0.096      0.051      0.081    101.030
    9      0.000      0.000      0.000      0.000      0.000
   10      0.030      0.000      0.000      0.000    108.030
   11      0.030      0.071     -0.002      0.071    107.030
   12      0.030      0.000      0.000      0.000    106.030
   13      0.030      0.000      0.000      0.000    105.030
   14      0.030      0.044      0.000      0.044    104.030
   15      0.030      0.000      0.000      0.000    103.030
   16      0.030      0.000      0.000      0.000    102.030
   17      0.030      0.071     -0.000      0.071    101.030
   18      0.000      0.000      0.000      0.000      0.000
   19      0.030      0.096     -0.054      0.079    108.030
   20      0.030      0.097     -0.055      0.080    107.030
   21      0.030      0.095     -0.054      0.079    106.030
   22      0.030      0.106      0.000      0.106    105.030
   23      0.030      0.097     -0.052      0.082    104.030
   24      0.030      0.097     -0.055      0.080    103.030
   25      0.030      0.096     -0.054      0.080    102.030
   26      0.030      0.097     -0.054      0.080    101.030
   27      0.000      0.000      0.000      0.000      0.000
   28      0.030      0.094      0.054      0.077    108.030
   29      0.030      0.097      0.055      0.080    107.030
   30      0.030      0.096      0.054      0.079    106.030
   31      0.030      0.106      0.000      0.106    105.030
   32      0.030      0.097      0.052      0.083    104.030
   33      0.030      0.097      0.054      0.080    103.030
   34      0.030      0.097      0.055      0.080    102.030
   35      0.030      0.097      0.055      0.080    101.030
   36      0.000      0.000      0.000      0.000      0.000
   37      0.030      0.068      0.000      0.068    108.030
   38      0.030      0.000      0.000      0.000    107.030
   39      0.030      0.070      0.002      0.070    106.030
   40      0.030      0.000      0.000      0.000    105.030
   41      0.030      0.045     -0.000      0.045    104.030
   42      0.030      0.000      0.000      0.000    103.030
   43      0.030      0.000      0.000      0.000    102.030
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   45        0.000        0.000        0.000        0.000        0.000
   46        0.030        0.091       -0.051        0.076      108.030
   47        0.030        0.096       -0.052        0.081      107.030
   48        0.030        0.094       -0.050        0.080      106.030
   49        0.030        0.000        0.000        0.000      105.030
   50        0.030        0.105        0.000        0.105      104.030
   51        0.030        0.000        0.000        0.000      103.030
   52        0.030        0.000        0.000        0.000      102.030
   53        0.029        0.000        0.000        0.000      101.029
   54        0.000        0.000        0.000        0.000        0.000
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    2        0.030        0.095        0.051        0.081      107.030
    3        0.030        0.094        0.051        0.080      106.030
    4        0.030        0.103        0.000        0.103      105.030
    5        0.030        0.106        0.000        0.106      104.030
    6        0.029        0.000        0.000        0.000      103.029
    7        0.030        0.000        0.000        0.000      102.030
    8        0.030        0.096        0.051        0.081      101.030
    9        0.000        0.000        0.000        0.000        0.000
   10        0.030        0.000        0.000        0.000      108.030
   11        0.030        0.071       -0.002        0.071      107.030
   12        0.030        0.000        0.000        0.000      106.030
   13        0.030        0.000        0.000        0.000      105.030
   14        0.030        0.044        0.000        0.044      104.030
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   16        0.030        0.000        0.000        0.000      102.030
   17        0.030        0.071       -0.000        0.071      101.030
   18        0.000        0.000        0.000        0.000        0.000
   19        0.030        0.096       -0.054        0.079      108.030
   20        0.030        0.097       -0.055        0.080      107.030
   21        0.030        0.095       -0.054        0.079      106.030
   22        0.030        0.106        0.000        0.106      105.030
   23        0.030        0.097       -0.052        0.082      104.030
   24        0.030        0.097       -0.055        0.080      103.030
   25        0.030        0.096       -0.054        0.080      102.030
   26        0.030        0.097       -0.054        0.080      101.030
   27        0.000        0.000        0.000        0.000        0.000
   28        0.030        0.094        0.054        0.077      108.030
   29        0.030        0.097        0.055        0.080      107.030
   30        0.030        0.096        0.054        0.079      106.030
   31        0.030        0.106        0.000        0.106      105.030
   32        0.030        0.097        0.052        0.083      104.030
   33        0.030        0.097        0.054        0.080      103.030
   34        0.030        0.097        0.055        0.080      102.030
   35        0.030        0.097        0.055        0.080      101.030
   36        0.000        0.000        0.000        0.000        0.000
   37        0.030        0.068        0.000        0.068      108.030
   38        0.030        0.000        0.000        0.000      107.030
   39        0.030        0.070        0.002        0.070      106.030
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41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.300					
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3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
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6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030

35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.400					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030

30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.500					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030

25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.600					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030

20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.700					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030

15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.800					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000

10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
8.900					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030

5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000

9.000

1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030

50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.100					
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3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030

45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.200					
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3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
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28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
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34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030

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41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
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51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.300					
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3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
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6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030

35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.400					
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2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030

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   30       0.030       0.096       0.054       0.079     106.030
   31       0.030       0.106       0.000       0.106     105.030
   32       0.030       0.097       0.052       0.083     104.030
   33       0.030       0.097       0.054       0.080     103.030
   34       0.030       0.097       0.055       0.080     102.030
   35       0.030       0.097       0.055       0.080     101.030
   36       0.000       0.000       0.000       0.000       0.000
   37       0.030       0.068       0.000       0.068     108.030
   38       0.030       0.000       0.000       0.000     107.030
   39       0.030       0.070       0.002       0.070     106.030
   40       0.030       0.000       0.000       0.000     105.030
   41       0.030       0.045      -0.000       0.045     104.030
   42       0.030       0.000       0.000       0.000     103.030
   43       0.030       0.000       0.000       0.000     102.030
   44       0.030       0.071       0.000       0.071     101.030
   45       0.000       0.000       0.000       0.000       0.000
   46       0.030       0.091      -0.051       0.076     108.030
   47       0.030       0.096      -0.052       0.081     107.030
   48       0.030       0.094      -0.050       0.080     106.030
   49       0.030       0.000       0.000       0.000     105.030
   50       0.030       0.105       0.000       0.105     104.030
   51       0.030       0.000       0.000       0.000     103.030
   52       0.030       0.000       0.000       0.000     102.030
   53       0.029       0.000       0.000       0.000     101.029
   54       0.000       0.000       0.000       0.000       0.000
 9.500
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    2       0.030       0.095       0.051       0.081     107.030
    3       0.030       0.094       0.051       0.080     106.030
    4       0.030       0.103       0.000       0.103     105.030
    5       0.030       0.106       0.000       0.106     104.030
    6       0.029       0.000       0.000       0.000     103.029
    7       0.030       0.000       0.000       0.000     102.030
    8       0.030       0.096       0.051       0.081     101.030
    9       0.000       0.000       0.000       0.000       0.000
   10       0.030       0.000       0.000       0.000     108.030
   11       0.030       0.071      -0.002       0.071     107.030
   12       0.030       0.000       0.000       0.000     106.030
   13       0.030       0.000       0.000       0.000     105.030
   14       0.030       0.044       0.000       0.044     104.030
   15       0.030       0.000       0.000       0.000     103.030
   16       0.030       0.000       0.000       0.000     102.030
   17       0.030       0.071      -0.000       0.071     101.030
   18       0.000       0.000       0.000       0.000       0.000
   19       0.030       0.096      -0.054       0.079     108.030
   20       0.030       0.097      -0.055       0.080     107.030
   21       0.030       0.095      -0.054       0.079     106.030
   22       0.030       0.106       0.000       0.106     105.030
   23       0.030       0.097      -0.052       0.082     104.030
   24       0.030       0.097      -0.055       0.080     103.030
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26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
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33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
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40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
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43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
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50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.600					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030

20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.700					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030

15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.800					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000

10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000
9.900					
1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030

5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030
50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000

10.000

1	0.030	0.095	0.051	0.080	108.030
2	0.030	0.095	0.051	0.081	107.030
3	0.030	0.094	0.051	0.080	106.030
4	0.030	0.103	0.000	0.103	105.030
5	0.030	0.106	0.000	0.106	104.030
6	0.029	0.000	0.000	0.000	103.029
7	0.030	0.000	0.000	0.000	102.030
8	0.030	0.096	0.051	0.081	101.030
9	0.000	0.000	0.000	0.000	0.000
10	0.030	0.000	0.000	0.000	108.030
11	0.030	0.071	-0.002	0.071	107.030
12	0.030	0.000	0.000	0.000	106.030
13	0.030	0.000	0.000	0.000	105.030
14	0.030	0.044	0.000	0.044	104.030
15	0.030	0.000	0.000	0.000	103.030
16	0.030	0.000	0.000	0.000	102.030
17	0.030	0.071	-0.000	0.071	101.030
18	0.000	0.000	0.000	0.000	0.000
19	0.030	0.096	-0.054	0.079	108.030
20	0.030	0.097	-0.055	0.080	107.030
21	0.030	0.095	-0.054	0.079	106.030
22	0.030	0.106	0.000	0.106	105.030
23	0.030	0.097	-0.052	0.082	104.030
24	0.030	0.097	-0.055	0.080	103.030
25	0.030	0.096	-0.054	0.080	102.030
26	0.030	0.097	-0.054	0.080	101.030
27	0.000	0.000	0.000	0.000	0.000
28	0.030	0.094	0.054	0.077	108.030
29	0.030	0.097	0.055	0.080	107.030
30	0.030	0.096	0.054	0.079	106.030
31	0.030	0.106	0.000	0.106	105.030
32	0.030	0.097	0.052	0.083	104.030
33	0.030	0.097	0.054	0.080	103.030
34	0.030	0.097	0.055	0.080	102.030
35	0.030	0.097	0.055	0.080	101.030
36	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030
38	0.030	0.000	0.000	0.000	107.030
39	0.030	0.070	0.002	0.070	106.030
40	0.030	0.000	0.000	0.000	105.030
41	0.030	0.045	-0.000	0.045	104.030
42	0.030	0.000	0.000	0.000	103.030
43	0.030	0.000	0.000	0.000	102.030
44	0.030	0.071	0.000	0.071	101.030
45	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030
47	0.030	0.096	-0.052	0.081	107.030
48	0.030	0.094	-0.050	0.080	106.030
49	0.030	0.000	0.000	0.000	105.030

50	0.030	0.105	0.000	0.105	104.030
51	0.030	0.000	0.000	0.000	103.030
52	0.030	0.000	0.000	0.000	102.030
53	0.029	0.000	0.000	0.000	101.029
54	0.000	0.000	0.000	0.000	0.000

MAXIMUM FLOODPLAIN VELOCITIES LISTED IN DESCENDING ORDER

NODE	MAXIMUM VELOCITY (FPS OR MPS)	DEPTH AT MAX. VELOCITY (FT OR M)	TIME OF OCCURRENCE (HRS)
5	0.74	0.26	2.31
50	0.32	0.21	4.76
23	0.30	0.17	1.34
17	0.29	0.14	2.29
8	0.29	0.14	2.27
26	0.28	0.15	2.29
6	0.28	0.14	2.24
7	0.28	0.14	2.28
22	0.27	0.13	1.37
16	0.27	0.13	2.28
25	0.27	0.13	1.27
24	0.26	0.12	1.39
4	0.24	0.12	2.24
32	0.23	0.12	4.76
15	0.22	0.10	2.24
53	0.22	0.09	2.10
44	0.22	0.09	2.25
35	0.22	0.09	4.92
51	0.21	0.09	4.80
52	0.21	0.09	4.83
31	0.21	0.09	4.73
43	0.20	0.09	4.81
34	0.20	0.09	4.82
33	0.20	0.08	4.78
21	0.20	0.08	2.28
12	0.19	0.08	2.28
3	0.19	0.08	2.28
13	0.19	0.13	1.33
49	0.18	0.08	3.92
20	0.17	0.07	5.00
42	0.17	0.06	4.79
11	0.16	0.06	1.48
2	0.16	0.06	1.48
30	0.15	0.06	4.57
39	0.14	0.05	3.88
40	0.14	0.09	4.73
48	0.14	0.05	3.88
19	0.13	0.05	5.00
29	0.13	0.04	1.20
38	0.12	0.04	4.36
10	0.12	0.04	5.00
47	0.12	0.04	4.37
1	0.12	0.04	1.32
28	0.10	0.03	4.34
46	0.10	0.03	3.13
37	0.10	0.03	3.68

14	0.09	0.05	2.32
41	0.07	0.03	4.40
18	0.00	0.00	0.00
9	0.00	0.00	0.00
36	0.00	0.00	0.00
27	0.00	0.00	0.00
45	0.00	0.00	0.00
54	0.00	0.00	0.00

FLO-2D Pro Verification and Validation, Supplement 1

Attachment 34

Repeatability Review Comparison Tables

Attachment 34

Repeatability Review – Test Case 9a

Grid Cell	Test Case 9a - Run 1			Test Case 9a - Run 2			Difference Between Runs (9a-Run 1 - 9a- Run 2)		
	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)
1	0.0305	108.0305	0.1020	0.0305	108.0305	0.1020	0.0000	0.0000	0.0000
2	0.0308	107.0308	0.1030	0.0308	107.0308	0.1030	0.0000	0.0000	0.0000
3	0.0326	106.0326	0.1062	0.0326	106.0326	0.1062	0.0000	0.0000	0.0000
4	0.0342	105.0342	0.1091	0.0342	105.0342	0.1091	0.0000	0.0000	0.0000
5	0.0356	104.0356	0.1131	0.0356	104.0356	0.1131	0.0000	0.0000	0.0000
6	0.0444	103.0443	0.1314	0.0444	103.0443	0.1314	0.0000	0.0000	0.0000
7	0.0468	102.0468	0.1358	0.0468	102.0468	0.1358	0.0000	0.0000	0.0000
8	0.0539	101.0539	0.1498	0.0539	101.0539	0.1498	0.0000	0.0000	0.0000
9	0.0541	100.0541	0.0000	0.0541	100.0541	0.0000	0.0000	0.0000	0.0000
10	0.0304	108.0304	0.1019	0.0304	108.0304	0.1019	0.0000	0.0000	0.0000
11	0.0308	107.0308	0.1030	0.0308	107.0308	0.1030	0.0000	0.0000	0.0000
12	0.0313	106.0312	0.1033	0.0313	106.0312	0.1033	0.0000	0.0000	0.0000
13	0.0333	105.0333	0.1083	0.0333	105.0333	0.1083	0.0000	0.0000	0.0000
14	0.0369	104.0369	0.1158	0.0369	104.0369	0.1158	0.0000	0.0000	0.0000
15	0.0462	103.0462	0.1351	0.0462	103.0462	0.1351	0.0000	0.0000	0.0000
16	0.0478	102.0478	0.1377	0.0478	102.0478	0.1377	0.0000	0.0000	0.0000
17	0.0543	101.0543	0.1494	0.0543	101.0543	0.1494	0.0000	0.0000	0.0000
18	0.053	100.053	0.0000	0.053	100.053	0.0000	0.0000	0.0000	0.0000
19	0.0301	108.0301	0.0000	0.0301	108.0301	0.0000	0.0000	0.0000	0.0000
20	0.0307	107.0307	0.1025	0.0307	107.0307	0.1025	0.0000	0.0000	0.0000
21	0.0313	106.0313	0.1034	0.0313	106.0313	0.1034	0.0000	0.0000	0.0000
22	0.0381	105.0381	0.1182	0.0381	105.0381	0.1182	0.0000	0.0000	0.0000
23	0.0436	104.0436	0.1297	0.0436	104.0436	0.1297	0.0000	0.0000	0.0000
24	0.0485	103.0485	0.1395	0.0485	103.0485	0.1395	0.0000	0.0000	0.0000
25	0.0488	102.0488	0.1401	0.0488	102.0488	0.1401	0.0000	0.0000	0.0000
26	0.0507	101.0507	0.1437	0.0507	101.0507	0.1437	0.0000	0.0000	0.0000
27	0.0519	100.0519	0.0000	0.0519	100.0519	0.0000	0.0000	0.0000	0.0000
28	0.0301	108.0301	0.0000	0.0301	108.0301	0.0000	0.0000	0.0000	0.0000
29	0.0307	107.0307	0.1025	0.0307	107.0307	0.1025	0.0000	0.0000	0.0000
30	0.0313	106.0313	0.1034	0.0313	106.0313	0.1034	0.0000	0.0000	0.0000
31	0.0381	105.0381	0.1182	0.0381	105.0381	0.1182	0.0000	0.0000	0.0000
32	0.0436	104.0436	0.1297	0.0436	104.0436	0.1297	0.0000	0.0000	0.0000
33	0.0485	103.0485	0.1395	0.0485	103.0485	0.1395	0.0000	0.0000	0.0000
34	0.0488	102.0488	0.1401	0.0488	102.0488	0.1401	0.0000	0.0000	0.0000
35	0.0507	101.0507	0.1437	0.0507	101.0507	0.1437	0.0000	0.0000	0.0000
36	0.0519	100.0519	0.0000	0.0519	100.0519	0.0000	0.0000	0.0000	0.0000
37	0.0304	108.0304	0.1019	0.0304	108.0304	0.1019	0.0000	0.0000	0.0000
38	0.0308	107.0308	0.1030	0.0308	107.0308	0.1030	0.0000	0.0000	0.0000
39	0.0313	106.0312	0.1033	0.0313	106.0312	0.1033	0.0000	0.0000	0.0000
40	0.0333	105.0333	0.1083	0.0333	105.0333	0.1083	0.0000	0.0000	0.0000
41	0.0369	104.0369	0.1158	0.0369	104.0369	0.1158	0.0000	0.0000	0.0000
42	0.0462	103.0462	0.1351	0.0462	103.0462	0.1351	0.0000	0.0000	0.0000
43	0.0478	102.0478	0.1377	0.0478	102.0478	0.1377	0.0000	0.0000	0.0000
44	0.0543	101.0543	0.1494	0.0543	101.0543	0.1494	0.0000	0.0000	0.0000
45	0.053	100.053	0.0000	0.053	100.053	0.0000	0.0000	0.0000	0.0000
46	0.0305	108.0305	0.1020	0.0305	108.0305	0.1020	0.0000	0.0000	0.0000
47	0.0308	107.0308	0.1030	0.0308	107.0308	0.1030	0.0000	0.0000	0.0000
48	0.0326	106.0326	0.1062	0.0326	106.0326	0.1062	0.0000	0.0000	0.0000
49	0.0342	105.0342	0.1091	0.0342	105.0342	0.1091	0.0000	0.0000	0.0000
50	0.0356	104.0356	0.1131	0.0356	104.0356	0.1131	0.0000	0.0000	0.0000
51	0.0444	103.0443	0.1314	0.0444	103.0443	0.1314	0.0000	0.0000	0.0000
52	0.0468	102.0468	0.1358	0.0468	102.0468	0.1358	0.0000	0.0000	0.0000
53	0.0539	101.0539	0.1498	0.0539	101.0539	0.1498	0.0000	0.0000	0.0000
54	0.0541	100.0541	0.0000	0.0541	100.0541	0.0000	0.0000	0.0000	0.0000

Attachment 34

Repeatability Review – Test Case 9b

Grid Cell	Test Case 9b - Run 1			Test Case 9b - Run 2			Difference Between Runs (9b-Run 1 - 9b- Run 2)		
	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)
1	0.0304	108.0304	0.1021	0.0304	108.0304	0.1021	0.0000	0.0000	0.0000
2	0.0308	107.0308	0.1030	0.0308	107.0308	0.1030	0.0000	0.0000	0.0000
3	0.0355	106.0355	0.1125	0.0355	106.0355	0.1125	0.0000	0.0000	0.0000
4	0.0391	105.0391	0.1205	0.0391	105.0391	0.1205	0.0000	0.0000	0.0000
5	0.0433	104.0433	0.1289	0.0433	104.0433	0.1289	0.0000	0.0000	0.0000
6	0.051	103.051	0.1440	0.051	103.051	0.1440	0.0000	0.0000	0.0000
7	0.0547	102.0547	0.1508	0.0547	102.0547	0.1508	0.0000	0.0000	0.0000
8	0.061	101.061	0.1627	0.061	101.061	0.1627	0.0000	0.0000	0.0000
9	0.061	100.061	0.0000	0.061	100.061	0.0000	0.0000	0.0000	0.0000
10	0.0304	108.0304	0.1020	0.0304	108.0304	0.1020	0.0000	0.0000	0.0000
11	0.0309	107.0309	0.1031	0.0309	107.0309	0.1031	0.0000	0.0000	0.0000
12	0.0347	106.0347	0.1107	0.0347	106.0347	0.1107	0.0000	0.0000	0.0000
13	0.039	105.039	0.1204	0.039	105.039	0.1204	0.0000	0.0000	0.0000
14	0.044	104.044	0.1304	0.044	104.044	0.1304	0.0000	0.0000	0.0000
15	0.0518	103.0518	0.1457	0.0518	103.0518	0.1457	0.0000	0.0000	0.0000
16	0.0552	102.0552	0.1517	0.0552	102.0552	0.1517	0.0000	0.0000	0.0000
17	0.0609	101.0609	0.1621	0.0609	101.0609	0.1621	0.0000	0.0000	0.0000
18	0.0604	100.0604	0.0000	0.0604	100.0604	0.0000	0.0000	0.0000	0.0000
19	0.0302	108.0302	0.0000	0.0302	108.0302	0.0000	0.0000	0.0000	0.0000
20	0.0309	107.0309	0.1032	0.0309	107.0309	0.1032	0.0000	0.0000	0.0000
21	0.0338	106.0338	0.1087	0.0338	106.0338	0.1087	0.0000	0.0000	0.0000
22	0.0414	105.0414	0.1253	0.0414	105.0414	0.1253	0.0000	0.0000	0.0000
23	0.0475	104.0475	0.1372	0.0475	104.0475	0.1372	0.0000	0.0000	0.0000
24	0.0529	103.0529	0.1476	0.0529	103.0529	0.1476	0.0000	0.0000	0.0000
25	0.0557	102.0557	0.1528	0.0557	102.0557	0.1528	0.0000	0.0000	0.0000
26	0.0592	101.0592	0.1595	0.0592	101.0592	0.1595	0.0000	0.0000	0.0000
27	0.0598	100.0598	0.0000	0.0598	100.0598	0.0000	0.0000	0.0000	0.0000
28	0.0302	108.0302	0.0000	0.0302	108.0302	0.0000	0.0000	0.0000	0.0000
29	0.0309	107.0309	0.1032	0.0309	107.0309	0.1032	0.0000	0.0000	0.0000
30	0.0338	106.0338	0.1087	0.0338	106.0338	0.1087	0.0000	0.0000	0.0000
31	0.0414	105.0414	0.1253	0.0414	105.0414	0.1253	0.0000	0.0000	0.0000
32	0.0475	104.0475	0.1372	0.0475	104.0475	0.1372	0.0000	0.0000	0.0000
33	0.0529	103.0529	0.1476	0.0529	103.0529	0.1476	0.0000	0.0000	0.0000
34	0.0557	102.0557	0.1528	0.0557	102.0557	0.1528	0.0000	0.0000	0.0000
35	0.0592	101.0592	0.1595	0.0592	101.0592	0.1595	0.0000	0.0000	0.0000
36	0.0598	100.0598	0.0000	0.0598	100.0598	0.0000	0.0000	0.0000	0.0000
37	0.0304	108.0304	0.1020	0.0304	108.0304	0.1020	0.0000	0.0000	0.0000
38	0.0309	107.0309	0.1031	0.0309	107.0309	0.1031	0.0000	0.0000	0.0000
39	0.0347	106.0347	0.1107	0.0347	106.0347	0.1107	0.0000	0.0000	0.0000
40	0.039	105.039	0.1204	0.039	105.039	0.1204	0.0000	0.0000	0.0000
41	0.044	104.044	0.1304	0.044	104.044	0.1304	0.0000	0.0000	0.0000
42	0.0518	103.0518	0.1457	0.0518	103.0518	0.1457	0.0000	0.0000	0.0000
43	0.0552	102.0552	0.1517	0.0552	102.0552	0.1517	0.0000	0.0000	0.0000
44	0.0609	101.0609	0.1621	0.0609	101.0609	0.1621	0.0000	0.0000	0.0000
45	0.0604	100.0604	0.0000	0.0604	100.0604	0.0000	0.0000	0.0000	0.0000
46	0.0304	108.0304	0.1021	0.0304	108.0304	0.1021	0.0000	0.0000	0.0000
47	0.0308	107.0308	0.1030	0.0308	107.0308	0.1030	0.0000	0.0000	0.0000
48	0.0355	106.0355	0.1125	0.0355	106.0355	0.1125	0.0000	0.0000	0.0000
49	0.0391	105.0391	0.1205	0.0391	105.0391	0.1205	0.0000	0.0000	0.0000
50	0.0433	104.0433	0.1289	0.0433	104.0433	0.1289	0.0000	0.0000	0.0000
51	0.051	103.051	0.1440	0.051	103.051	0.1440	0.0000	0.0000	0.0000
52	0.0547	102.0547	0.1508	0.0547	102.0547	0.1508	0.0000	0.0000	0.0000
53	0.061	101.061	0.1627	0.061	101.061	0.1627	0.0000	0.0000	0.0000
54	0.061	100.061	0.0000	0.061	100.061	0.0000	0.0000	0.0000	0.0000

Attachment 34

Repeatability Review – Test Case 9c

Grid Cell	Test Case 9c - Run 1			Test Case 9c - Run 2			Difference Between Runs (9c-Run 1 - 9c- Run 2)		
	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)	Max Depth (ft)	Max Elevation (ft)	Max Velocity (ft/s)
1	0.0304	108.0304	0.1022	0.0304	108.0304	0.1022	0.0000	0.0000	0.0000
2	0.0311	107.0311	0.1032	0.0311	107.0311	0.1032	0.0000	0.0000	0.0000
3	0.0383	106.0383	0.1187	0.0383	106.0383	0.1187	0.0000	0.0000	0.0000
4	0.0442	105.0442	0.1308	0.0442	105.0442	0.1308	0.0000	0.0000	0.0000
5	0.05	104.05	0.1419	0.05	104.05	0.1419	0.0000	0.0000	0.0000
6	0.0566	103.0566	0.1544	0.0566	103.0566	0.1544	0.0000	0.0000	0.0000
7	0.0617	102.0617	0.1634	0.0617	102.0617	0.1634	0.0000	0.0000	0.0000
8	0.0674	101.0674	0.1739	0.0674	101.0674	0.1739	0.0000	0.0000	0.0000
9	0.0674	100.0674	0.0000	0.0674	100.0674	0.0000	0.0000	0.0000	0.0000
10	0.0304	108.0304	0.1021	0.0304	108.0304	0.1021	0.0000	0.0000	0.0000
11	0.031	107.031	0.1031	0.031	107.031	0.1031	0.0000	0.0000	0.0000
12	0.038	106.038	0.1178	0.038	106.038	0.1178	0.0000	0.0000	0.0000
13	0.0443	105.0443	0.1309	0.0443	105.0443	0.1309	0.0000	0.0000	0.0000
14	0.0505	104.0505	0.1429	0.0505	104.0505	0.1429	0.0000	0.0000	0.0000
15	0.0571	103.0571	0.1552	0.0571	103.0571	0.1552	0.0000	0.0000	0.0000
16	0.062	102.062	0.1639	0.062	102.062	0.1639	0.0000	0.0000	0.0000
17	0.0674	101.0674	0.1738	0.0674	101.0674	0.1738	0.0000	0.0000	0.0000
18	0.0673	100.0673	0.0000	0.0673	100.0673	0.0000	0.0000	0.0000	0.0000
19	0.0303	108.0303	0.0000	0.0303	108.0303	0.0000	0.0000	0.0000	0.0000
20	0.031	107.031	0.1032	0.031	107.031	0.1032	0.0000	0.0000	0.0000
21	0.0377	106.0377	0.1171	0.0377	106.0377	0.1171	0.0000	0.0000	0.0000
22	0.0449	105.0449	0.1322	0.0449	105.0449	0.1322	0.0000	0.0000	0.0000
23	0.0513	104.0513	0.1446	0.0513	104.0513	0.1446	0.0000	0.0000	0.0000
24	0.0575	103.0575	0.1561	0.0575	103.0575	0.1561	0.0000	0.0000	0.0000
25	0.0622	102.0622	0.1645	0.0622	102.0622	0.1645	0.0000	0.0000	0.0000
26	0.0669	101.0669	0.1730	0.0669	101.0669	0.1730	0.0000	0.0000	0.0000
27	0.0671	100.0671	0.0000	0.0671	100.0671	0.0000	0.0000	0.0000	0.0000
28	0.0303	108.0303	0.0000	0.0303	108.0303	0.0000	0.0000	0.0000	0.0000
29	0.031	107.031	0.1032	0.031	107.031	0.1032	0.0000	0.0000	0.0000
30	0.0377	106.0377	0.1171	0.0377	106.0377	0.1171	0.0000	0.0000	0.0000
31	0.0449	105.0449	0.1322	0.0449	105.0449	0.1322	0.0000	0.0000	0.0000
32	0.0513	104.0513	0.1446	0.0513	104.0513	0.1446	0.0000	0.0000	0.0000
33	0.0575	103.0575	0.1561	0.0575	103.0575	0.1561	0.0000	0.0000	0.0000
34	0.0622	102.0622	0.1645	0.0622	102.0622	0.1645	0.0000	0.0000	0.0000
35	0.0669	101.0669	0.1730	0.0669	101.0669	0.1730	0.0000	0.0000	0.0000
36	0.0671	100.0671	0.0000	0.0671	100.0671	0.0000	0.0000	0.0000	0.0000
37	0.0304	108.0304	0.1021	0.0304	108.0304	0.1021	0.0000	0.0000	0.0000
38	0.031	107.031	0.1031	0.031	107.031	0.1031	0.0000	0.0000	0.0000
39	0.038	106.038	0.1178	0.038	106.038	0.1178	0.0000	0.0000	0.0000
40	0.0443	105.0443	0.1309	0.0443	105.0443	0.1309	0.0000	0.0000	0.0000
41	0.0505	104.0505	0.1429	0.0505	104.0505	0.1429	0.0000	0.0000	0.0000
42	0.0571	103.0571	0.1552	0.0571	103.0571	0.1552	0.0000	0.0000	0.0000
43	0.062	102.062	0.1639	0.062	102.062	0.1639	0.0000	0.0000	0.0000
44	0.0674	101.0674	0.1738	0.0674	101.0674	0.1738	0.0000	0.0000	0.0000
45	0.0673	100.0673	0.0000	0.0673	100.0673	0.0000	0.0000	0.0000	0.0000
46	0.0304	108.0304	0.1022	0.0304	108.0304	0.1022	0.0000	0.0000	0.0000
47	0.0311	107.0311	0.1032	0.0311	107.0311	0.1032	0.0000	0.0000	0.0000
48	0.0383	106.0383	0.1187	0.0383	106.0383	0.1187	0.0000	0.0000	0.0000
49	0.0442	105.0442	0.1308	0.0442	105.0442	0.1308	0.0000	0.0000	0.0000
50	0.05	104.05	0.1419	0.05	104.05	0.1419	0.0000	0.0000	0.0000
51	0.0566	103.0566	0.1544	0.0566	103.0566	0.1544	0.0000	0.0000	0.0000
52	0.0617	102.0617	0.1634	0.0617	102.0617	0.1634	0.0000	0.0000	0.0000
53	0.0674	101.0674	0.1739	0.0674	101.0674	0.1739	0.0000	0.0000	0.0000
54	0.0674	100.0674	0.0000	0.0674	100.0674	0.0000	0.0000	0.0000	0.0000

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Repeatability Review – Test Case 9d

Grid Cell	Test Case 9d - Run 1		Test Case 9d - Run 2		Diff B/T Runs (9d-Run 1 - 9d- Run 2)	
	Final Depth (ft)	Max Elevation (ft)	Final Depth (ft)	Max Elevation (ft)	Final Depth (ft)	Max Elevation (ft)
1	0.0295	108.0304	0.0295	108.0304	0.0000	0.0000
2	0.0297	107.0315	0.0297	107.0315	0.0000	0.0000
3	0.0294	106.0345	0.0294	106.0345	0.0000	0.0000
4	0.0298	105.0382	0.0298	105.0382	0.0000	0.0000
5	0.0299	104.0532	0.0299	104.0532	0.0000	0.0000
6	0.0294	103.0693	0.0294	103.0693	0.0000	0.0000
7	0.0296	102.0522	0.0296	102.0522	0.0000	0.0000
8	0.0300	101.0575	0.0300	101.0575	0.0000	0.0000
9	0.0000	100.0578	0.0000	100.0578	0.0000	0.0000
10	0.0298	108.0306	0.0298	108.0306	0.0000	0.0000
11	0.2916	107.2916	0.2916	107.2916	0.0000	0.0000
12	0.0294	106.0321	0.0294	106.0321	0.0000	0.0000
13	0.0295	105.0381	0.0295	105.0381	0.0000	0.0000
14	0.0300	104.0571	0.0300	104.0571	0.0000	0.0000
15	0.5833	103.5833	0.5833	103.5833	0.0000	0.0000
16	0.0299	102.0479	0.0299	102.0479	0.0000	0.0000
17	0.0298	101.0580	0.0298	101.0580	0.0000	0.0000
18	0.0000	100.0584	0.0000	100.0584	0.0000	0.0000
19	0.0296	108.0302	0.0296	108.0302	0.0000	0.0000
20	0.0296	107.0309	0.0296	107.0309	0.0000	0.0000
21	0.0294	106.0331	0.0294	106.0331	0.0000	0.0000
22	0.0293	105.0414	0.0293	105.0414	0.0000	0.0000
23	0.0300	104.0566	0.0300	104.0566	0.0000	0.0000
24	0.0294	103.0656	0.0294	103.0656	0.0000	0.0000
25	0.0294	102.0547	0.0294	102.0547	0.0000	0.0000
26	0.0299	101.0597	0.0299	101.0597	0.0000	0.0000
27	0.0000	100.0575	0.0000	100.0575	0.0000	0.0000
28	0.0294	108.0302	0.0294	108.0302	0.0000	0.0000
29	0.0296	107.0309	0.0296	107.0309	0.0000	0.0000
30	0.0293	106.0385	0.0293	106.0385	0.0000	0.0000
31	0.0299	105.0382	0.0299	105.0382	0.0000	0.0000
32	0.0297	104.0464	0.0297	104.0464	0.0000	0.0000
33	0.0298	103.0681	0.0298	103.0681	0.0000	0.0000
34	0.0295	102.0774	0.0295	102.0774	0.0000	0.0000
35	0.0299	101.0547	0.0299	101.0547	0.0000	0.0000
36	0.0000	100.0565	0.0000	100.0565	0.0000	0.0000
37	0.0298	108.0304	0.0298	108.0304	0.0000	0.0000
38	0.0298	107.0334	0.0298	107.0334	0.0000	0.0000
39	0.5833	106.5833	0.5833	106.5833	0.0000	0.0000
40	0.0300	105.0336	0.0300	105.0336	0.0000	0.0000
41	0.0299	104.0413	0.0299	104.0413	0.0000	0.0000
42	0.0296	103.0672	0.0296	103.0672	0.0000	0.0000
43	0.2916	102.2916	0.2916	102.2916	0.0000	0.0000
44	0.0296	101.0552	0.0296	101.0552	0.0000	0.0000
45	0.0000	**100.0568**	0.0000	100.0568	0.0000	0.0000
46	0.0296	108.0304	0.0296	108.0304	0.0000	0.0000
47	0.0298	107.0329	0.0298	107.0329	0.0000	0.0000
48	0.0295	106.0457	0.0295	106.0457	0.0000	0.0000
49	0.0295	105.0375	0.0295	105.0375	0.0000	0.0000
50	0.0294	104.0408	0.0294	104.0408	0.0000	0.0000
51	0.0299	103.0612	0.0299	103.0612	0.0000	0.0000
52	0.0297	102.0719	0.0297	102.0719	0.0000	0.0000
53	0.0300	101.0607	0.0300	101.0607	0.0000	0.0000
54	0.0000	100.0579	0.0000	100.0579	0.0000	0.0000

Attachment 34

Repeatability Review – Test Case 9e

Timestep	TC 9e Element 9 (CFS)			TC 9e Element 18 (CFS)			TC 9e Element 27 (CFS)			TC 9e Element 36 (CFS)			TC 9e Element 45 (CFS)			TC 9e Element 54 (CFS)		
(HRS)	TC Run 1	TC Run 2	Diff (1-2)	TC Run 1	TC Run 2	Diff (1-2)	TC Run 1	TC Run 2	Diff (1-2)	TC Run 1	TC Run 2	Diff (1-2)	TC Run 1	TC Run 2	Diff (1-2)	TC Run 1	TC Run 2	Diff (1-2)
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	0.19	0.19	0.00	0.19	0.19	0.00	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.4	0.31	0.31	0.00	0.31	0.31	0.00	0.22	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.5	0.45	0.45	0.00	0.45	0.45	0.00	0.32	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.6	0.57	0.57	0.00	0.58	0.58	0.00	0.37	0.37	0.00	0.14	0.14	0.00	0.20	0.20	0.00	0.19	0.19	0.00
0.7	0.65	0.65	0.00	0.67	0.67	0.00	0.43	0.43	0.00	0.18	0.18	0.00	0.25	0.25	0.00	0.25	0.25	0.00
0.8	0.69	0.69	0.00	0.71	0.71	0.00	0.46	0.46	0.00	0.21	0.21	0.00	0.30	0.30	0.00	0.29	0.29	0.00
0.9	0.71	0.71	0.00	0.73	0.73	0.00	0.48	0.48	0.00	0.23	0.23	0.00	0.33	0.33	0.00	0.32	0.32	0.00
1	0.71	0.71	0.00	0.73	0.73	0.00	0.49	0.49	0.00	0.25	0.25	0.00	0.34	0.34	0.00	0.34	0.34	0.00
1.1	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.25	0.25	0.00	0.35	0.35	0.00	0.35	0.35	0.00
1.2	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.3	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.4	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.5	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.6	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.7	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.8	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
1.9	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.1	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.2	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.3	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.4	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.5	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.6	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.7	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.8	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
2.9	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.1	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.2	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.3	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.4	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.5	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.6	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.7	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.8	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
3.9	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.1	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.2	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.3	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.4	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.5	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.6	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.7	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.8	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
4.9	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
5	0.72	0.72	0.00	0.74	0.74	0.00	0.49	0.49	0.00	0.26	0.26	0.00	0.36	0.36	0.00	0.35	0.35	0.00
5.1	0.56	0.56	0.00	0.58	0.58	0.00	0.39	0.39	0.00	0.21	0.21	0.00	0.29	0.29	0.00	0.28	0.28	0.00
5.2	0.40	0.40	0.00	0.42	0.42	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.3	0.05	0.05	0.00	0.14	0.14	0.00	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Attachment 34

Repeatability Review – Test Case 9e

Grid Cell	Test Case 9e - Final Depth (ft)		
	Run 1	Run 2	Diff (Run 1 - Run 2)
1	0.0296	0.0296	0.0000
2	0.0298	0.0298	0.0000
3	0.0299	0.0299	0.0000
4	0.0300	0.0300	0.0000
5	0.0297	0.0297	0.0000
6	0.0294	0.0294	0.0000
7	0.0298	0.0298	0.0000
8	0.0295	0.0295	0.0000
9	0.0000	0.0000	0.0000
10	0.0294	0.0294	0.0000
11	0.0296	0.0296	0.0000
12	0.0294	0.0294	0.0000
13	0.0300	0.0300	0.0000
14	0.0295	0.0295	0.0000
15	0.0298	0.0298	0.0000
16	0.0296	0.0296	0.0000
17	0.0298	0.0298	0.0000
18	0.0000	0.0000	0.0000
19	0.0295	0.0295	0.0000
20	0.0300	0.0300	0.0000
21	0.0297	0.0297	0.0000
22	0.0295	0.0295	0.0000
23	0.0299	0.0299	0.0000
24	0.0297	0.0297	0.0000
25	0.0295	0.0295	0.0000
26	0.0297	0.0297	0.0000
27	0.0000	0.0000	0.0000
28	0.0299	0.0299	0.0000
29	0.0296	0.0296	0.0000
30	0.0296	0.0296	0.0000
31	0.0297	0.0297	0.0000
32	0.0295	0.0295	0.0000
33	0.0296	0.0296	0.0000
34	0.0295	0.0295	0.0000
35	0.0296	0.0296	0.0000
36	0.0000	0.0000	0.0000
37	0.0296	0.0296	0.0000
38	0.0294	0.0294	0.0000
39	0.0297	0.0297	0.0000
40	0.0297	0.0297	0.0000
41	0.0298	0.0298	0.0000
42	0.0299	0.0299	0.0000
43	0.0295	0.0295	0.0000
44	0.0298	0.0298	0.0000
45	0.0000	0.0000	0.0000
46	0.0298	0.0298	0.0000
47	0.0298	0.0298	0.0000
48	0.0300	0.0300	0.0000
49	0.0298	0.0298	0.0000
50	0.0298	0.0298	0.0000
51	0.0295	0.0295	0.0000
52	0.0296	0.0296	0.0000
53	0.0296	0.0296	0.0000
54	0.0000	0.0000	0.0000

Attachment 34

Repeatability Review – Test Case 9f

Grid Cell	Test Case 9f Run 1 (Timestep = 0.100)					Test Case 9f Run 2 (Timestep = 0.100)					Difference Between Test Case 9f (Run 1 - Run 2)				
	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)
1	0.031	0.093	0.052	0.077	108.031	0.031	0.093	0.052	0.077	108.031	0.000	0.000	0.000	0.000	0.000
2	0.033	0.097	0.054	0.080	107.033	0.033	0.097	0.054	0.080	107.033	0.000	0.000	0.000	0.000	0.000
3	0.033	0.097	0.054	0.080	106.033	0.033	0.097	0.054	0.080	106.033	0.000	0.000	0.000	0.000	0.000
4	0.034	0.105	0.000	0.105	105.034	0.034	0.105	0.000	0.105	105.034	0.000	0.000	0.000	0.000	0.000
5	0.061	0.135	0.000	0.135	104.061	0.061	0.135	0.000	0.135	104.061	0.000	0.000	0.000	0.000	0.000
6	0.035	0.101	0.058	0.082	103.035	0.035	0.101	0.058	0.082	103.035	0.000	0.000	0.000	0.000	0.000
7	0.035	0.098	0.055	0.081	102.035	0.035	0.098	0.055	0.081	102.035	0.000	0.000	0.000	0.000	0.000
8	0.034	0.098	0.055	0.081	101.034	0.034	0.098	0.055	0.081	101.034	0.000	0.000	0.000	0.000	0.000
9	0.034	0.000	0.000	0.000	100.034	0.034	0.000	0.000	0.000	100.034	0.000	0.000	0.000	0.000	0.000
10	0.031	0.069	0.000	0.069	108.031	0.031	0.069	0.000	0.069	108.031	0.000	0.000	0.000	0.000	0.000
11	0.033	0.071	0.000	0.071	107.033	0.033	0.071	0.000	0.071	107.033	0.000	0.000	0.000	0.000	0.000
12	0.033	0.071	0.000	0.071	106.033	0.033	0.071	0.000	0.071	106.033	0.000	0.000	0.000	0.000	0.000
13	0.034	0.055	0.000	0.055	105.034	0.034	0.055	0.000	0.055	105.034	0.000	0.000	0.000	0.000	0.000
14	0.032	0.047	0.000	0.047	104.032	0.032	0.047	0.000	0.047	104.032	0.000	0.000	0.000	0.000	0.000
15	0.034	0.073	0.000	0.073	103.034	0.034	0.073	0.000	0.073	103.034	0.000	0.000	0.000	0.000	0.000
16	0.035	0.073	0.000	0.073	102.035	0.035	0.073	0.000	0.073	102.035	0.000	0.000	0.000	0.000	0.000
17	0.034	0.072	0.000	0.072	101.034	0.034	0.072	0.000	0.072	101.034	0.000	0.000	0.000	0.000	0.000
18	0.034	0.000	0.000	0.000	100.034	0.034	0.000	0.000	0.000	100.034	0.000	0.000	0.000	0.000	0.000
19	0.032	0.096	-0.055	0.078	108.032	0.032	0.096	-0.055	0.078	108.032	0.000	0.000	0.000	0.000	0.000
20	0.033	0.097	-0.054	0.080	107.033	0.033	0.097	-0.054	0.080	107.033	0.000	0.000	0.000	0.000	0.000
21	0.033	0.097	-0.054	0.080	106.033	0.033	0.097	-0.054	0.080	106.033	0.000	0.000	0.000	0.000	0.000
22	0.034	0.106	0.000	0.106	105.034	0.034	0.106	0.000	0.106	105.034	0.000	0.000	0.000	0.000	0.000
23	0.050	0.115	-0.064	0.095	104.050	0.050	0.115	-0.064	0.095	104.050	0.000	0.000	0.000	0.000	0.000
24	0.036	0.104	-0.062	0.083	103.036	0.036	0.104	-0.062	0.083	103.036	0.000	0.000	0.000	0.000	0.000
25	0.035	0.098	-0.055	0.081	102.035	0.035	0.098	-0.055	0.081	102.035	0.000	0.000	0.000	0.000	0.000
26	0.034	0.097	-0.055	0.081	101.034	0.034	0.097	-0.055	0.081	101.034	0.000	0.000	0.000	0.000	0.000
27	0.034	0.000	0.000	0.000	100.034	0.034	0.000	0.000	0.000	100.034	0.000	0.000	0.000	0.000	0.000
28	0.017	0.000	0.000	0.000	108.017	0.017	0.000	0.000	0.000	108.017	0.000	0.000	0.000	0.000	0.000
29	0.017	0.000	0.000	0.000	107.017	0.017	0.000	0.000	0.000	107.017	0.000	0.000	0.000	0.000	0.000
30	0.017	0.000	0.000	0.000	106.017	0.017	0.000	0.000	0.000	106.017	0.000	0.000	0.000	0.000	0.000
31	0.017	0.000	0.000	0.000	105.017	0.017	0.000	0.000	0.000	105.017	0.000	0.000	0.000	0.000	0.000
32	0.031	0.080	0.044	0.066	104.031	0.031	0.080	0.044	0.066	104.031	0.000	0.000	0.000	0.000	0.000
33	0.017	0.000	0.000	0.000	103.017	0.017	0.000	0.000	0.000	103.017	0.000	0.000	0.000	0.000	0.000
34	0.017	0.000	0.000	0.000	102.017	0.017	0.000	0.000	0.000	102.017	0.000	0.000	0.000	0.000	0.000
35	0.017	0.000	0.000	0.000	101.017	0.017	0.000	0.000	0.000	101.017	0.000	0.000	0.000	0.000	0.000
36	0.034	0.000	0.000	0.000	100.034	0.034	0.000	0.000	0.000	100.034	0.000	0.000	0.000	0.000	0.000
37	0.017	0.000	0.000	0.000	108.017	0.017	0.000	0.000	0.000	108.017	0.000	0.000	0.000	0.000	0.000
38	0.017	0.000	0.000	0.000	107.017	0.017	0.000	0.000	0.000	107.017	0.000	0.000	0.000	0.000	0.000
39	0.017	0.000	0.000	0.000	106.017	0.017	0.000	0.000	0.000	106.017	0.000	0.000	0.000	0.000	0.000
40	0.017	0.000	0.000	0.000	105.017	0.017	0.000	0.000	0.000	105.017	0.000	0.000	0.000	0.000	0.000
41	0.017	0.000	0.000	0.000	104.017	0.017	0.000	0.000	0.000	104.017	0.000	0.000	0.000	0.000	0.000
42	0.017	0.000	0.000	0.000	103.017	0.017	0.000	0.000	0.000	103.017	0.000	0.000	0.000	0.000	0.000
43	0.017	0.000	0.000	0.000	102.017	0.017	0.000	0.000	0.000	102.017	0.000	0.000	0.000	0.000	0.000
44	0.017	0.000	0.000	0.000	101.017	0.017	0.000	0.000	0.000	101.017	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
46	0.017	0.000	0.000	0.000	108.017	0.017	0.000	0.000	0.000	108.017	0.000	0.000	0.000	0.000	0.000
47	0.017	0.000	0.000	0.000	107.017	0.017	0.000	0.000	0.000	107.017	0.000	0.000	0.000	0.000	0.000
48	0.017	0.000	0.000	0.000	106.017	0.017	0.000	0.000	0.000	106.017	0.000	0.000	0.000	0.000	0.000
49	0.017	0.000	0.000	0.000	105.017	0.017	0.000	0.000	0.000	105.017	0.000	0.000	0.000	0.000	0.000
50	0.032	0.090	0.000	0.090	104.032	0.032	0.090	0.000	0.090	104.032	0.000	0.000	0.000	0.000	0.000
51	0.017	0.000	0.000	0.000	103.017	0.017	0.000	0.000	0.000	103.017	0.000	0.000	0.000	0.000	0.000
52	0.017	0.000	0.000	0.000	102.017	0.017	0.000	0.000	0.000	102.017	0.000	0.000	0.000	0.000	0.000
53	0.017	0.000	0.000	0.000	101.017	0.017	0.000	0.000	0.000	101.017	0.000	0.000	0.000	0.000	0.000
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Attachment 34

Repeatability Review – Test Case 9f

Grid Cell	Test Case 9f Run 1 (Timestep = 2.500)					Test Case 9f Run 2 (Timestep = 2.500)					Difference Between Test Case 9f (Run 1 - Run 2)				
	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)
1	0.039	0.108	0.060	0.090	108.039	0.039	0.108	0.060	0.090	108.039	0.000	0.000	0.000	0.000	0.000
2	0.060	0.144	0.080	0.119	107.060	0.060	0.144	0.080	0.119	107.060	0.000	0.000	0.000	0.000	0.000
3	0.078	0.168	0.093	0.140	106.078	0.078	0.168	0.093	0.140	106.078	0.000	0.000	0.000	0.000	0.000
4	0.122	0.240	0.000	0.240	105.122	0.122	0.240	0.000	0.240	105.122	0.000	0.000	0.000	0.000	0.000
5	0.262	0.387	0.000	0.387	104.262	0.262	0.387	0.000	0.387	104.262	0.000	0.000	0.000	0.000	0.000
6	0.139	0.230	0.095	0.210	103.139	0.139	0.230	0.095	0.210	103.139	0.000	0.000	0.000	0.000	0.000
7	0.136	0.221	0.079	0.207	102.136	0.136	0.221	0.079	0.207	102.136	0.000	0.000	0.000	0.000	0.000
8	0.144	0.260	0.144	0.217	101.144	0.144	0.260	0.144	0.217	101.144	0.000	0.000	0.000	0.000	0.000
9	0.145	0.000	0.000	0.000	100.145	0.145	0.000	0.000	0.000	100.145	0.000	0.000	0.000	0.000	0.000
10	0.040	0.081	-0.002	0.081	108.040	0.040	0.081	-0.002	0.081	108.040	0.000	0.000	0.000	0.000	0.000
11	0.062	0.108	-0.003	0.108	107.062	0.062	0.108	-0.003	0.108	107.062	0.000	0.000	0.000	0.000	0.000
12	0.080	0.127	-0.005	0.127	106.080	0.080	0.127	-0.005	0.127	106.080	0.000	0.000	0.000	0.000	0.000
13	0.131	0.129	-0.006	0.129	105.131	0.131	0.129	-0.006	0.129	105.131	0.000	0.000	0.000	0.000	0.000
14	0.050	0.061	0.000	0.061	104.050	0.050	0.061	0.000	0.061	104.050	0.000	0.000	0.000	0.000	0.000
15	0.100	0.148	0.000	0.148	103.100	0.100	0.148	0.000	0.148	103.100	0.000	0.000	0.000	0.000	0.000
16	0.131	0.179	0.003	0.179	102.131	0.131	0.179	0.003	0.179	102.131	0.000	0.000	0.000	0.000	0.000
17	0.145	0.192	-0.006	0.192	101.145	0.145	0.192	-0.006	0.192	101.145	0.000	0.000	0.000	0.000	0.000
18	0.145	0.000	0.000	0.000	100.145	0.145	0.000	0.000	0.000	100.145	0.000	0.000	0.000	0.000	0.000
19	0.046	0.126	-0.077	0.100	108.046	0.046	0.126	-0.077	0.100	108.046	0.000	0.000	0.000	0.000	0.000
20	0.067	0.139	-0.050	0.129	107.067	0.067	0.139	-0.050	0.129	107.067	0.000	0.000	0.000	0.000	0.000
21	0.085	0.159	-0.057	0.148	106.085	0.085	0.159	-0.057	0.148	106.085	0.000	0.000	0.000	0.000	0.000
22	0.135	0.271	-0.017	0.271	105.135	0.135	0.271	-0.017	0.271	105.135	0.000	0.000	0.000	0.000	0.000
23	0.172	0.265	-0.144	0.222	104.172	0.172	0.265	-0.144	0.222	104.172	0.000	0.000	0.000	0.000	0.000
24	0.123	0.212	-0.083	0.195	103.123	0.123	0.212	-0.083	0.195	103.123	0.000	0.000	0.000	0.000	0.000
25	0.130	0.241	-0.134	0.201	102.130	0.130	0.241	-0.134	0.201	102.130	0.000	0.000	0.000	0.000	0.000
26	0.147	0.228	-0.079	0.214	101.147	0.147	0.228	-0.079	0.214	101.147	0.000	0.000	0.000	0.000	0.000
27	0.129	0.000	0.000	0.000	100.129	0.129	0.000	0.000	0.000	100.129	0.000	0.000	0.000	0.000	0.000
28	0.031	0.095	0.055	0.077	108.031	0.031	0.095	0.055	0.077	108.031	0.000	0.000	0.000	0.000	0.000
29	0.045	0.124	0.074	0.099	107.045	0.045	0.124	0.074	0.099	107.045	0.000	0.000	0.000	0.000	0.000
30	0.056	0.142	0.085	0.114	106.056	0.056	0.142	0.085	0.114	106.056	0.000	0.000	0.000	0.000	0.000
31	0.089	0.207	0.011	0.207	105.089	0.089	0.207	0.011	0.207	105.089	0.000	0.000	0.000	0.000	0.000
32	0.115	0.200	0.108	0.168	104.115	0.115	0.200	0.108	0.168	104.115	0.000	0.000	0.000	0.000	0.000
33	0.083	0.161	0.062	0.149	103.083	0.083	0.161	0.062	0.149	103.083	0.000	0.000	0.000	0.000	0.000
34	0.086	0.183	0.102	0.152	102.086	0.086	0.183	0.102	0.152	102.086	0.000	0.000	0.000	0.000	0.000
35	0.095	0.196	0.109	0.163	101.095	0.095	0.196	0.109	0.163	101.095	0.000	0.000	0.000	0.000	0.000
36	0.112	0.000	0.000	0.000	100.112	0.112	0.000	0.000	0.000	100.112	0.000	0.000	0.000	0.000	0.000
37	0.030	0.000	0.000	0.000	108.030	0.030	0.000	0.000	0.000	108.030	0.000	0.000	0.000	0.000	0.000
38	0.041	0.082	0.002	0.082	107.041	0.041	0.082	0.002	0.082	107.041	0.000	0.000	0.000	0.000	0.000
39	0.052	0.096	0.003	0.096	106.052	0.052	0.096	0.003	0.096	106.052	0.000	0.000	0.000	0.000	0.000
40	0.086	0.098	0.004	0.098	105.086	0.086	0.098	0.004	0.098	105.086	0.000	0.000	0.000	0.000	0.000
41	0.033	0.047	0.000	0.047	104.033	0.033	0.047	0.000	0.047	104.033	0.000	0.000	0.000	0.000	0.000
42	0.065	0.111	0.000	0.111	103.065	0.065	0.111	0.000	0.111	103.065	0.000	0.000	0.000	0.000	0.000
43	0.086	0.136	0.000	0.136	102.086	0.086	0.136	0.000	0.136	102.086	0.000	0.000	0.000	0.000	0.000
44	0.094	0.145	0.000	0.145	101.094	0.094	0.145	0.000	0.145	101.094	0.000	0.000	0.000	0.000	0.000
45	0.095	0.000	0.000	0.000	100.095	0.095	0.000	0.000	0.000	100.095	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030	0.030	0.091	-0.051	0.076	108.030	0.000	0.000	0.000	0.000	0.000
47	0.039	0.109	-0.060	0.090	107.039	0.039	0.109	-0.060	0.090	107.039	0.000	0.000	0.000	0.000	0.000
48	0.051	0.128	-0.071	0.107	106.051	0.051	0.128	-0.071	0.107	106.051	0.000	0.000	0.000	0.000	0.000
49	0.080	0.181	0.000	0.181	105.080	0.080	0.181	0.000	0.181	105.080	0.000	0.000	0.000	0.000	0.000
50	0.215	0.319	0.000	0.319	104.215	0.215	0.319	0.000	0.319	104.215	0.000	0.000	0.000	0.000	0.000
51	0.093	0.174	-0.069	0.159	103.093	0.093	0.174	-0.069	0.159	103.093	0.000	0.000	0.000	0.000	0.000
52	0.090	0.168	-0.059	0.157	102.090	0.090	0.168	-0.059	0.157	102.090	0.000	0.000	0.000	0.000	0.000
53	0.095	0.196	-0.109	0.163	101.095	0.095	0.196	-0.109	0.163	101.095	0.000	0.000	0.000	0.000	0.000
54	0.094	0.000	0.000	0.000	100.094	0.094	0.000	0.000	0.000	100.094	0.000	0.000	0.000	0.000	0.000

Attachment 34

Repeatability Review – Test Case 9f

Grid Cell	Test Case 9f Run 1 (Timestep = 5.000)					Test Case 9f Run 2 (Timestep = 5.000)					Difference Between Test Case 9f (Run 1 - Run 2)				
	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)	Flow Depth (ft)	Velocity (ft/s)	Velocity Direction (X)	Velocity Direction (Y)	WSE (ft)
1	0.038	0.108	0.060	0.090	108.038	0.038	0.108	0.060	0.090	108.038	0.000	0.000	0.000	0.000	0.000
2	0.059	0.144	0.080	0.119	107.059	0.059	0.144	0.080	0.119	107.059	0.000	0.000	0.000	0.000	0.000
3	0.077	0.168	0.093	0.140	106.077	0.077	0.168	0.093	0.140	106.077	0.000	0.000	0.000	0.000	0.000
4	0.121	0.240	0.000	0.240	105.121	0.121	0.240	0.000	0.240	105.121	0.000	0.000	0.000	0.000	0.000
5	0.257	0.388	0.000	0.388	104.257	0.257	0.388	0.000	0.388	104.257	0.000	0.000	0.000	0.000	0.000
6	0.139	0.231	0.096	0.210	103.139	0.139	0.231	0.096	0.210	103.139	0.000	0.000	0.000	0.000	0.000
7	0.135	0.221	0.079	0.207	102.135	0.135	0.221	0.079	0.207	102.135	0.000	0.000	0.000	0.000	0.000
8	0.143	0.260	0.144	0.217	101.143	0.143	0.260	0.144	0.217	101.143	0.000	0.000	0.000	0.000	0.000
9	0.144	0.000	0.000	0.000	100.144	0.144	0.000	0.000	0.000	100.144	0.000	0.000	0.000	0.000	0.000
10	0.039	0.081	-0.002	0.081	108.039	0.039	0.081	-0.002	0.081	108.039	0.000	0.000	0.000	0.000	0.000
11	0.061	0.108	-0.003	0.108	107.061	0.061	0.108	-0.003	0.108	107.061	0.000	0.000	0.000	0.000	0.000
12	0.079	0.127	-0.005	0.127	106.079	0.079	0.127	-0.005	0.127	106.079	0.000	0.000	0.000	0.000	0.000
13	0.130	0.129	-0.006	0.129	105.130	0.130	0.129	-0.006	0.129	105.130	0.000	0.000	0.000	0.000	0.000
14	0.049	0.061	0.000	0.061	104.049	0.049	0.061	0.000	0.061	104.049	0.000	0.000	0.000	0.000	0.000
15	0.099	0.148	0.000	0.148	103.099	0.099	0.148	0.000	0.148	103.099	0.000	0.000	0.000	0.000	0.000
16	0.130	0.179	0.003	0.179	102.130	0.130	0.179	0.003	0.179	102.130	0.000	0.000	0.000	0.000	0.000
17	0.144	0.192	-0.005	0.192	101.144	0.144	0.192	-0.005	0.192	101.144	0.000	0.000	0.000	0.000	0.000
18	0.144	0.000	0.000	0.000	100.144	0.144	0.000	0.000	0.000	100.144	0.000	0.000	0.000	0.000	0.000
19	0.045	0.126	-0.077	0.100	108.045	0.045	0.126	-0.077	0.100	108.045	0.000	0.000	0.000	0.000	0.000
20	0.067	0.139	-0.050	0.129	107.067	0.067	0.139	-0.050	0.129	107.067	0.000	0.000	0.000	0.000	0.000
21	0.084	0.159	-0.057	0.148	106.084	0.084	0.159	-0.057	0.148	106.084	0.000	0.000	0.000	0.000	0.000
22	0.134	0.271	-0.017	0.271	105.134	0.134	0.271	-0.017	0.271	105.134	0.000	0.000	0.000	0.000	0.000
23	0.170	0.265	-0.144	0.222	104.170	0.170	0.265	-0.144	0.222	104.170	0.000	0.000	0.000	0.000	0.000
24	0.123	0.212	-0.083	0.195	103.123	0.123	0.212	-0.083	0.195	103.123	0.000	0.000	0.000	0.000	0.000
25	0.129	0.241	-0.134	0.201	102.129	0.129	0.241	-0.134	0.201	102.129	0.000	0.000	0.000	0.000	0.000
26	0.146	0.228	-0.079	0.214	101.146	0.146	0.228	-0.079	0.214	101.146	0.000	0.000	0.000	0.000	0.000
27	0.128	0.000	0.000	0.000	100.128	0.128	0.000	0.000	0.000	100.128	0.000	0.000	0.000	0.000	0.000
28	0.031	0.094	0.054	0.077	108.031	0.031	0.094	0.054	0.077	108.031	0.000	0.000	0.000	0.000	0.000
29	0.044	0.124	0.074	0.099	107.044	0.044	0.124	0.074	0.099	107.044	0.000	0.000	0.000	0.000	0.000
30	0.056	0.142	0.085	0.114	106.056	0.056	0.142	0.085	0.114	106.056	0.000	0.000	0.000	0.000	0.000
31	0.089	0.207	0.011	0.207	105.089	0.089	0.207	0.011	0.207	105.089	0.000	0.000	0.000	0.000	0.000
32	0.115	0.200	0.108	0.168	104.115	0.115	0.200	0.108	0.168	104.115	0.000	0.000	0.000	0.000	0.000
33	0.082	0.161	0.062	0.149	103.082	0.082	0.161	0.062	0.149	103.082	0.000	0.000	0.000	0.000	0.000
34	0.085	0.183	0.102	0.152	102.085	0.085	0.183	0.102	0.152	102.085	0.000	0.000	0.000	0.000	0.000
35	0.094	0.196	0.109	0.163	101.094	0.094	0.196	0.109	0.163	101.094	0.000	0.000	0.000	0.000	0.000
36	0.111	0.000	0.000	0.000	100.111	0.111	0.000	0.000	0.000	100.111	0.000	0.000	0.000	0.000	0.000
37	0.030	0.068	0.000	0.068	108.030	0.030	0.068	0.000	0.068	108.030	0.000	0.000	0.000	0.000	0.000
38	0.040	0.082	0.002	0.082	107.040	0.040	0.082	0.002	0.082	107.040	0.000	0.000	0.000	0.000	0.000
39	0.052	0.096	0.003	0.096	106.052	0.052	0.096	0.003	0.096	106.052	0.000	0.000	0.000	0.000	0.000
40	0.086	0.098	0.004	0.098	105.086	0.086	0.098	0.004	0.098	105.086	0.000	0.000	0.000	0.000	0.000
41	0.033	0.047	0.000	0.047	104.033	0.033	0.047	0.000	0.047	104.033	0.000	0.000	0.000	0.000	0.000
42	0.064	0.111	0.000	0.111	103.064	0.064	0.111	0.000	0.111	103.064	0.000	0.000	0.000	0.000	0.000
43	0.086	0.136	0.000	0.136	102.086	0.086	0.136	0.000	0.136	102.086	0.000	0.000	0.000	0.000	0.000
44	0.094	0.145	0.000	0.145	101.094	0.094	0.145	0.000	0.145	101.094	0.000	0.000	0.000	0.000	0.000
45	0.094	0.000	0.000	0.000	100.094	0.094	0.000	0.000	0.000	100.094	0.000	0.000	0.000	0.000	0.000
46	0.030	0.091	-0.051	0.076	108.030	0.030	0.091	-0.051	0.076	108.030	0.000	0.000	0.000	0.000	0.000
47	0.039	0.109	-0.060	0.090	107.039	0.039	0.109	-0.060	0.090	107.039	0.000	0.000	0.000	0.000	0.000
48	0.051	0.128	-0.071	0.107	106.051	0.051	0.128	-0.071	0.107	106.051	0.000	0.000	0.000	0.000	0.000
49	0.079	0.181	0.000	0.181	105.079	0.079	0.181	0.000	0.181	105.079	0.000	0.000	0.000	0.000	0.000
50	0.214	0.319	0.000	0.319	104.214	0.214	0.319	0.000	0.319	104.214	0.000	0.000	0.000	0.000	0.000
51	0.093	0.174	-0.069	0.159	103.093	0.093	0.174	-0.069	0.159	103.093	0.000	0.000	0.000	0.000	0.000
52	0.089	0.168	-0.059	0.157	102.089	0.089	0.168	-0.059	0.157	102.089	0.000	0.000	0.000	0.000	0.000
53	0.094	0.196	-0.109	0.163	101.094	0.094	0.196	-0.109	0.163	101.094	0.000	0.000	0.000	0.000	0.000
54	0.094	0.000	0.000	0.000	100.094	0.094	0.000	0.000	0.000	100.094	0.000	0.000	0.000	0.000	0.000

Revisions, Enhancements and Bug Fixes to the FLO-2D Pro Model and Processor Programs Since October 1, 2012

Updated 12/26/19 (Most recent revisions are displayed in blue below.) Current Build: 19-07-21

Model revisions are tagged with a build number in the format:

YR.MM.BB

where:

YR is a two digit number of the year that major revisions were implemented (e.g. 12 for 2012);

MM is a two digit number of the month that major revisions were implemented (e.g. 10 for October);

BB is a two digit number that identifies the executable build. A change in the build number represents a significant bug fix or model revision. Build numbers are not changed for typos, minor revisions or enhancements.

For example, 12.10.02 indicates that the 2nd build (revised and recompiled) executable in October, 2012.

Build Numbers are revised when changes to the model engine code might affect flow hydraulics or results from either bug fixes or model enhancements. The most recent revisions are presented at the end of each model or processor program section with the highest item number.

FLO-2D Pro Model

Revisions and bug fixes in the FLO.EXE program include (most recent at the bottom):

1. The channel cross section flow depth computation for bankfull discharge was edited from a "less than" to a "less than or equal to" to avoid a potential error when the flow depth exactly matched the bankfull condition (10/26/12). Build No. 12-10-02.
2. The outflow node array allocations code was relocated to accommodate multiple outflow hydrograph conversion to inflow hydrographs. A deallocation statement was mislocated as a result. This is a fatal error that would terminate the model if no outflow nodes were assigned (10/29/12). Build No. 12.10.02.
3. A Green-Ampt infiltration bug was fixed for the volumetric soil moisture deficiency DTHETA. The volumetric soil moisture deficient was reverse with the general soil moisture deficient by multiplying by the porosity (11/12/12). Build No. 12.11.02.
4. A more robust assignment of the infiltration limiting soil depth was implemented to allow for grid elements with no limiting soil depth. Also the hydraulic conductivity adjustment parameter assignment was revised to allow for globally decreasing the spatially variable hydraulic conductivity (11/12/12). Build No. 12.11.02.
5. An error message to check for data in the SED.DAT file for mudflow bypass the read statement and no mudflow data was read by the model resulting in a water flood event even with high concentrations (11/26/12). Build No. 12.11.02.
6. Prescribed levee failure expansion to contiguous flow directions and grid elements was corrected. Originally this expansion as the breach grows was limited to breach scour and when it was revised for prescribed levee failure with horizontal and vertical failure rates, not all of the necessary switches were triggered to identify the expansion directions. The

levee failure reporting file (LEVEE.OUT) format was edited (11/29/12). Build No. 12.11.02.

7. Fixed a bug was associated with infiltration when the surface area was zero, there was an immediate volume conservation error (infinity) at the start of the simulation (12/6/12). Build No. 12.11.02.
8. SWMMQIN.OUT file was created to report the storm drain inlet discharge to the storm drain system and model (12/6/12). Build No. 12.11.02.
9. Following the implementation of the SWMMQIN.OUT file in the revision 8 above, it was noted that the wrong timestep was used to compute the discharge volume reported in SWMMQIN.OUT (12/20/12). Build No. 12.12.02.
10. The SWMMQIN.OUT file format was incorrect and not all the inlet discharge was being reported to file (1/21/13). Build No. 13.01.03.
11. The prescribed levee failure routine was edited to include submergence, variable weir coefficients and expansion of the levee breach opening to addition flow directions and grid elements (1/21/13). Build No. 13.01.03.
12. The levee overtopping component was expanded to included DOT submergence criteria that eliminate numerical surging as the headwater to tailwater equilibrium was approached (1/21/13). Build No. 13.01.03.
13. There was an error in the code for channel confluence connections from the right bank of the main channel. This resulted in a severe volume conservation error (1/21/13). Build No. 13.01.03.
14. The hydraulic structure component was expanded to include a better transition from downstream to upstream flow for rating tables that was based on the headwater to tailwater difference (1/21/13). Build No. 13.01.03.
15. An enhancement was made to assign outflow nodes that will generate an inflow hydrograph in the INFLOW.DAT file format to a downstream different grid system. The downstream grid system can be a different size than the upstream grid system but must have an overlapping row of grid elements (1/21/13). Build No. 13.01.03.
16. The generalized culvert equation routine was modified to account for flow equilibration and upstream flow through the levee. The culvert equations designed for inlet and outlet control assumes that the flow is only from upstream to downstream. The range of conditions involving when tailwater equals or exceeds the headwater are not adequately address by the equations. Based on the DOT criteria for using one of the five headwater to tailwater conditions and selecting a minimum discharge did not allow for a smooth transition of the discharge in an unsteady flow routing scenario. A submergence criteria was adopted to enable a smooth transition as the tailwater approached the headwater water surface elevation (1/21/13). Build No. 13.01.03.
17. The Pro Model did not write the CHAN.RGH and FPLAIN.RGH files because these file were replaced by TOPO.RGH and MANNINGSN.RGH. The Pro Model now writes these files, but it all four files should be replaced when using the limiting Froude numbers to adjust the n-values (1/25/13). Build No. 13.01.03.
18. The volume of the discharge hydrograph in HYCROSS.OUT was not being reported for metric units (1/30/13). Build No. 13.01.03.

19. A levee breach element variable was missing from the breach subroutine call. This was a fatal error and would stop the model from running a breach simulation (2/5/13). Build No. 13.02.04.
20. The Horton infiltration model was added. Now the infiltration model options are Green-Ampt, SCS curve number and Horton (2-25-13). Build No. 13.02.04.
21. Channel infiltration was significantly enhanced by the following changes Build No. 13.02.04.:
    - Channel infiltration can be limited by soil depth assignment.
    - Channel hydraulic conductivity can decay exponentially from an initial to a final value triggered by the wetting front reaching the limiting soil depth.
    - Channel hydraulic conductivity (initial and final), and limiting soil depth can be assigned by segment (or reach).
22. BATCH code was included to the PRO code (3/7/13). Build No. 13.02.04:
    - If BATCHCYCLE.DAT file is on the project folder and it contains the switch 'ON', summary dialog window will be skipped and the model will terminates without any User action. Multiple projects can be run by using the batch executable.
    - If BATCHCYCLE.DAT file is on the project folder and it contains the switch 'OFF'. Summary dialog window will be shown. Multiple projects cannot be runby using the batch executable.
    - If there is not a BATCHCYCLE.DAT file on the project folder then the Summary dialog window will be shown and the model termination requires a User action. Multiple projects cannot be run by using the batch executable.
23. The BASE.OUT file format was fixed for grid systems with more than 1 million elements (3/7/13). Build No. 13.02.04.
24. Hydraulic structure arrays INFLONOD and OUTFLONOD were initialized and set equal to zero (3/7/13). Build No. 13.02.04.
25. Levee breach discharge routine was revised to allow the prescribed breach element to discharge into another levee element (3/7/13). Build No. 13.02.04.
26. For the case where the channel can fit inside one grid element, a revision was made to allow floodplain flow exchange across the diagonal when a levee is assigned to the channel element in the center of three channel elements forming a 'L' (3/16/13). Build No. 13-02-04.
27. For a project with hydraulic structures with tailwater control and multiple channels (rill and gully flow), a typo was corrected to recognize the structure inlet flow depth (3/16/13). Build No. 13-02-04.
28. A reporting error in HYCHAN.OUT of the channel discharge and velocity was corrected (3/20/13). Build No. Build No. 13-02-04.
29. Revisions were made to the hydraulic structure routine to further eliminate potential surging when the structure rating curve or table does not match the upstream discharge. Numerical surging can occur when the rating table discharge exceeds the upstream discharge. In the physical system this is possible for a concrete box culvert or bridge with an apron if the flow accelerates through the structure, but numerically it occurs when the rating curve or table is based on underestimated structure roughness or entrance

conditions. The model will now automatically revise the rating table discharge as the headwater and tailwater surfaces equilibrate if the INOUTCONT parameter is set to 1. This is a revision as to how this parameter is used. Previously it was used for rating tables that were based on the difference between the headwater and tailwater (5/2/13). Build No. 13-07-05.

30. Modification to the hydraulic structure headwater flow depth computation was made for adverse bed slope, for velocity head to the structure, and for floodplain structure headwater to tailwater relationships. These revisions were made to reduce or eliminate the potential for numerical surging through the model when the discharge through the structure based on the rating table exceeds the upstream inflow to the structure. These revisions may result in a difference in the maximum flow depths, velocities and discharges when compared to previous models when numerical surging may have occurred (5/2/13). Build No. 13-07-05.
31. The HYDROSTUCT.OUT file was revised to report the average discharge over the output interval instead of the instantaneous discharge at the output interval. This was done to be consistent with the rest of the model reporting (5/2/13). Build No. 13-07-05.
32. Modified the reporting of the hydraulic structure velocities based on flow area for the current time step. These velocities are not used by the model because the discharge is computed directly from the rating curve or table (5/2/13). Build No. 13-07-05.
33. The TIMETOPEAK, TIMETOONEFT and TIMETWOFT output files are now reported when using the multiple channel (rill and gullies) component (5/2/13). Build No. 13-07-05.
34. A warning message for adverse bed slope through the hydraulic structure is now written to the ERROR.CHK file (5/2/13). Build No. 13-07-05.
35. Adjustments were made to the HSUBFACTOR coefficient increment for hydraulic structures that adjusts the rating table or curve discharge when the headwater and tailwater surface approach equilibrium. This was based on a sensitivity analysis (6/25/13). Build No. 13-07-05.
36. If adjustments are made to the hydraulic structure rating table during a simulation, the changes in the rating table pairs are written to the REVISED_ RATING_TABLES.OUT file. This enables the rating table to be adjusted for the next simulation (6/25/13). Build No. 13-07-05.
37. A warning message for an unreasonable rate of change in the discharge versus the rate of change in the stage (depth) for hydraulic structure rating tables is written to the ERROR.CHK file (6/25/13). Build No. 13-07-05.
38. Multiple outflow nodes can be designated to write the outflow hydrograph to the inflow nodes of a separate downstream model with different size grid elements. Inflow hydrographs for up to nine separate downstream grid system can be generated for a single simulation. The ID character O in the OUTFLOW.DAT file must be assigned O1, O2,...O9 (6/25/13). Build No. 13-07-05.
39. An error on the multiple outflow nodes feature was corrected. The error did not introduce any incorrect calculation but it was preventing the code from locating or assigning the upstream outflow hydrograph to the downstream grid element as an inflow for the case of a coarser upstream grid transferring outflow to downstream grid system (6/25/13). Build No. 13-07-05.

40. Modification of the ERROR.CHK file for the multiple outflow nodes feature. The upstream grid cell number is reported to the ERROR.CHK file along with a message when the upstream cell is dry during the total simulation and there is no outflow hydrograph that can be assigned to the downstream grid system (6/25/13). Build No. 13-07-05.
41. An ERROR.CHK warning message was implemented to check if the hydraulic structure discharge was greater than 1.5 times the inlet discharge. This identifies that the rating curve or table has been inappropriately assigned (6/25/13). Build No. 13-07-05.
42. Storm drain inlet discharge volume must be greater than the existing volume on the grid element (depth-TOL) x surface area to initiate inflow to the storm drain (6/25/13). Build No. 13-07-05.
43. Warning messages are written to ERROR.CHK for hydraulic structures were added to identify component conflicts with ARF values, inflow and outflow nodes, streets, and channels. Hydraulic structure inflow and outflow elements that repeated in HYSTRUC.DAT are identified in the ERROR.CHK file (6/25/13). Build No. 13-07-05.
44. The floodplain to channel hydraulic structure warning messages was fixed to identify adverse slope (6/25/13). Build No. 13-07-05.
45. The limiting discharge capacity from multiple hydraulic structure inlets to an individual outlet (D-line in HYSTRUC.DAT) was revised with an expanded array allocation (6/25/13). Build No. 13-07-05.
46. The reporting format for large grid element numbers in CROSSQ.OUT file was increased (6/25/13). Build No. 13-07-05.
47. A revision was made to assign the instantaneous levee failure width as either the grid element side or the assigned maximum failure width (6/25/13). Build No. 13-07-05.
48. Corrected an error in the reference elevation computation for hydraulic structure flow depth. The bed elevation was used instead of the water surface elevation (6/25/13). Build No. 13-07-05.
49. Corrected an error in the conversion of metric units for the SWMM component (6/25/13). Build No. 13-07-05.
50. A switch was added to activate and deactivate a SWMM node's ponding feature. The ponding variable changes from 0 to 1 depending on the comparison between the FLO-2D water surface elevation and SWMM pressure head. If the switch is activated, the node volume is changed from return flow volume into full volume and overflow is set to 0 (6/25/13). Build No. 13-07-05.
51. A revision was made to allow return flow from the storm drain to the surface water when the storm drain system capacity is exceeded or the pipe pressure exceeds the surface water elevation and the storm drain inlet overflows (6/25/13). Build No. 13-07-05.
52. SWMMQIN.OUT file was modified to report the discharge that flows into and out of a storm drain inlet. This is discharge computed by the FLO-2D to the SWMM model inlets. The SWMM.rpt file includes the pipe inflow and outflow at a junction (6/25/13). Build No. 13-07-05.
53. Mass balance on the SUMMARY.OUT file was modified to report the total volume that flows into and out of the storm drain. The volume remaining in the storm drain system is also reported (6/25/13). Build No. 13-07-05.

54. Added storm drain flapgate option to simulate outfalls with a gate that stops the flow from entering the storm drain system through the outfall. The SWMMFLO.DAT file was modified to include a new variable FLAPGATE (column 8). This variable has the value of 0 (off - default) or 1 (ON) that activate the flap gate in the outflow nodes (6/25/13). Build No. 13-07-05.
55. Added rating table options (INTYPE=4) to the SWMM storm drain method as a new type of inlet condition. SWMMFLORT.DAT is open/read when inlet type 4 are defined in the storm drain system. The file contains the rating table for all inlets type 4. (6/25/13). Build No. 13-07-05.
56. SWMM error code is now reported to the ERROR.CHK file (FLO-2D file) (6/25/13). Build No. 13-07-05.
57. A dam breach erosion variable assignment error was fixed that precluded the BREACH.OUT file from being populated (7/31/13) Build No. 13-07-05.
58. Levee breach expansion for prescribed breach failures was improved (7/31/13) Build No. 13-07-05.
59. To eliminate the numerical stability issues with grid element evacuation at shallow flows for very small TOL value, the code was revised to redistribute the discharge out of a grid element when evacuation occurs (7/31/13) Build No. 13-07-05.
60. Follow-up with revision 59 for very small TOL values, the TOL value was hardwired to 0.1 ft (0.03 m) for channel flow, bank elements, hydraulic structure and levee overtopping (8/24/13) Build No. 13-07-05.
61. When hydraulic structure inflow and outflow nodes are assigned to contiguous grid elements with a levee on the side joining the inflow and outflow elements, if the levee fails, the hydraulic structure is turned off regardless of the type of prescribed levee failure (instantaneous, with time duration, or horizontal rate of failure (8/24/13) Build No. 13-07-05.
62. An improvement was made permit instantaneous levee breach failures to revert to overland flow instead of broad crest weir flow. This revision will predict wall failure discharge more accurately and eliminate potential surging (8/24/13) Build No. 13-07-05.
63. The hydraulic structure rating table revisions are written to file. The number of revisions was reduced by changing the incremental depth variation (8/24/13) Build No. 13-07-05.
64. Error messages were added to identify levees assigned against boundary elements and in outflow nodes (9/7/13) Build No. 13-07-05.
65. Two potential array zero assignments were fixed for checking the channel interior elements (9/7/13) Build No. 13-07-05.
66. A levee instantaneous failure variable was inadvertently added to the levee overtopping routine. This cause was fatal error if no levee failure mode was on (9/7/13) Build No. 13-07-05.
67. The rainfall depth area reduction factors were incorrectly assigned to interior channel elements that were wider than two elements. This may cause a minor volume conservation error (9/7/13) Build No. 13-07-05.
68. A debug file can be generated with all the hydraulic information for a specific grid element for each computational timestep. The output data includes timestep, depth, velocity, water surface elevation, discharge in eight direction, n-value, Froude number,

hydraulic structure discharge, and levee overtopping. To create the DEBUG.OUT file, the DEBUG.DAT must be prepared. This file is one-line with four data entries space delimited containing: grid element, start time and end time (hrs), and floodplain, channel or street switch (1,2 or 3 respectively) (9/7/13) Build No. 13-07-05.

69. A long culvert bug was fixed. The discharge variable was not initialized in the correct location (9/7/13) Build No. 13-07-05.
70. The channel can now terminate on the alluvial fan or floodplain with flow exchange from all the channel end grid elements. If the channel bank elements at the end of the channel are separate by one or more elements, all the elements between the banks and the bank elements will discharge to the floodplain (9/7/13) Build No. 13-07-05.
71. An error message will be generated if a time-stage element has a bed elevation that is higher than the specified stage (9/7/13) Build No. 13-07-05.
72. To further reduce numerical instability for bridge hydraulic structures, an option was incorporated into the hydraulic structure routine to shut off the rating table for flow depths less than 1 ft (0.3 m) or when the SUBFACTOR is less than 0.02 (nearly equal tailwater and headwater surfaces). The hydraulic structure inflow and outflow nodes must be contiguous. To activate this option, set the culvert length parameter CLENGTH = 1.0 while the culvert diameter CDIAMETER = 0. (9/7/13) Build No. 13-07-05.
73. An error was found in the assignment of the flow width for 8-direction WRF values. The Pro model WRF values in ARF.DAT were expanded from 4-directions to 8-directions. The computation of the flow width for one or more of the directions could be in error due to an error in the array index variable. This could affect some of the diagonal flow direction velocities (11/13/13). Build No. 13-11-06.
74. The error messages were expanded in ERROR.CHK for reading the SWMMFLO.DAT file (11/13/13). Build No. 13-11-06.
75. A channel array parameter allocation was expanded to for the side connectivity. This was a fatal error (11/13/13). Build No. 13-11-06.
76. The hydraulic structure routine had two RETURN commands that should have been CYCLE commands. These bugs were introduced in bug fix 72 above. This caused the hydraulic structure routine to generate completely garbage data in some cases (12/17/13). Build No. 13-11-06.
77. The channel terminating on the floodplain using all the elements between the left and right banks had a conflict with the confluences and need to be expanded for channel segments joined by hydraulic structures (12/17/13). Build No. 13-11-06.
78. The SWMM storm drain model interface was enhanced to include: street and channel inlet exchange, outfall node discharge to channel and default grid element elevation to the rim elevation assigned in the SWMM.inp file (01/10/14). Build No. 13-11-06.
79. New output files were created to report results during runtime. FPRIMELEV.OUT reports the floodplain elevation, the rim elevation, the comparison between them and the new floodplain elevation. (01/10/14). Build No. 13-11-06.
80. New output files were created to report results during runtime. SWMMOUTFIN.OUT reports the outfall discharges from SWMM to FLO-2D. (01/10/14). Build No. 13-11-06.

81. New output files were created to report results during runtime. CHVOLUME.OUT reports the OUTFLOW TO SWMM and the INFLOW FROM SWMM for an outfall that discharges to a channel grid. (01/10/14). Build No. 13-11-06.
82. New Errors are written to the error.chk file: Multiple inlets to a grid. (01/10/14).). Build No. 13-11-06.
83. First line of the SWMMFLO.dat (path) was eliminated. The model automatically searches for the swmm data files on the FLO-2D project folder. (01/10/14).). Build No. 13-11-06.
84. Notation of coordinates in TOPO.DAT was expanded to make room for larger coordinates (01/16/14).). Build No. 13-11-06.
85. The code was modified to read the new SWMFLO.DAT that contains the name of the junctions defined in the INP file. (02/19/14). Build No. 13-11-06.
86. The channel terminating on the floodplain using all the elements between the left and right banks were revised (02/19/14). Build No. 13-11-06
87. An incorrectly assigned index was found on the SWMM reporting subroutine output_saveNodeResults (02/19/14). Build No. 13-11-06.
88. The error messages were expanded in ERROR.CHK for reading the SWMMFLO.DAT file with SWMM ID for Inlets (02/19/14). Build No. 13-11-06.
89. The error messages were expanded in ERROR.CHK to report a warning message for those inlets that have different datum for FLO-2D and SWMM (floodplain and invert elevations) (02/19/14). Build No. 13-11-06.
90. The error messages were expanded in ERROR.CHK to report a warning message for the invert elevation of the outfall (02/19/14). Build No. 13-11-06.
91. The error messages were expanded in ERROR.CHK to report multiple storm drain inlets to a single FLO-2D grid cell (02/19/14). Build No. 13-11-06.
92. The channel termination routine was further revised (see revision 70 above) to facilitate the flow distribution out of the internal channel elements to the floodplain at the end of a channel without a channel outflow node. The floodplain elevation in the channel end exchange elevation was reset to the channel bed elevation. A document describing the channel termination methodology is available (3/10/14). Build No. 14-03-07.
93. The prescribed dam and levee breach routine was improved to include submergence by downstream ponding. In the case where the breach discharge fills a bermed, leveed area or confined area, the breach discharge is reduced when the tailwater submerges breach from having free overfall. The breach weir discharge computation reverts to overland floodplain flow through the breach when the ratio of tailwater to headwater is 0.9 (3/10/14). Build No. 14-03-07.
94. The horizontal breach rate for the prescribed levee breach routine was assigned a decay function. When the vertical breach failure reaches the foundation beach elevation, the maximum shear stress is computed. Subsequently, the horizontal breach rate is computed as the original horizontal breach rate multiplied by the ratio of the breach shear stress to the maximum shear stress. The shear ratio is also set to zero (i.e. the horizontal breach rate is zero) if the breach velocity is less than 3 fps (1 mps) (3/10/14). Build No. 14-03-07.

95. A TIME.OUT file sorting bug was fixed and the TIME.OUT file reporting is correct (3/10/14). Build No. 14-03-07.
96. The warning message for levees assigned to the boundary was turned off. If a levee is assigned along a boundary, the model ignores it (3/10/14). Build No. 14-03-07.
97. The numerical stability was improved for street routing component for shallow flow. This will reduce the frequency of timestep decrements for shallow street flow (3/10/14). Build No. 14-03-07.
98. Rainfall runoff from buildings using the IRAINBUILDING switch in RAIN.DAT was enhanced. When IRAINBUILDING = 1, the n-values within the building for all the ARF = 1 elements are set to 0.03. The water surface elevations outside the building are ignored when computing the discharge from the building elements to the nodes outside the building. The TOL value inside the buildings is minimize to a value of 0.03 ft (0.01 m) to enhance building runoff (3/10/14). Build No. 14-03-07.
99. A revision was made to the floodplain outflow nodes elevations. When the outflow node elevation is greater than the contiguous upstream grid element elevations, the slope between the contiguous upstream element and then next upstream element is computed and the outflow node elevation is adjusted using that computed slope. If the criteria for a slope adjustment is not met, then the outflow node is assigned an elevation 0.1 ft (0.03 m) lower than the lowest contiguous upstream element (3/14/14). Build No. 14-03-07.
100. The breach output file TIMEONEFT.OUT was not reporting the channel times when the corresponding floodplain element was not inundated (4/18/14). Build No. 14.03.07.
101. The prescribed levee and dam horizontal breach rate is set to zero for a velocity less than 3 fps that is based on the breach discharge. The local side discharge was incorrectly used instead of the total breach discharge and was corrected (4/27/14). Build No. 14.03.07.
102. A warning message was implemented for the condition where the infiltration initial abstraction exceeds the TOL value for the depression storage (4/27/14). Build No. 14.03.07.
103. The channel confluence variable array assignment was expanded. The array size was limited to the number of channel segments. This was expanded by 50 for a project with numerous confluences and split flows that exceeded the number of segments. (4/27/14). Build No. 14.03.07.
104. A new output file was generated to provide additional dam breach timing data as follows:

Node X-coord Y-coord Floodwave Arrival Time Flood Time Peak Time Deflood Time Max WS

Where:

Floodwave Arrival Time: Time in hours from when the breach discharge exceeds 0.01 cfs or cms to when the floodplain grid element flow depth exceeds 0.1 ft or 0.3 m.

Flood Time: Time (hrs) from when the breach discharge exceeds 0.01 (cfs or cms) to when a given grid element flow depth exceeds 0.5 ft or 0.15 m on the floodplain.

Peak Time: Time (hrs) from when the breach discharge exceeds 0.01 (cfs or cms) to when a given grid element flow depth reaches a maximum depth.

Deflood Time: Time (hrs) from when the flood arrives at a grid element (flow depth exceeds 0.5 ft or 0.15m) to the time when the flood recedes to a depth lower than 0.5 ft or 0.15 m.

Max WS: The maximum water surface for a given floodplain grid element is reported.

105. A mathematical typo (.EQ.1 instead of .EQ.2) was discovered that caused the hydraulic structure option INOUTCONT = 2 for upstream flow through structure to be by-passed (6/12/14). Build No. 14.03.07.
106. An incorrectly assigned index was found on an array on the SWMM DISCHARGE subroutine that recalculates the total volume accumulated since the last SWMM Timestep. In those cases the flow depth was not getting correctly updated and the volume that leaves the FLO-2D grid cell and passes to SWMM was not subtracted. This behavior was observed only for large projects (06/12/14). Build No. 14-07-08.
107. Existing error messages are expanded and new messages are created in ERROR.CHK for FLO-2D SWMM Integrated model (06/12/14). Build No. 14-07-08.
108. Model stops and report a message when: (06/12/14). Build No. 14-07-08
    - More than one storm drain inlet assign to a single cell
    - Simulation times between FLO-2D and SWMM are not compatible
109. SWMM inlet flow depths for the dynamic wave are passed through FLO-2D SWMM interface for comparison with FLO-2D flow depths at inlet grid cells (06/12/14). Build No. 14-07-08
110. Surcharge depth assigned in the SWMMFLO.DAT file are passed through the FLO-2D SWMM interface and assigned to the corresponding inlet node in SWMM. Both models were modified to be able to calculate the time when the manhole cover is popped and then the manhole can receive inflow and outflow (return flow to the surface) (06/12/14). Build No. 14-07-08.
111. The Storm Drain Totals were updated on the SUMMARY.OUT file. The storm drain volumes were being incorrectly reported for some isolated simulations (06/12/14). Build No. 14-07-08.
112. Additional Output files are written when the "Time Lapse Output" switch is activated as follow:
    - ITIMTEP:0, No output results are written to the TIMDEP File
    - ITIMTEP:1, Only TIMDEP.OUT file is written
    - ITIMTEP:2, TIMDEP.OUT and HDF5 files are written
    - ITIMTEP:3, TIMDEP.OUT and NETCDF4 files are written
    - ITIMTEP:4, All output files are written. (06/12/14). Build No. 14-07-08
113. For levee instantaneous failure, the flow hydraulics after failure were not using the base elevation and n-value of the overland flow. The switch for instantaneous failure was not used in all subroutines (8/2/2014). Build No. 14-07-08.
114. Formatting for the SUPER.OUT file was enhanced. Only the 100 first channel elements are now written (8/2/2014). Build No. 14-07-08.
115. Simulation time is automatically pass from FLO-2D (SIMUL variable in CONT.DAT) to the storm drain engine (11/4/2014). Build No. 14-11-09.
116. Ending time and date of the storm drain simulation (End Analysis On in the *.inp file) is being automatically calculated based on the SIMUL time from the CON.DAT file (11/4/2014). Build No. 14-11-09.
117. Outfall elevation can be set lower than the ground. If the FLO-2D model has ponded flows covering an outfall invert, the WSEL can be assigned as a ground elevation and

will represent initial head to the outfall. This head is always present during the simulation. During the simulation water may be added to either the outfall grid element surface water or the upstream storm drain pipe and the pipe flow can go in either direction based on the head comparison (11/4/2014). Build No. 14-11-09.

118. A volume conservation error was generated for the condition when the outfall is higher the floodplain or channel bed. The outfall received water into the storm drain when the WSEL is greater than the invert. In addition, the evacuation of the grid element water volume above the invert was possible if the inflow discharge to the outfall exceeded the available volume. This error was fixed (11/4/2014). Build No. 14-11-09.
119. A warning message was added for those culverts assigned the generalized culvert equation that had a zero culvert length in the HYSTRUC.DAT file (11/4/2014). Build No. 14-11-09.
120. A warning message was added for those natural channel cross sections with rating tables having less than 10 stations in the cross section. If a rectangular or trapezoidal channel geometry is being simulated, use the appropriate prescribed geometry instead of the natural channel geometry to preserve accuracy (11/4/2014). Build No. 14-11-09.
121. The option for a hydraulic structure to share discharge from a channel element to the floodplain element using a rating table or the generalized culvert equations was created. This finalizes all the possible hydraulic structure combinations of floodplain to floodplain, channel to channel, floodplain to channel and channel to floodplain (11/4/2014). Build No. 14-11-09.
122. For rainfall on buildings, downspout discharge can be computed using a hydraulic structure rating table. The hydraulic structure will connect the roof (floodplain element) to the ground (floodplain element). Water will shared between grid elements when it exceeds the TOL value. Roof parapet walls can be assigned using the levee component on the outside of the building elements. Flow can overtop the parapet walls (11/4/2014). Build No. 14-11-09.
123. The channel can be terminated on the floodplain without a channel outflow node. The channel interior elements and the bank elements will share discharge with the next downstream floodplain element. The interior channel element grid element elevation should be set to the thalweg elevations and the downstream floodplain elevations should be lower than the end of the channel thalweg elevation (11/4/2014). Build No. 14-11-09.
124. The assignment of interior channel elements between the two bank elements in a very large channel with small elements was not correct. Some interior channel elements were being missed. The algorithm for selecting the interior channel elements was revised (11/4/2014). Build No. 14-11-09.
125. For a project with many roadway, levee or other embankments, the LEVOVERTOP.OUT was getting too large and was taking hours to reformat. The levee overtopping discharge output was limited to selected levee elements in LEVEE.DAT. The selection is based on assigning a negative value to a levee element. Only those negative levee elements in LEVEE.DAT will have output data written to the LEVOVERTOP.OUT file (11/4/2014). Build No. 14-11-09.
126. An error in the multiple channel infiltration routine was discovered. Several lines of code were duplicated thereby double accounting the multiple channel infiltration (11/4/2014). Build No. 14-11-09.

127. Fix a channel infiltration error for limiting flow depth. The infiltration was ceased for global limiting soil depth if no individual spatially variable channel limiting soils depth were not assigned (11/2/14). Build No. 14-11-09.
128. An improvement was made to the IMPACT.OUT and SPECENERGY.OUT files. The maximum impact pressure and specific energy were based on the maximum velocity and the corresponding flow depth when the maximum velocity occurred. While this is fine almost all of the time, it was noted that there are some instances during a frontal wave progression that the maximum velocity may occur with a shallow depth. The correct was to compare the maximum impact pressure and specific energy for each timestep regardless of when the maximum velocity occurred (12/09/14). Build No. 14-11-09.
129. Spatially variable tolerance was created. TOLSPATIAL.DAT file can be created from the updated GDS. (12/09/14). Build No. 14-11-09.
130. A line was fixed for the initialization of the variable that carry the discharge of hydraulic structures when the Hydraulic structure is not equal to IFPORCHAN(I) = 3. (01/08/15). Build No. 14-11-09.
131. A portion of the SCS infiltration code was left out of the most recent compilation of the model because some routines were moved around to improve the organization of the code. This resulted in a major volume conservation error at the start of the SCS model. (01/12/15). Build No. 14-11-09.
132. Several code revisions were necessary to enable the general culvert equations to correctly predict upstream flow through the culvert when the tailwater surface elevation exceeded the headwater elevation. These revisions include a check for negative numbers in the routine, revision to the variable names for upstream flow and sign direction for upstream flow through the culvert. (01/21/15). Build No. 14-11-09.
133. The *'channel extension through the levee'* error messaging statement was bypassed with a recent update. This revision re-instates the levee and channel conflict testing. (01/23/15). Build No. 14-11-09.
134. Items were updated in the Summary.out report file (2/17/15). Build No. 15.02.10.
135. New alluvial channel avulsion routine. This new component for alluvial fans predicts potential multiple channel avulsion and new path based on channel overtopping flows, steepest flow path, width and depth channel geometry relationships (02/20/15). Build No. 15.02.10.
136. Fixed spikes for the storm drain inlets where oscillations in the hydrograph were observed (2/20/15). Build No. 15.02.10.
137. Adjustments were made to the general culvert equations for outlet control criteria. The flow depth criteria was adjusted to eliminate overlap between partial submergences and full pipe flow outlet control (2/23/15). Build No. 15-02-10.
138. The error messages for the right bank extension were revised and updated (2/23/15). Build No. 15.02.10.
139. The spatially variable TOL code was (Revision 129 above) modified to make sure that the assigned TOL value matched the appropriate grid element (and its neighbor) (2/23/15). Build No. 15.02.10.
140. The overland shallow flow n-value was hardwired to 0.1 for flow depths less than 0.1 ft (0.03 m) and an n-value of 0.05 or less (2/23/15). Build No. 15.02.10.

141. A modification was made for shallow flow volume conservation. If the volume out of the grid element exceeds the storage plus inflow volumes, the grid element volume is set to zero and the outflow is redistributed to the neighbor grid elements. This computation was modified to limit the adjustment to only the outflow directions (2/23/15). Build No. 15.02.10.
142. Error.chk file was edited and errors were reviewed and simplified. (3/20/15). Build No. 15.05.11.
143. Multiple assignments of 'channel to floodplain' hydraulic structures in the same data file (HYSTRUC.DAT) caused a volume conservation error related to summation of structure volume diverted from the channel. This was corrected with an appropriate identification of the hydraulic structure in the channel. (3/27/15). Build No. 15.05.11.
144. ITIMDEP criteria was changed to (3/27/15 - Build No. 15.05.11):
    0 = no TIMDEP file is written.
    1 = timdep.out
    2 = hdf5 binary output
    3 = NetCDF binary output
    4 = ALL
145. The wetted perimeter for the channel natural cross section geometry overbank flow was adjusted. This was not increasing with increased flow depth over the top of banks (4/20/2015). Build No. 15.07.12.
146. A new file (EVACUATEDCHAN.OUT) to report the complete evacuation of channel volume for shallow flow during channel stability assessments was added (4/20/2015). Build No. 15.07.12.
147. The sediment distribution in the trapezoidal channel and the resultant modified channel geometry for scour/deposition was revised in the sediment transport routine (4/20/2015). Build No. 15.07.12.
148. Code was added to limit bank channel bank scour (4/20/2015). Build No. 15.07.12.
149. The reporting of the sediment transport volume conservation in SUMMARY.OUT was expanded to include final channel sediment storage (4/20/2015). Build No. 15.07.12.
150. Calculation of convective/local terms was adjusted for the main channel in confluence elements (4/27/2015). Build No. 15.07.12.
151. The project folder and path is written to the FLO-2D runtime window status bar at the bottom of the screen (4/27/2015). Build No. 15.07.12.
152. The CHVOLUME.OUT column header labels and format for metric was edited (4/27/2015). Build No. 15.07.12.
153. The SUMMARY.OUT file was modified to enable a detailed comparison of the exchange volumes between the surface water flooding and the storm drain (5/4/2015) Build No. 15.07.12. The revisions to the SUMMARY.OUT file include exchange volumes with the Storm Drain component were divided into four categories:
    - ✓ Storm Drain Inflow - inflow through inlets and outfalls.
    - ✓ Storm Drain Outflow - discharge outflow back to the surface water through outfalls and the discharge outflow off the storm drain system.

- ✓ Return Flow - Storm Drain discharge to the surface water through inlets plus the inlet ponded flow that re-enters the storm drain system when storage capacity is available.
- ✓ The following volumes are extracted directly from the SWMM.rpt file and written to SUMMARY.OUT for comparison:
  - WET WEATHER INFLOW - The inflow to the storm drain system through inlets and outfalls.
  - EXTERNAL INFLOW – The direct inflow to the storm drain system from external sources.
  - EXTERNAL OUTFLOW - The total outflow that leaves the storm drain system.
  - Total Storm Drain Storage – Includes all the storm drain volume storage in nodes and links.
  - Continuity error – Volume conservation error internal to the storm drain engine.

154. The channel floodplain exchange routine was revised to have a minimum n-value of 0.065 for the channel bank element overland flow. This was required to avoid automated assignment of very low street n-values to the channel bank elements where the overbank velocities are typically low (5/5/2015). Build No. 15.07.12.
155. Additional criteria was added for the assignment of the floodplain elevation in comparison to the channel top of bank element elevation. Originally, if the channel top of bank elevation is different from the floodplain elevation for the bank element by more than 1.0 ft, the floodplain elevation is reset to the channel top of bank elevation. For small grid elements this can be a significant slope for overbank discharge. A slope calculation has been implemented. If the slope between the top of bank and the floodplain exceeds one percent (0.01), the model reassigns the floodplain elevation to the top of bank. This represents a 0.2 ft difference for a 20 ft grid element (5/5/2015). Build No. 15.07.12.
156. A building collapse routine was added to the model. By assigning negative ARF-values for either totally or partially blocked elements in ARF.DAT, the removal of buildings during the flood event can be simulated when velocity and depth criteria for the collapse of the buildings is exceeded (5/5/2015). Build No. 15.07.12.
157. Uniform flow in the storm drain inlet hydrograph were observed when the orifice equation was used. The discharge was reset to zero for some orifice conditions and generated spikes in the inlets. Changes were also requires in the VC2005-CON to fix this issue (5/5/2015). Build No. 15.07.12.
158. Additional Output files are written when the "Time Lapse Output" switch is activated as follow:
    - ITIMTEP: 0, no output results are written to the TIMDEP File
    - ITIMTEP: 1, only TIMDEP.OUT file is written
    - ITIMTEP: 2, only the TIMDEP in HDF5 binary format is written
    - ITIMTEP: 3, only the TIMDEP file for the creation of the NETCDF4 file is written

- ITIMTEP: 4, All output files are written.
- ITIMTEP: 5, TIMDEPCELL.OUT (ASCII FILE) is created for only those cells list in TIMDEPCELL.DAT file (05/20/15). Build No. 15.07.12

159. New error messages have been added or enhanced for the FLO-2D Storm Drain component (05/25/15). Build No. 15.07.12:
    - THERE IS AN OUTFLOW NODE AND A STORM DRAIN INLET ASSIGNED TO GRID CELL.
    - THERE IS AN OUTFLOW NODE AND A STORM DRAIN OUTFALL ASSIGNED TO GRID CELL.
    - THERE IS AN INFLOW NODE AND A STORM DRAIN INLET ASSIGNED TO GRID CELL.
    - THERE IS AN INFLOW NODE AND A STORM DRAIN OUTFALL ASSIGNED TO GRID CELL.
    - THERE IS A LEVEE AND A STORM DRAIN INLET ASSIGNED TO GRID CELL.
    - THERE IS A LEVEE AND A STORM DRAIN OUTFALL ASSIGNED TO GRID CELL.
    - THERE IS A STORM DRAIN INLET OR OUTFALL ASSIGNED TO COMPLETELY BLOCKED GRID CELL.
    - THERE IS A HYDRAULIC STRUCTURE AND A STORM DRAIN INLET ASSIGNED TO GRID CELL.
    - THERE IS A HYDRAULIC STRUCTURE AND A STORM DRAIN OUTFALL ASSIGNED TO GRID CELL.
    - MULTIPLE INLETS ASSIGNED TO ONE GRID CELL.
    - CELLS ASSIGNED TO ONE INLET.
    - THE GRID ELEMENT FLOODPLAIN OR STREET ELEVATIONS WERE REVISED DURING THE SIMULATION TO THE STORM DRAIN INLET RIM ELEVATIONS FOR THE FOLLOWING GRID ELEMENTS (PLEASE REVIEW AND REVISE FPRIMELEV.OUT FILE IF NECESSARY).
    - THE TYPE 4 STORM DRAIN INLET ELEVATIONS ARE DIFFERENT THAN THE GRID ELEMENT FLOODPLAIN ELEVATIONS. NO ACTION WAS TAKEN DURING THE SIMULATION. PLEASE REVIEW AND REVISE IF NECESSARY.
    - NOTE: THE STORM DRAIN OUTFALL INVERT ELEVATION SHOULD BE EQUAL TO OR GREATER THAN THE FLOODPLAIN/CHANNEL/STREET ELEVATION. NO ACTION IS TAKEN. PLEASE REVIEW AND REVISE IF NECESSARY. THE MODEL WILL NOT TERMINATE DUE TO THIS WARNING.
    - THERE ARE A MISSING OR INAPPROPIATE STORM DRAIN INLET GEOMETRY IN FILE.
    - REVIEW STORM DRAIN INLET: ',A25,' DRAIN TYPE: ',i5,' ON GRID CELL: ',I10,' ERROR.
    - THERE ARE STORM DRAIN INLETS ON CHANNEL GRID ELEMENTS, THE CHANNEL BED ELEVATION IS DIFFERENT THAN THE INVERT ELEVATION. NO ACTION WAS TAKEN DURING THE SIMULATION. PLEASE REVIEW AND REVISE IF NECESSARY.
    - GRID ELEMENT (FLOODPLAIN SWALES) WERE REVISED DURING THE SIMULATION TO THE STORM DRAIN INLET INVERT ELEVATIONS FOR THE FOLLOWING GRIDS (PLEASE REVIEW AND REVISE FPRIMELEV.OUT FILE IF NECESSARY).
    - THE TYPE 5 (MANHOLE) STORM DRAIN INLET ELEVATIONS ARE DIFFERENT THAN THE GRID ELEMENT FLOODPLAIN ELEVATIONS. NO ACTION WAS TAKEN DURING THE SIMULATION. PLEASE REVIEW AND REVISE IF NECESSARY.
    - VERTICAL INLET OPENING ON A 1D CHANNEL WITH STORM DRAIN INLET INVERT ELEVATION DIFFERENT THAN THE GRID ELEMENT FLOODPLAIN ELEVATIONS. NO ACTION WAS TAKEN DURING THE SIMULATION. PLEASE REVIEW AND REVISE IF NECESSARY.
    - NOTE: Inlet on a 1-D channel end of segment where the channel flow is discharging to the storm drain pipe, the invert elevation should be channel bed elevation.
    - NOTE: Floodplain swale where the flow is discharging to a storm drain pipe or culvert, the invert elevation should be equal to the grid element floodplain elevation.
    - THE FOLLOWING STORM DRAIN OUTFALL NODES ARE IN CHANNEL INTERIOR ELEMENTS, RE-ASSIGN TO THE CHANNEL ELEMENTS IN CHAN.DAT.
160. Build versions are now being compared between FLO-2D engine and VC2005-CON engine for version discrepancies. (06/05/15). Build No. 15-07-12.

161. Channel (CHAN.DAT) data input subroutine has been updated to fix an issue when bank elevation was less than 1 ft. (06/12/15). Build No. 15.07.12.
162. Storm Drain data (SWMMFLO.DAT) data input subroutine was updated to use a less demanding algorithm and includes all previous versions of the files. (06/12/15). Build No. 15.07.12.
163. An inconsistency in the transfer of parameters between the FLO-2D surface layer and the storm drain component was identified. This produces zero flow been routed in the storm drain system for some conditions in metrics. (06/05/15). Build No. 15-07-12.
164. Free outfalls and underground free outfalls in the storm drain system were reviewed to hold the FLO-2D boundary condition (WSE) for all cases. (06/05/15). Build No. 15-07-12.
165. Channel flow area reporting to the HYCHAN.OUT was corrected for trapezoidal and rectangular channels when various channel geometries were mixed together in the same channel segment (06/07/15). Build No. 15-07-12.
166. Channel routing solution algorithm was revised to improve the following:
    - ✓ Confluence momentum terms.
    - ✓ Velocity prediction if the solution algorithm does converge.
    - ✓ Seed velocity estimate (smoothed out difference between the predictor and diffusive wave estimate.
    - ✓ A new output file (CHANNEL_CONVERGENCE.OUT) was created to list the channel element, simulation, and various computed velocities used when the solution did not convergence. This is an indicator of potential channel surging elements that can be reviewed.

These changes resulting in the ability to increase the Courant number and maintain numerical stability (06/07/15). Build No. 15-07-12.

167. In SUMMARY.OUT an extra line of output was added to report the area of inundation for depths greater than 0.5 ft (0.15 m) (06/07/15). Build No. 15-07-12.
168. The levee breach expansion into other grid elements was corrected for the case of multiple prescribed breaches. The reporting in LEVEE.OUT had to be corrected also (06/07/15). Build No. 15-07-12.
169. The simplified storm drain routine for the hydraulic structures where multiple inflow nodes can outlet to the same outflow node was modified to allow the outflow collector node to discharge to a channel. This is unrelated to the FLO-2D storm drain component (10/22/15). Build No. 15-10-13.
170. A new output file, CHAN_INTERIOR_NODES.OUT (file number 263) was created to identify those floodplain elements that are internal to the channel to be identified for mapping purposes (10/22/15). Build No. 15-10-13.
171. Reading the channel data for the variable geometry power regression relationships was fixed. The read code with channel bank elevations was distorted with the INTEL compiler (10/22/15). Build No. 15-10-13.
172. The calculation that accumulates the inflow volume, than then is passed through the Storm Drain inlets, was review to make sure volumes match exactly between surface and storm drain layers. (10/22/15). Build No. 15-10-13.

173. Storm Drain Inflow was dampened and three different dampen calculations were imposed to reduce inflow oscillations at inlets. (10/22/15). Build No. 15-10-13.
174. The California Office of Emergency Service Dam Breach reporting times was revised for the Flood Time definition. The criteria was increased from 0.5 ft (0.15 m) to 2.0 (0.61 m). The Flood Time definition actually only applied to channel flow and some criteria was selected for floodplain flooding. This corresponds to time to two ft criteria that is typical for dam breach mapping. (11/19/15). Build No. 15-10-13.
175. Reporting to OVERBANK.OUT file was altered to reflect only the overbank volume and surface area in the grid element (11/19/15). Build No. 15-10-13.
176. The channel bank elevations were initialized to zero for CHAN.DAT files without bank elevations. This eliminates the potential for assigning random numbers to the bank elevation arrays if the data is not read but assigned automatically (11/19/15). Build No. 15-10-13.
177. The channel termination on floodplain (without outflow nodes) routine was revised to eliminate errors introduced when setting the internal channel elements at the end of the channels for more than one channel segment. The routine was simplified to better identify the channel elements sharing with the floodplain at the end of a channel segment (1/11/16). Build No. 15-10-13.
178. Reporting the multiple channel maximum water surface elevations was corrected. The maximum water surface elevation in MAXWSELEV.OUT and TIMDEP.OUT was in error because the multiple channel depth was subtracted twice from the water surface elevation for these two files (1/11/16). Build No. 15-10-13.
179. Channel termination on floodplain routine (see 177 above) still had problems. One problem was that the channel segments that terminated with a hydraulic structure or a confluence were not correctly addressed when the improvements were added in early January (1/27/16). Build No. 15-10-13.
180. The floodplain overland flow in 8-directions timestep incrementing/decrementing routine was improved. When the Courant number is exceeded, the model now resets the timestep to the computed Courant number timestep. In addition, the rate of change in the timestep increment was adjusted (2/22/16). Build No. 16-02-14.
181. Supercritical flow reporting in SUPER.OUT was revised. The file now reports a summary of all the channel and floodplain supercritical flow in the model at the end of the simulation and resorts the data based on the Froude number in descending order. This file can be used in conjunction with VELTIMEFP.OUT and TIME.OUT to adjust unreasonable velocities and n-values in the model (2/22/16). Build No. 16-02-14.
182. The dam breach erosion expansion routine was adjusted to report the expansion discharge based on the ratio of breach width within a given grid element to the total breach width. This is now similar to the prescribed breach width expansion routine (2/22/16). Build No. 16-02-14.
183. The floodplain cross section reporting was improved. The reported average cross section velocity was based on the discharge divided by the average flow depth and grid element width. The width was the grid element size. This method of reporting enables the user to evaluate the discharge by multiplying the average velocity, flow depth and width in the HYCROSS.OUT file. For one grid element and potential flow direction, however, the flow width should be the flow direction width not the grid element width. For the case of

a single grid element in the cross section, the average cross section velocity was being under-reported (2/22/16). Build No. 16-02-14.

184. The natural cross section routine was revised to vertically extend the lowest bank elevation to the higher bank elevation at runtime. This eliminated the potential for having an exceedingly low bank with a very small flow area. This will be similar to the HEC-RAS assessment of channel cross sections. It will not significantly change the potential for overbank discharge exchange with the floodplain. It will only increase the flow area for channel hydraulic computations (3/28/16). Build No. 16-02-14.

185. Two new output files are generated (3/28/16):

     DEPRESSED_ELEMENTS.OUT - This file is generated at the end of the data input at runtime. Every grid element elevation is checked with its neighbors' elevations to see if it is depressed based on a minimum difference of the DEPRESSDEPTH variable which replaces the ISUPER switch in CONT.DAT. A value of DEPRESSDEPTH = 3.0 ft is suggested. This depth will ignore minor small depression elements which can fill and overview.

     LOW_LEVEE_CREST_ELEVATIONS.OUT - . Having a levee represent a wall that is only 0.1 ft above the ground is pointless. This condition could occur because of shape file elevation assignments or the grid element interpolation. The same variable DEPRESSDEPTH in the ISUPER variable position in CONT.DAT is used to evaluate the minimum difference in the levee crest elevations compared to the ground elevation on both sides of the levee. If used with DEPRESSED_ELEMENTS.OUT, the DEPRESSDEPTH variable either has to be the same value or two separate independent simulations are required for different values (use SIMUL = 0.1 or 0.01 hrs for each). If you used the DEPRESSDEPTH = 3.0 ft (or higher) to generate the depressed elements, the DEPRESSED_ELEMENTS.OUT file could be renamed and DEPRESSDEPTH reassigned to 1.0 ft (or lower) to generate LOW_LEVEE_CREST_ELEVATIONS.OUT file. Build No. 16-02-14.

186. An error in the box culvert switch for the generalized culvert equations was fixed. A full culvert flow inlet condition was being ignored with this error (3/28/16). Build No. 16-02-14.

187. The generalized culvert equation routine was not reporting upstream flow if the hydraulic structure connecting two channel segments was separated by more than one channel element. The code was modified to identify the correct upstream flow condition when the tailwater exceeded the headwater for separated channel elements. The same modification also enable the tributary confluence upstream flow to be reported in the HYCHAN.OUT file (3/28/16). Build No. 16-02-14.

188. The hydraulic structure floodplain to channel criteria to have the flow moving upstream in the channel to reverse flow with higher tailwater than headwater was considered unnecessary and removed. The flow through the hydraulic structure from downstream to upstream will depend solely on water surface elevation not momentum for the floodplain to channel option (3/30/16). Build No. 16-02-14.

189. StormDrain_ERROR.CHK file was created to report storm drain errors and warning messages. The storm drain error and warning messages were removed from the ERROR.CHK file (3/30/16). Build No. 16-02-14.

190. Existing errors and warnings for the storm drain system were reviewed and some warnings/errors were expanded. Modifications were implemented in those error/ warnings related to conflicts between storm drain features and surface components as well as the outfall elevations checks (3/30/16). Build No. 16-02-14.
191. AVVELRES array for the subroutine that calculates the cross sectional analysis was initialized and set equal to zero (3/30/16). Build No. 16-02-14.
192. A new data file was implemented to enable the building collapse routine to be initiated. Building collapse is now based on three structure vulnerability curves (4/6/16). Build No. 16-02-14.
193. Calculation of mudflow velocities were ignored when recent improvements were made to the overland routing model. It was necessary to revise the mudflow velocity computation to include recent advancements to speed up the model (4/22/16). Build No. 16-02-14.
194. An error reading trapezoidal channel data at the end of a segment when the initial depth for next channel segment was non-zero was fixed (5/21/16). Build No. 16-02-14.
195. The TIMDEP.OUT file was revised to include a zero time output interval with all zeros for all reported values, so that the various plots made this file have an initial zero starting point. Previously, the first set of reported data was the first nonzero output interval (5/21/16). Build No. 16-02-14.
196. The FLO-2D surface water engine runtime speed has been enhanced with OpenMP code for sharing the computation workload between multiple processors. This is an on-going effort to reduce the model runtimes. The first expansion has focused on the overland flow loops since it is the most computation expensive loop in the model. The model runtime has been reduced by about 50% over the previous build (6/27/16). Build No. 16-06-15.
197. Prior to the implementation of the OpenMP code, the computation algorithm and timestep incrementing/decrementing scheme was improved. Computational algorithm enhancements involved adjustments to initial solution velocity estimate and changes to the default solution when the full momentum equation solution did not converge. The solution to the floodplain and channel routing algorithms was revised to improve the following:
    - ✓ The timestep decrement was reduced to the Courant criteria timestep when the stability criteria was not met. This reduced the number of timestep decrements and sped up the model.
    - ✓ The timestep accelerator function and default value was modified (see below).
    - ✓ Seed velocity estimate was adjusted and the difference between the predictor and diffusive wave estimate was smoothed out.
    - ✓ The predicted velocity was modified if the solution algorithm did not converge.
    - ✓ Two new output files were created (CHANNEL_CONVERGENCE.OUT and FLOODPLAIN_CONVERGENCE.OUT) that list the channel or floodplain element, simulation time, and the various computed intermediate velocities used when the solution did not convergence. This is an indicator of potential surging elements that can be reviewed.

The incremental rate of change in the timestep parameter (TIME_ACCEL) was adjusted and the default value was changed from 0.1 to 1.0. A higher TIME_ACCEL parameter will result in larger timestep increments. When the computational timestep is less than 1.0 second and a simulation timestep loop was successfully completed without exceeding the stability criteria, the timestep is incremented by the TIME_ACCEL (default 1.0) x 0.001. So if the timestep was 0.5, then next timestep would be increased to 0.501 seconds. If the timestep is greater than 1 second, then the timestep increment is:

$$DSEC = DSEC + TIME\_ACCEL*0.0085/XFAST$$

where:

DSEC = computational timestep in seconds

TIME_ACCEL = user defined accelerator parameter ranging from 0.1 to 10.0 with a default of 1.0

XFAST = XFAST + 0.001 for each successfully completed timestep loop when DSEC > 1.0 second. XFAST resets to 1.0 each time the DSEC timestep is decremented.

198. This algorithm increases the timestep uniformly until the timestep DSEC is greater than 1 second. When DSEC > 1.0, successive increases in DSEC result in a larger values of XFAST which begins to slow down the timestep rate of change. The maximum timestep is limited to 30 seconds (6/27/16). Build No. 16-06-15.

NOTE: It is necessary to reset TIME_ACCEL = 1. in the TOLER.DAT file for most existing models. This is accomplished automatically at runtime if TIME_ACCEL = 0.1 when a new simulation is initiated. See updated revision 328 comment.

199. Following a recent change in the channel bank surface area computation, the floodplain surface area in the channel bank elements was being over estimated for trapezoidal channel on diagonal flow directions when the channel extension was 2 grid elements or more (6/29/16). Build No. 16-06-15.

200. A recent bug was fixed. The conversion to Open MP code included a number of revisions from a REAL number to a DOUBLE PRECISION number for the routing parameters. In a few code locations, other variables that computed with the new double precision numbers must also be converted from real to double precisions. Data transfer across subroutines will be in error when mixing the two formats causing the model to blow up (6/29/16). Build No. 16-06-15.

201. The channel wetted perimeter computation for overbank flow was incorrect for the revised natural cross section vertical extension of the lowest bank elevation to the higher bank elevation at runtime (7/13/16). Build No. 16-06-15.

202. The dam breach reporting criteria was revised to better conform with the California Office of Emergency Services requirements that the deflood time is the time elapsed from the initial failure of the dam until the measured location returns to its preflood water elevation prior to failure (7/13/16). Build No. 16-06-15.

203. New volumes are reported in the SUMMARY.OUT file (7/15/16). Build No. 16-06-15.

STORM DRAIN SYSTEM STORAGE: Storage volume in the pipe system at the end of the simulation.

STORM DRAIN MASS BALANCE: Mass balance volume conservation calculated as:
Total Inflow - Total Outflow + System Storage

204. Depth area reduction factors RAINARF can now be applied to the spatially and temporally variable rainfall component for NEXRAD data. To accomplish this, simply add the RAINARF data to the RAIN.DAT file with the IRAINREAL switch on as follows (8/8/16) Build No. 16-06-15:

In RAIN.DAT line 1, set IRAINREAL = 1, and IRAINBUILDING = 0 or 1
Line 2: RTT = 0, RAINABS = 0, IRAINARF =1, MOVINGSTORM = 0
Line 3 to the end: IRGRID(IJ), RAINARF(IRGRID(IJ))

205. Several dam breach erosion bugs were corrected. The most important error was some of the subroutine transfer parameters were out of order. This error was imposed with the new OpenMP code. It resulted in no breach discharge being computed. A couple of minor bugs included the sediment gradation for fines in a small breach was over-estimated and the pipe roughness term was being reset to zero (7/13/16). Build No. 16-06-15.

206. The floodplain element between separated right bank elements when the channel consisted of two elements (just left and right bank elements) was not properly identified with the channel interior elements and sharing discharge across the channel from the left bank element to this floodplain element occurred. This problem was resolved by designating this floodplain element as an interior channel element (8/14/16). Build No. 16-06-15.

207. Several output files text format was revised including EVACUATEDCHAN.OUT, CHANNEL _CONVERGENCE.OUT, and DEPRESSED_ELEMENTS.OUT (8/23/16). Build No. 16-06-15.

208. Two new output files were created. The EVACUATEDFP.OUT reports floodplain elements that have the volume completed removed for one timestep because the outflow to the element exceeds the inflow resulting in a redistribution of the 8-direction discharge to eliminate the potential for any negative volumes being reported. The second file DAMBREACH_VOLUME.OUT reports the volume associated with dam breach discharge as function of output interval (8/23/16). Build No. 16-06-15.

209. HYDRAULIC STRUCTURE_RUNTIME WARNINGS.OUT file was expanded to include messages that were originally in the ERROR.CHK file (8/23/16). Build No. 16-06-15.

210. An error message was implemented to identify that the user is not in a folder with a CONT.DAT file (8/23/16). Build No. 16-06-15.

211. For channels that terminate on the floodplain without a channel outflow node, a code revision was made to avoid completely evacuating the channel volume in the last channel element when only rainfall is the inflow to the channel resulting in very shallow depths. This will eliminate potential minor volume conservation errors that result from more water being shared to the floodplain than is in the channel (8/28/16). Build No. 16-06-15.

212. The hydraulic structure routing option for upstream flow was revised for when water becomes ponded around the outlet node and there is no inflow velocity to the outflow node. Without inflow velocity, there was no upstream flow through the hydraulic structure even though the outflow node water surface elevation exceeded the upstream water surface elevation. The code was revised to allow upstream flow for the tailwater control condition (INOUTCONT=2) when the water surface is higher in outflow nodes neighbor elements with a lower bed elevation (8/28/16). Build No. 16-06-16.

213. For the various flood reporting files such as time to peak, time to one foot, time to two foot, time to flooding and deflood time, there are two cases that have been separated: no level or dam breach, and breaching. If there is a levee or dam breach, the start time for the flooding parameters will be based on time of breach. If there is only typical flooding with no dam or levee breach, then the start will be the start of the model at hour 0.0. If there are flood inflows to the model with a dam breach, the areas flooded outside of the dam breach area of inundation will be reported in the time to flooding files if they exceed the maximum depth after the breach. There is no way to separate normal flooding from the breach flooding. For reservoirs with a starting water surface the initial depth elements are excluded from the time to flooding files (9/15/16). Build No. 16-06-16.

214. Two automated Manning's n-value adjustments are now turned off if AMANN = -99 (CONT.DAT) that is the switch for turning off the floodplain depth variable n-values. These included flood routing algorithm non-convergence n-values increases and n-value adjustments for overbank flow exchange Froude numbers that exceed 0.5 (9/15/16). Build No. 16-06-16.

215. The Horton infiltration method when combined with multiple channels generated a Fortran error for a non-initialized array associated with Green-Ampt impervious areas. This was corrected by identifying the infiltration method with the multiple channel option activated (9/19/16). Build No. 16-06-16.

216. A distinction has been made for the start times of the Time to 1 ft and Time to 2 ft for levee and dam breach models. Some parties wanted the start time to be the model time start time of 0.0 hrs, others wanted the levee or dam breach initiation time to be the start time. This is complicated if there is multiple levee or dam breaches or if there are inflow hydrographs or rainfall not associated with a dam breach. There can only be one start time for a time to one ft or two ft of depth and the distinction between flows mixing from multiple breaches or from an inflow flood hydrograph with a breach hydrograph as to which flow contributes to the one ft or two ft is impossible. If you want the time to one ft or two to be based on the model start time, there are no data file changes. If you want the start time to one ft or two ft to be based on the levee or dam breach time, then it

necessary to revise one variable depending on prescribed breach or breach erosion as follows:

For prescribed breach if FAILTIM < 0.0 (e.g -1.0 or -25.4) , the start time will be based on the dam breach. If FAILTIM = 0. (fails immediately) and the start time is to be based on the dam or levee breach time, assign FAILTIM = -99.0 and FAILTIM is reset to 0. Otherwise, the FAILTIM is greater than or equal to 0.0 hr, the start time to 1 ft or 2 ft is the start time of the model (0.0 hr).

For breach erosion: The same approach...if GBREACHTIME = 0 or a positive time, the start time is the model start time (0.0 hr). If GBREACHTIME is less than 0.0, then the start time is the first dam or levee breach time. If GBREACHTIME = -99.0, the start time is the dam or levee breach time but GBREACHTIME reverts to 0.0. (9/19/16). Build No. 16-06-16.

217. Several 1-D street routing/floodplain flow exchange errors were introduced with the channel termination code that were fatal and caused volume conservation. These were fixed by further separating the channel and street code. (10/2/16). Build No. 16-06-16.

218. A sort routine bug was introduced in the output reporting code. This was a fatal error that failed to exit a do loop and stopped the model from completing writing the output data to file (10/7/16). Build No. 16-06-16.

219. A flag error in the building rainfall runoff routine was identified that stopped the roof rainfall from routing. This error was the result of array indexing and resulting in no roof runoff when the IRAINBUILDING switch was activated (10/7/16). Build No. 16-06-16.

220. The building collapse routine was modified by using a different collapse equation for higher velocities and depths as suggested by the research team (10/15/16). Build No. 16-06-16.

221. The breach erosion routine had an error for the breach topwidth calculation. When the breach bottom width exceeded the maximum bottom width, the equation computed only the incremental value not the total topwidth plus the incremental increase (10/15/16). Build No. 16-06-16.

222. The Time for One Foot Depth and the Time for Two Feet Depth had a writing issue when the breach routine is activated in the code. The calculated time was reported on a range between 0 and 0.10 hrs independently of the time of simulation (10/16/16). Build No. 16-06-16.

223. A revision to the temporal output was made. The TIMDEP.OUT ASCII file is created for all ITIMTEP options from 1 to 4. See Data Input Manual page 34 for more details. The option ITIMTEP= 3 now writes two files: TIMEDEP.OUT and NETCDF4 files (10/26/16). Build No. 16-06-16.

224. The outflow nodes list in OUTFLOW.DAT are no longer written in the DEPRESSED_ELEMENTS.OUT file (10/26/16). Build No. 16-06-16.

225. An reporting error in ROUGH.OUT was corrected involving the initialization of the maximum Manning's n-value array (10/26/16). Build No. 16-06-16.

226. An error in the DAMBREACH_VOLUME.OUT file was fixed. The FLO-2D code was writing the total breached volume to this file for every successful timestep and every breach element direction. The code was changed to write the volume only once for all breached elements and only for the output interval not the timesteps (10/26/16). Build No. 16-06-16.

227. A comment was added to the SD ManholePopUp.OUT file to clarify the Pop Off Pressure Head (PH) reported in the file and how it compares to the PH reported in the SWMM.RPT. The new comment is: Pop Off Pressure Head is an instantaneous head that removes the manhole cover. This pressure head can be different to the reported pressure head in the SWMM.RPT file (10/26/16). Build No. 16-06-16.

228. An Open MP code 'CRITICAL' statement was removed from the rainfall subroutine call in the overland flow routing algorithm. This 'CRITICAL' statement appreciably slowed down the model (3 times slower) and was implemented one month ago because of an array index conflict. The conflict was removed by renaming the INDEX parameter (10/27/16). Build No. 16-06-16.

229. The building collapse routine was revised to use the maximum velocity on the grid element contiguous to the building element instead of the directional velocity (11/13/16). Build No. 16-06-16.

230. The discharge and velocity for hydraulic structure connecting channel elements was being erroneously reported in HYCHAN.OUT as negative instead of positive (11/13/16). Build No. 16-06-16.

231. The mudflow algorithm channel variables were re-assigned to double precision numbers to match other code revisions for OpenMP (11/13/16). Build No. 16-06-16.

232. The sort routines for reporting the output in VELTIMEFP.OUT, ROUGH.OUT and SUPER.OUT in descending order was limited to only the top 100 elements to reduce the time required prepare the output files (11/21/16). Build No. 16-06-16.

233. Similar to the channel termination on the floodplain, inflow to the channel can now be exchanged from the floodplain to the channel interior elements. Overland flow will enter the upstream end of the channel. The floodplain elements connected to the channel should have an elevation that reflects the channel thalweg (11/27/16). Build No. 16-06-16.

234. For levee failure the time to peak was not being written to the output file (11/28/16). Build No. 16-06-16.

235. The BASE.OUT file is no longer generated unless the summary output parameter NOPRTFP is not equal to 2 in the CONT.DAT file. The BASE.OUT file can be huge and most of the information is extraneous and is not used graphically. Similarly levee overtopping flow reporting to the LEVOVERTOP.OUT now requires that the levee grid element number in line L of the LEVEE.DAT file be assigned as negative number. Each

levee element to be reported in the LEVOVERTOP.OUT must be assigned as a negative number. The breach levee elements in LEVEE.OUT are now reported individually as a hydrograph in XXXX_LEVEE.OUT where XXXX is the failed levee element (12/27/16). Build No. 16-06-16.

236. Three reporting errors were fixed. 1. There was no data output in HYCROSS.OUT due to recent change to optional output to BASE.OUT. 2. HYCHAN.OUT was reporting a -1000.0 maximum stage when the levee failure component was assigned due to the recent change in dam failure start time. 3. The recently added DAMBREACH_VOLUME.OUT was reporting cubic feet instead of acre-ft (12/2/16). Build No. 16-06-16.

237. Rainfall depth area reduction values (RAINARF values) can now be applied to the spatially varied rainfall component for NEXRAD rainfall data (IRAINREAL option). Line 2 in RAIN.DAT is required for this to assign the IRAINARF = 1. If no rainfall depth area reduction is being simulated then line 2 is optional (12/8/16). Build No. 16-06-16.

238. There were multiple errors in the coding of the Toffaleti sediment transport equation that were fixed. This was primarily due to the errors in the reference. Multiple references were consulted to re-derive and check the coding (12/16/16). Build No. 16-06-16.

239. The TIMETOPEAK was not being reported with levee prescribed breach failure for any grid elements because a trigger was being reset to initiate the start time for tracking the time to peak (12/16/16). Build No. 16-06-16.

240. A compilation error was resolved that created severe volume conservation errors at the outset of a realtime (NEXRAD) rainfall simulation (12/27/16). Build No. 16-06-16.

241. The sediment transport code was re-organized for the Open MP code and several errors in the Toffaleti equations were corrected (12/27/16). Build No. 16-06-16.

242. The levee failure code was reviewed and a minor bug in the index of IXLABEL array was fixed in the numerical routine. This bug can produce a crash in the FORTRAN routine for some specific levee failure cases (1/15/16). Build No. 16-06-16.

243. The initialization of the RAINARF arrays was fixed (1/9/17). Build No. 16.06.16.

244. An error message was added for turning of the channel ICHANNEL = 0 and leaving channel inflow hydrographs (C-lines) in the INFLOW.DAT file (1/10/17). Build No. 16.06.16.

245. The start time for dam and levee breaches reporting for time to 1 ft was adjusted (1/13/17). Build No. 16.06.16.

246. Individual levee or dam breach discharge hydrographs are reported to output files with the name GRID ELEMENT NO_LEVEE.OUT (e.g. 2345_LEVEE.OUT) to facilitate review of the breach discharge originally reported in LEVEE.OUT for all grid elements (1/13/17). Build No. 16.06.16.

247. A new binary LEVEE.HDF5 output file is written for levee failure. The following variables are written for each grid direction (1 to 8) and for the output failure time (01/15/17, Build No. 16.06.16):

- Grid Element
- Breach Elevation
- Water Surface Elevation
- Discharge
- Failure Width
- Total Q

248. A revision to the temporal output was made, the TIMDEP NETCDF4 file and TIMDEPCELL.OUT were reviewed, the variables were reorganized. The Output files that are written when the "Time Lapse Output" switch is activated are:

- ITIMTEP: 0, no output results are written to the TIMDEP File
- ITIMTEP: 1, only TIMDEP.OUT file is written
- ITIMTEP: 2, only the TIMDEP in HDF5 binary format is written
- ITIMTEP: 3, only the TIMDEP file for the creation of the NETCDF4 file is written
- ITIMTEP: 4, All output files are written.
- ITIMTEP: 5, TIMDEPCELL.OUT (ASCII FILE) is created for only those cells listed in TIMDEPCELL.DAT file (01/20/17). Build No. 16.06.16

249. The sort routine for the ROUGH.OUT, SUPER.OUT and VELTIME.OUT files was revised to speed up the reporting (1/23/17). Build No. 16.06.16.

250. Sediment routing by size fractions was improved with several bug fixes, automated scour depth limitation around inflow and outflow nodes (1/23/17). Build No. 16.06.16.

251. Fixed a bug in the levee discharge file name for item 245 above (2/3/17). Build No. 16.06.16.

252. Revisions were made to the levee overtopping weir flow including weir coefficient adjustments, bugs in the OpenMP code parameter assignment, and a modification to headwater to tailwater assessment for submergence (2/24/17). Build No. 16.06.16.

253. A new starting computational timestep of 5 seconds instead of 1 second was assigned except for a model with a starting reservoir water surface elevation (2/24/17). Build No. 16.06.16.

254. Reporting for dam or levee breach overtopping output file initialization was modified. A missing parameter in the call statement for the pipe breach subroutine was added (2/24/17). Build No. 16.06.16.

255. A significant redesign of read code for the channel geometry power regression relationship was implemented. Bank elevations cannot be assigned in the range of -0.5 ft to 0.5 ft above sea level. (2/24/17). Build No. 16.06.16.

256. Some OpenMP code was implement for parameter initialization, array assignment and file plotting (2/24/17). Build No. 16.06.16.

257. Channel flow assessment depth for the Courant number stability parameter was revised and a modification was added to channel limiting Froude number Manning's n-value increment (2/24/17). Build No. 16.06.16.

258. FLO-2D compares the rim elevation with the grid element elevation and reports the differences in the FPRIMELEV.OUT. If the rim elevation and floodplain elevations are different, the model reassigns the floodplain elevation to the rim elevation based on the assumption that the rim elevation was surveyed and the grid element elevation was interpolated. The model uses the rim elevation as the reference to determine the water surface elevation and inlet flow depth. The revised bed or floodplain elevations are not reported in the FPLAIN.DAT file. These are only modified at runtime and reported to FPRIMELEV.OUT file. For the floodplain revisions, the user must review the FPRIMELEV.OUT and adjust the elevations in FPLAIN.DAT to match the modifications in the FPRIMELEV.OUT. Two new files are written FPLAIN_SDElev.RGH and TOPO_SDElev.RGH, these files contains the elevation changes from the FPRIMELEV.OUT file. They should replace the FPLAIN.DAT and TOPO.DAT files when using a Storm Drain system to adjust the surface elevation. RIM elevations for the inlets located in channel or street cells are not checked and must be verified by the user (1/25/16). Build No. 16-06-16.

259. The total inflow volume summation was edited for the rainfall on buildings (4/27/17). Build No. 16-06-16.

260. A new output file PRESCRIBED_BREACH Q.OUT reports the prescribed levee and dam breach failure discharge by output interval (5/2/17). Build No. 16-06-16.

261. The sediment transport incipient motion criteria using the Shield's diagram was updated to include the revisions made by Gessler in the Simons and Senturk (1976) book <u>Sediment Transport Technology</u>. The minimum Shields parameter was set to 0.03. The critical shear stress parameter in MPM Smart sediment transport equation and in the dam breach piping erosion was also adjusted. (5/9/17). Build No. 16-06-16.

262. Channel interior nodes (grid elements inside the 1-D channel bank elements that do not exchange flow with the floodplain elements) can be read and edited from the CHAN_INTERIOR_NODES.DAT file. If this file exists the model will read it first before identifying any additional interior nodes that may be missed. This file can be created by renaming the CHAN_INTERIOR_NODES.OUT file that is created with the initial simulation. The purpose of this file is to add any missing interior elements that the model may miss at runtime because the channel is very wide and the size of the grid elements is small resulting in numerous interior elements. In this situation, sharp bends and numerous extensions into a single right bank element may result in some interior elements being missed along the right bank. The missing elements can be added to the CHAN_INTERIOR_NODES.DAT file (6/8/17). Build No. 16-06-16.

263. The hydraulic structure submergence criteria was adjusted for tailwater to headwater ratio greater than 0.8 to limit the submergence factor to 1 percent (6/21/17). Build No. 16-06-16.

264. For dam breach erosion, one foot (0.3 m) had been added to the dam foundation as the lower limit of the vertical scour. This was an arbitrary observation that most dams do not scour uniformly to bedrock but leave an irregular surface with some core material. The 1 ft increment was removed to provide the use with ultimate control over the bed erosion limit (7/7/17). Build No. 17-08-17.

265. An error was corrected for the building collapse component the width was initially reset to the WRF value after building collapse and this was revised to the side width of the grid element (7/11/17). Build No. 17-08-17.

266. Several changes were made to the reservoir routing for dam breach. The first revision was to assign an n-value of 0.25 to all reservoir elements assigned by using a reservoir water surface elevation in INFLOW.DAT. If the starting reservoir surface elevation is assigned as a negative value, a deadpool is identified that includes all the reservoir grid elements with bed elevations below the dam breach foundation (limiting scour elevation) assigned by the base elevation in the dam breach element. The deadpool is then eliminated from the reservoir routing. The reservoir flow depths are based on the deadpool elevation and the reservoir will not drain lower than the breach foundation elevation. This reduces the reservoir flow depths for the routing algorithm.

Two additional files are created: TOPO_RES.BAC and MANNING_N_RES.BAC. These files have the new reservoir n-values and deadpool topography and the revisions can be made permanent by renaming these files to TOPO.DAT and MANNINGS_N.DAT and by deleting the FPLAIN.DAT file which will be recreated with the next simulation automatically.

Finally, the reservoir routing algorithm was revised. Instead of using Manning’s equation in its original form, the equation was revised so that the depth or hydraulic radius exponent is computed as a function of the flow depth and slope:

$$V = 1.486/n \; \text{depth}^{\text{exp}} \; S^{1/2}$$

where: exp = 0.5 - 0.0004 * depth - 30.0 * water surface slope

This results in a depth average velocity on the order of 0.1 to 1.0 fps (0.03 to 0.3 mps) for depths over 20 ft (6.7 m). This equation is based on observations of reservoir surveys and from personal experience (7/13/17). Build No. 17-08-17.

267. The shallow n-value roughness can be spatially variable by simply creating a SHALLOWN_SPATIAL.DAT file with grid element number a shallow n for those grid elements with a shallow n-value that is different from the global SHALLOWN value assigned in the CONT.DAT file. Spatially variable SHALLOWN values will be useful when assigning flow over streets and parking lots.

For the 1-D channel component, the shallow n-values are assigned by channel segment using the ROUGHADJ variable. The channel segment SHALLOWN value is the global SHALLOWN assigned in CONT.DAT unless the ROUGHADJ is assigned as the fourth variable in line 1 of the CHAN.DAT file for each segment. If ROUGHADJ is assigned then SHALLOWN = ROUGHADJ/2.0. (7/13/17). Build No. 17-08-17.

268. A file DAMBREACH_VOLUME.OUT was created to report the total volume of the breach discharge for the dam breach erosion component (7/13/17). Build No. 17-08-17.

269. Adjustments were made to the dam breach channel slope computation through the dam to account for the size of the core. The dam breach submergence criteria was also modified to limit the submergence factor to 0.01. Finally, the distribution of the sediment scour in the breach was edited to allow the user to control the removal of the sediment to the breach channel bed or sides of the trapezoidal channel by adjusting the BRATIO parameter. The higher the BRATIO variable, the faster the breach width expands and the slower the vertical rate of erosion. A typical value of BRATIO is 1.5 and general range for this parameter is 0.5 to 4.0 (7/13/17). Build No. 17-08-17.

270. An error was found in the Mudflow routing component related to the model OpenMP code implementation. Several variables were did not have a correct array assignment and viscous flows behaved like water. The parameters in question were initially globally assigned but to enable parallel processing, they had to be locally assigned to be distributed to the processors simultaneously and couple associated with the viscosity and yield stress were missed (10/13/17). Build No. 17-08-17.

271. The roof runoff was based on an artificial head of at least 0.5 ft above the exterior building ground elevation. This head criteria was changed to 0.5 ft above the exterior building water surface elevation in case water is ponded against the building. With this revision 0.5 ft (0.167 m) is added to the water surface elevation (if any) on the grid elements contiguous to the building to ensure rainfall runoff from the roof when the IRAINBUILDING switch in 'on' (11/15/17). Build No. 17-08-17.

272. The building collapse routine did not reset the flow width correctly and the flow wasn't going through the building after the collapse (1/24/18). Build No. 18-01-18.

273. A new street gutter flow option was implemented that enables the flow to be routed in a cross section defined by the curb height and a 2% street cross slope. This option is only available for floodplain elements that represent the street. It is not an option for the 1-D street routing component. To activate this option it is only necessary to create the GUTTER.DAT file in the project folder. There is a street gutter white paper that describes the option and the required data file (1/26.18). Build No. 18-01-18.

274. The obsolete numerical stability parameter WAVEMAX in TOLER.DAT was removed (1/26/18). Build No. 18-01-18.

275. A minimum n-value of 0.065 is automatically assigned to reservoir elements (1/26/18). Build No. 18-01-18.

276. The LEVEE.OUT file format was edited (1/26/18). Build No. 18-01-18.

277. A number of subroutines were separated from the main program and OpenMP was implemented for some new loops. This will speed up the model for most large projects (1/26/18). Build No. 18-01-18.

278. A sediment concentration output variable was added to the outflow node discharge output file OUTNQ.OUT (1/26/18). Build No. 18.01.18.

279. A warning message was added for the condition when a hydraulic structure headwater depth exceeds the maximum assigned rating table stage. This results in a constant discharge for the duration that the maximum stage value is exceeded (2/13/18). Build No. 18.01.18.

280. A recently implemented error in a channel termination variable was discovered because no discharge was leaving the channel interior elements. All the channel flow was exchanged with the floodplain through the two channel bank elements (2/25/18). Build No. 18.01.18.

281. Zeros are no longer required in the RAINCELL.DAT file for NEXRAD real storm event simulations. The GDS and QGIS pre-processor programs will not write zeros to this file when interpolating the NEXRAD pixels or ASCII format real rainfall data to the FLO-2D grid elements. This will make the file significantly smaller (3/5/18). Build No. 18.01.18.

282. The NOEXCHANGE channel floodplain option was eliminated. NOEXCHANGE elements in CHAN.DAT disabled the channel floodplain discharge sharing for those elements. The routine became obsolete when the culvert component was developed. Previously it was used to model channel reaches that went underground (3/5.18). Build No. 18.01.18.

283. A minor reporting error in HYCROSS.F90 related to double precision numbers was fixed so that the maximum discharge correctly reflects the output interval discharge (3/5/18). Build No. 18.01.18.

284. The starting computation timestep was reset from 5 seconds to 1 second after initially increasing it to 5 seconds last year. It was discovered on some projects with very steep frontal wave flood that the 5 seconds timestep was too large and caused initial volume conservation errors (3/5/18). Build No. 18.01.18.

285. For the case where a hydraulic structure diverts water from one channel to another separate channel (not part of the same channel), a switch was needed to identify that the flow in each channel continues downstream of the hydraulic structure. The hydraulic structure switch for joining two channel segments is to assign (IFPORCHAN = 1) as a negative value (-1) in the S-Line of HYSTRUC.DAT (3/19/18). Build No. 18.01.18.

286. Edits to the OMP code removed some conflicts that caused racing or minor variation in some variables. This eliminated differences in the results for multiple simulations using the same data files and executable (3/19/18). Build No. 18.01.18.

287. A bug was fixed for hydraulic structures that joined channel elements separated by more than one grid element in the 6 to 8 flow directions. The local direction was defaulted to the 8 direction because there was no connection direction. If the channel was joined by a hydraulic structure, but the upstream channel direction happened to be direction 8 (NW), then a conflict occurred that caused a major volume conservation error. The local direction was reassigned to the opposite of the upstream channel element direction (3/20/18). Build No. 18.01.18.

288. A recent code revision resulted in a major channel volume conservation error because channel outflow elements were excluded from reporting by identifying only floodplain elements for outflow volume. The code was moved to a new subroutine and the channel identifying parameter was inadvertently left out (4/9/18). Build No. 18.01.18.

289. The new gutter routine had a couple of variables that were assigned the wrong array size associated with the number of grid elements instead of the number of sides (4/9/18). Build No. 18.01.18.

290. Some warning messages for hydraulic structures were not getting reported to ERROR.CHK because of a reporting format issue that was resolved (4/9/18). Build No. 18.01.18.

291. A missing array index was fixed for reporting the maximum mudflow hydraulics. This error that was introduced in January 2018 and had the effect of slowing down the model by almost 10 times (4/26/18). Build No. 18.01.18.

292. A number of revisions were made to help speed up the model with the review of the 291 bug fix above. These included revisions to the OMP code, separation of the code into more subroutines, and elimination of extraneous tests of the stability criteria (4/26/18). Build No. 18.01.18.

293. Some changes were made to the floodplain cross section reporting. The resolved velocity was eliminated from the HYCROSS.OUT file. This variable did not appropriately represent any velocities for the cross section. The average flow width computation was revised to correctly represent the straight line distance of the wetted top width. The average velocity reporting was adjusted for shallow depths and no flow width to avoid infinite values. The average velocity is computed by dividing the floodplain discharge by average flow area and flow area is slightly different with the change in flow width (5/7/18). Build No. 18.01.18.

294. The length of the hydraulic structures name was extended from 15 characters to 30 characters. A warning message was added for the length of the hydraulic structure exceeding 30 characters (4/30/18). Build No. 18.01.18.

295. Multiple outflow nodes can be designated to write the outflow hydrograph to the inflow nodes, the sediment concentration by volume is now calculated. Sediment concentration by volume up to nine separate downstream grid system is generated and write to the INFLOW.DAT file. The ID character O in the OUTFLOW.DAT file must be assigned O1, O2,...O9 (5/4/2018). Build No. 18-01-18.

296. The dam breach reporting criteria was revised to conform with the California Office of Emergency Services regulatory actions effective on 4-18-2018 (Water code sections 6160 and 6161, sections 11346.1 and 11349.6) that deflood time is the time elapsed from the initial failure of the dam until the measured location returns to within 1 ft of its preflood water (6/03/18). Build No. 18-01-18.

297. The sediment transport routing was removed from floodplain routing subroutine and placed in the update subroutine after the computation timestep loop. This reflects the uncoupled nature of the sediment transport and flow hydraulics because FLO-2D

timestep is so small. For sediment transport analyses, this eliminates extra computations during the flow routing algorithm (7/26/18). Build No. 18.07.18.

298. A number of codes revisions were made to simplify and automate the model response to evacuated elements including:

- The separate computational loop for evaluating the evacuated cells was eliminated.
- The limitation on the number of times (1,000) that evacuated elements were encountered was eliminated. The number of times each floodplain or channel element is now evacuated is listed in the EVACUATEDxx.OUT files.
- Evacuated element n-values are increased by 0.001 to a limit of 0.250 for both the floodplain and channel.
- The model terminates the current timestep loop and reduces the timestep by 1 percent.
- The evacuated channel element TOL value is increased to 0.2 ft (0.067) if TOL is less than 0.2 ft (0.067 m) and increases the TOL by 0.02 ft (0.006 m) if greater than 0.2 up to a maximum value of 0.4 ft (0.122 m).
- The floodplain evacuated element TOL value is increased to 0.1 ft (0.03) if TOL is less than 0.1 ft (0.03 m) and increases the TOL to 0.25 ft (0.076 m) if greater than 0.1 ft (0.03 m).

The focus is to adjust the flood hydraulics and the depression storage rather than the timestep for evacuated elements at shallow flows (8/30/18). Build No. 18.07.18.

299. Multiple initialization and allocation of arrays were reviewed and revised to avoid conflicts in parallel processing (8/30/19). Build No. 18-09-19.

300. An OpenMP Loop was turned off in the Overland Subroutine. (9/15/18) Build No. 18-09-19.

301. An internal trigger was set to distinguish between n-value revisions with the limiting Froude number and those associated with Courant number stability conditions. This was for reporting purposes in ROUGH.OUT so that only the n-value revisions associated with the limiting Froude were reported in this file (9/15/18). Build No. 18-09-19.

302. The reporting of the average water surface elevation in HYCROSS.OUT was changed to reflect the average bed elevation plus the average flow depth instead of the average of the water surface elevation. The computation was distorted if there was no flood depth (9/15/18). Build No. 18-09-19.

303. A mudflow sediment volume parameter was initialized to zero when sediment loading volumes instead of sediment concentration by volume is input into the INFLOW.DAT file (9/15/18). Build No. 18-09-19.

304. New and revised error/warning messages were established for storm drain projects without subcatchments/rain gages and projects with inconsistencies in the features table order for the SWMM.INP, SWMMFLO.DAT and SWMMOUTF.DAT (9/15/18). Build No. 18-09-19.

305. The no flood graphics warning message for the variable IDEPLT in INFLOW.DAT was improved for clarity (9/15/18). Build No. 18-09-19.
306. The TIME-STAGE array data in OUTPUT.DAT was expanded to 2,500 pairs of time intervals to enable longer tidal simulations (9/15/18). Build No. 18-09-19.
307. A new file ARF_ADJUSTMENT.CHK and warning message was created to write the ARF values greater than 0.95 that were revised to 1.0 because the ERROR.CHK file was too cumbersome for this reporting (9/15/18). Build No. 18-09-19.
308. The ROUGH.OUT descending order sorting function was revised to allow for a greater number of reported n-value revisions (9/15/18). Build No. 18-09-19.
309. For mudflows, a flow depth update loop was repositioned for parallel processing code to avoid an error of missing the flow depth update for some grid elements because of array index conflicts (9/15/18). Build No. 18-09-19.
310. The SIMULATION SUMMARY dialog box was edited to provide the directory folder name on the dialog title so that multiple simulation summaries could be correctly identified (9/15/18). Build No. 18-09-19.
311. Early model cessation at the end of a simulation before the completion of the SUMMARY dialog box was eliminated by completely re-importing all the source files and recompiling the entire project (9/30/18). Build No. 18-09-19.
312. If there are more than one hydraulic structure, some of the structure results being reported to HYDROSTRUCT.OUT were excluded because of the timestep results in a simulation time greater than the last output interval and the number of output intervals are miscounted. The fix was to put the read end of file line number reference in the loop, not outside the loop (10/29/18). Build No. 18-09-19.
313. An error message was created for WRF values greater than one. The QGIS interpolation resulted a few WRF values greater than one. This will be rectified in the QGIS also (10/29/18). Build No. 18-09-19.
314. A line of code was added to make sure that if the ARF value was initial set to 1.0 or was reset to 1.0 at runtime because of a small surface area percentage, all the WRF values for 8-directions are all set to 1.0 (blocked) (11/27/18). Build No. 18-09-19.
315. The following information was added to the end of the SUMMARY.OUT file: Grid size, total number of grid elements, and project domain area (11/1/18). Build No. 18-09-19.
316. In anticipation of eliminating the FPLAIN.DAT and CADPTS.DAT, the TOPO.DAT file is initially identified and read. A new binary file, NEIGHBORS.DAT, is generated with the contiguous grid elements in each of the 8-directions is generated, if it is missing, and this file is then read in subsequent simulations for that project. This eliminates the need to generate the contiguous cell neighbors for each simulation (12/12/18). Build No. 18-12-20.
317. A review of the mudflow component applied to large fire impact projects revealed that the mudflow routing routine velocity computation was being superseded in the full dynamic wave computation during multiple sweeps of the OMP code. This had the effect of simulating portions of the mudflow as water resulting in higher velocities and

shallower depths than the mudflow component would compute. It is unclear when this occurred, but it may be necessary to rerun some simulations from this year to determine if the mudflow results are different. It should be relatively obvious if the mudflow simulation was behaving like water and was too fluid. This won't occur or be apparent on smaller projects (12/12/18). Build No. 18-12-20.

318. The multiple channel (rill and gully flow) routine was improved for mudflow simulations. A volume conservation issue was encountered when the mudflow and multiple channel routines were combined in the same simulation. This combination of components has not been previously attempted to our knowledge (12/12/18). Build No. 18-12-20.
319. The evacuated elements reported in the EVACUATFP.OUT file were not properly adjusted for multiple channels. This slowed the model down and results in volume conservation error (12/12/18). Build No. 18-12-20.
320. When a time to failure for prescribed levee or dam breach greater than zero was assigned, the breach volume was still being written to the DAMBREACH_VOLUME.OUT file as an instantaneous failure. This reporting bug was to this new file was fixe (1/1/19). Build No. 18-12-20.
321. The DEPRESSED_ELMENTS.OUT file listing the elements that are lower in elevation than all of their contiguous neighbor elements by a specified elevation (typically 3 ft or 1 m) was revised to include x- and y-coordinates so the elements can be easily located in QGIS (1/4/19). Build No. 18-12-20.
322. The implementation of the new binary file NEIGHBORS.DAT (item 316) required the relocation of some of the Gutter routine variables and several had to relocated again to the location in the code where the Gutter data was input. A fatal Fortran was encountered when reading the data (1/18/19). Build No. 18-12.20.
323. For flow entering the upstream end of the channel from the floodplain, an interior channel element was misidentified as a bank element. The flow entered the channel but was not uniformly distributed (2/6/19). Build No. 18-12-20.
324. In accordance with item 322 above, a variable that was no longer used was discovered with the relocation of the allocation subroutine. This variable was being assigned a zero initialization but had no array size resulting in Fortran error (2/12/19). Build No. 18-12-20.
325. Reporting levee overtopping discharge to LEVOVERTOP.OUT was revised and a new output file LEVOVERTOPMAX.OUT was created to report the peak overtopping discharge separately as well as in LEVOVERTOP.OUT (3/26/19). Build No. 18-12-20.
326. The reporting to MULT.RGH when the multiple channel n-values are adjusted at runtime was fixed. The n-values were not be updated. This file is only created if an n-value is revised (4/5/19). Build No. 18-12-20.
327. The gutter component was not integrated completely with the storm drain. There was no sharing of discharge between the gutter component and storm drain due to an oversight in finishing the gutter code. This identified a volume conservation issue for the Gutter Component for one of the storm drain verification cases. A discrepancy between the

gutter inflow, storm drain inlet inflow and reported cross section discharge was fixed (5/13/19). Build No. 18-12-20.

328. With the latest model release the TIME_ACCEL parameter has new guidelines that supersede Revision 198. In that older Revision, the incremental rate of change in the timestep parameter (TIME_ACCEL), the default value was changed from 0.1 to 1.0, but as the grid elements on project got smaller, TIME_ACCEL = 1, can result in timestep increments that are too large and potential model instability. It is now recommended that the TIME_ACCEL = 0.1 when starting a project and successive increments of 0.1 be applied to enable the model to run faster while reviewing the VELTIMEFP.OUT and SUPER.OUT files for instability. See the White Paper on Guidelines for Assigning the Courant Number and TIME_ACCEL Parameter (5/20/19). Build No. 18-12-20.

329. Revision comment 307 is expanding to identify that the automated ARF = 1 adjustments when too little surface area is available were made spatially variable as follows:

For grid element SIDE:	SIDE > 50 ft and ARF > 0.95	ARF = 1.0
	50 ft > SIDE > 20 ft and ARF > 0.90	ARF = 1.0
	SIDE < 20 ft and ARF > 0.85	ARF = 1.0

The SIDE length criteria is adjusted for metric too. These ARF adjustment are generated to avoid model instability associated with exchanging too much volume on a grid element remaining small surface area (5/20/19). Build No. 18-12-20.

330. A truncated decimal (rounding up) for a variable was corrected for reporting in the OUTNQ.OUT file. The truncated number prevented some results to be correctly reported to the output file for some projects. The OUTNQ.OUT file was reporting duplicate zeros for the beginning of the time series data and the time series ends before the end of the simulation (6/18/19). Build No. 19-07-21.

331. Warnings/errors are reported to output file DEBUG_Version_MM.DD.YYYY.OUT that can be read by FLO-2D QGIS Plugin for graphical display in the project environment. This new file will facilitate project development and review (6/18/19). Build No. 19-07-21.

332. A new ICON for the FLOPRO.EXE file was updated (6/18/19). Build No. 19-07-21.

333. Global assignment of the GUTTER variables was not being properly assigned if the grid element gutter variables were assigned to zero (6/19/19). Build No. 19-07-21.

334. Maximum velocities in resolved components are reported to a new output file VELRESMAX.OUT that has the following data:

Node	X-coord	Y-coord	Max Resolved Velocity	Max. X-Velocity	Max. Y-Velocity

This data enables a maximum velocity flow field to be plotted in the MAXPLOT program or in a GIS or CADD mapping software (6/19/19). Build No. 19-07-21.

335. Additional warnings/errors are reported now to DEBUG_Version_MM.DD.YYYY.OUT file that can be read by FLO-2D QGIS Plugin for graphical display. This file help users with project revision and optimization (7/23/19). Build No. 19-07-21.

336. An issue was fixed for the calculation of the timestep decrements, after 3 consecutive decrements a bad assignment of the Courant Timestep was done for some channel

elements. This produce instability issues in the channel for one of our verification cases (7/23/19). Build No. 19-07-21.

337. There was an error in the variable array index for writing the channel bank elevations to the CHAN.RGH that was corrected (7/23/19). Build No. 19-07-21.

338. An Open MP loop was removed that conflicted with writing the grid element text in the zoom view of the runtime graphics mode (7/23/19). Build No. 19-07-21.

339. A new bridge hydraulics routine was implemented in the new build. This component computes the free surface flow, pressure flow and combined pressure and weir flow over the deck based on the bridge geometry and features such as piers or pilings. The new component eliminates the need to use an external software program to compute a headwater stage discharge relationship for the hydraulic structure (7/23/19). Build No. 19-07-21.

340. An error was discovered in a newly implemented debug routine that curtailed the model with an error statement related to the infiltration parameter INFMETHOD (7/31/19). Build No. 19-07-21.

341. New code for the 1-D street routing algorithm had a bug in it that existed the routing loop. This was fixed along with the reporting of the sorting of the maximum street velocity in the VELTIMEST.OUT file (8/8/19). Build No. 19-07-21.

342. The dam breach erosion discharge for a channel breach was limited to the inflow to the breach element. After the pipe collapses into a channel, the breach erosion discharge is governed by the weir equation at the upstream breach channel entrance. For mild upstream pipe and channel slopes such as in the case of a tailings dam, the breach weir discharge can exceed the available discharge to the breach resulting in discharge surging through the breach. If the weir discharge exceeds in the inflow discharge to the breach element, the breach discharge is set equal to the inflow discharge (9/1/19). Build No. 19-07-21.

343. The calculation the maximum resolved velocity vectors for plotting arrows in MAXPLOT and other graphics programs using the VELRESMAX.OUT file was revised. It was not computing the x- and y-components correctly for flume flow (9/16/19). Build No. 19-07-21.

344. An ARF-WRF error was introduced with the new DEBUG routine that caused ARF.DAT files with only 1 line of ARF-WRF values not to be read correctly. This was fixed with initialization of the WRF values in a different code location (9/23/19). Build No. 19-07-21.

345. The model response to volume evacuation of floodplain and channel elements at shallow flow was adjusted. Revisions were made to spatially variable TOL(i) value and the Mannings n-value (including the SHALLOWN value). The timestep is reduced when a grid element is evacuated and more outflow is computed than inflow discharge plus storage volume (10/13/19). Build No. 19-07-21.

346. Levee (wall) failure warning messages were expanded to include a difference in grid element elevations greater than 1 ft on each side of the wall (10/13/19). Build No. 19-07-21.

347. The low levee warning message code based on the DEPRESSDEPTH parameter assigned in CONT.DAT was expanded to three options:

    a. DEPRESSDEPTH = 0.0 to 10.0 ft; Identifies the wall with a crest elevation lower than DEPRESSDEPTH in LOW_LEVEE_CREST_ELEVATIONS.OUT file.
    b. DEPRESSDEPTH = -1.0 to - 10.0 ft; Assesses the side of the wall where the crest elevation is assigned to determine if the levee height is lower than the DEPRESSDEPTH value.
    c. DEPRESSDEPTH = -101.0 to -110.0 ft; Assesses both sides of the wall to determine if the height is lower than DEPRESSDEPTH (1 ft to 10 ft).

    If DEPRESSDEPTH is negative, LEVEE.BAC file is written as a backup file omitting the low levees that can be renamed as LEVEE.DAT.

348. INOUTCONT is automatically set to zero for generalize culverts regardless of the user assigned value because the tailwater effect is already taken care of in the generalized culvert equations (10/13/19). Build No. 19-07-21.
349. The Gutter Component assignment of the spatially variable curb height was cross correlated with the storm drain curb height to insure consistency between the two components (10/13/19). Build No. 19-07-21.
350. The assignment of the global and spatially variable levee failure width was re-organized to make sure the maximum width was utilized with the prescribed failure (10/13/19). Build No. 19-07-21.
351. The criteria that the instantaneous failure of levee or wall occurred when the water surface exceeded the failure elevation was modified to address the condition that the difference in the water surface elevations across the wall must exceed the failure elevation minus the ground elevation. This ensures that the static pressure across the wall will result in failure. In previous model versions, the ground elevation might exceed the failure elevation or the water surfaces may be equivalent and failure should not occur in these cases (10/13/19). Build No. 19-07-21.
352. When the floodplain routing algorithm predicts a flow velocity out of a grid element and the flow depth is less than the TOL value, the velocity is now reset to zero. This eliminates the potential for evacuation of a grid element with shallow flow when the convective acceleration is in opposite direction of the difference in the water surface elevation. This condition was made apparent with the instantaneous wall failure when the shallow flow water surface on one side of the wall was higher than the deep flow water surface on the opposite side of the wall (10/13/19). Build No. 19-07-21.
353. The debug routine to interface with the QGIS included code revision to accommodate the old 4 WRF value format in the ARF.DAT file. This code revision was not correct and resulting in the WRF values for the diagonal direction being set to zero instead of one (10/25/19). Build No. 19-07-21.
354. The multiple channel routine was improved by comparing resetting the average flow depth on steep slopes to make sure that the upstream multiple channel element was not evacuated for low flow conditions (10/25/19). Build No. 19-07-21.

355. Channel time-stage component code was edited to account for volume in time-stage elements with negative water surface elevations (11/4/19). Build No. 19-07-19.
356. An adjustment was made to the wall failure criteria when the ground elevations on the opposite sides of the wall are unequal (11/4/19). Build No. 19-07-19.
357. A velocity reporting issue was corrected. If the discharge for a given flow direction is zero, the corresponding velocity is also set to zero. This can occur because the velocity is computed before the flow width is used to compute the discharge (11/4/19). Build No. 19-07-19.
358. The channel mudflow routing was improved. To improve the volume conservation, some adjustments were made to the variable assignment as double precision numbers. In addition the potential for numerical surging was reduce by implementing depth averaging of some parameters. Reporting to CHVOLUME.OUT was also fixed (11/24.19). Build No. 19-07-19.

Revisions and bug fixes in the Processor Programs include (most recent at the bottom):

1. GDS – Froude.TMP deleted from project folder when project is saved (5/7/12).
2. GDS – Supplement.DAT variables limited to real number with 2 decimals (5/7/12).
3. GDS – General culvert equation dialog box activates when selected (5/7/12).
4. GDS - Right bank check error message changed to “Check Error.chk file for potential bank errors.” (5/7/12).
5. GDS – Change WRF values to write the values as ARF WRF(1,2,3,4,5,6,7,8) in the correct order (5/7/12).
6. GDS – Changes made to the writing, reading and porting of the hystruc.dat file (5/7/12).
7. GDS – SWMM display of outflow nodes fixed (5/10/12).
8. GDS – Allow ibackup = 2 to be written to the control variable dialog box (5/11/12).
9. GDS – Shallow n-value range validation changed to 0.01 to 1.0 (5/17/12).
10. GDS - Add D line for storm drain in HYSTRUCT.DAT to limit outlet discharge with multiple inlets (5/17/12).
11. GDS - Hydrograph import error for HEC-1 output files. The 1 hour discharge import error fixed. (7/10/12)
12. GDS – Channel tools moved to channel drop down on tools menu (7/19/12).
13. GDS – Add File Create Grid – Shape file of the computational domain (7/19/2012).
14. GDS - Zoom function with images was refined to avoid zooming out to full view when importing images in a zoom configuration. Infiltration display was turned off when initializing the GDS to eliminate the infiltration the color coverage (10/25/12).
15. GDS - The rain data editor was updated to include the IRAINBUILDING switch on Line 1 of the RAIN.DAT file (10/25/12).
16. GDS - Activated view of any component when created (10/25/12).

17. GDS - Outflow for multiple grid system (10/25/12).
18. GDS - Deleted C F line at LEVEE.DAT when there are no fragility curves (10/27/12).
19. GDS - Pit tool: watershed directions for selected watersheds (10/29/12).
20. GDS - Floating variables editor (Reduction Factors): add “Completely Blocked Grid Element” for and Optional ARF value (10/30/12).
21. GDS - Channels from HEC-RAS: filter stations outside left and right banks (11/28/12).
22. GDS - XSEC.DAT from HEC-RAS is now written with river mile name (12/07/12).
23. GDS - TOLER 2nd line (1,2 or 3 Courant values for floodplain, channel, and street (12/18/12).
24. MAXPLOT - Simplified the do loops for reading the TOPO.DAT file to create the array of contiguous grid elements. This enables the program to load significantly faster (12/18/12).
25. PROFILES - When the water surface profile is plotted, a new file is written WSURF_DIFF.OUT that contains the channel grid element number, cross section name from XSEC.DAT, measured (surveyed) or reported water surface elevation from WSURF.DAT (e.g. HEC-RAS predicted water surface elevation), the FLO-2D predicted water surface, and the difference between them (measured - FLO-2D predicted) (12/18/12).
26. PROFILES - Reading and writing NOFLOCs were added back to PROFILES so that the program can be used for either Version 2009 or the PRO model (1/8/13).
27. GDS - Green-Ampt: new dialog with infiltration calculations for range of cells (01/16/13).
28. GDS - Created cross sections from HEC-RAS file excluding the stations that are outside the left and right banks (01/18/13).
29. GDS - Can now accept Manning value of -99 (01/20/13).
30. GDS - Prints PIT.DAT after applying pit tool: write new elevation, old elevation, and difference (02/16/13).
31. GDS - Pit tool: color rendering of elevation differences (02/17/13).
32. GDS - Pit tool colors for selected watersheds (02/20/13).
33. PROFILES - A new tool was added to the PROFILES to interpolate n-values to flow area. A new icon command on the tool bar activates a dialog box that will display minimum, maximum and average flow areas to the lowest top of bank. The user enters flow area range for interpolation and minimum, maximum and average n-values and the program will assign an n-value to every channel element based on the flow area interpolation. Automated adjustments for adverse slope can also be made (2/25/13).
34. GDS - New infiltration dialog with Horton infiltration. New dialog for channel infiltration with initial and final hydraulic conductivity, and max. soil depth (02/28/13).
35. GDS - Changes in SWMM module to read all lines in [CONDUIT] group in .INP file (03/12/13).
36. GDS - Express editor now includes Horton infiltration (03/20/13).
37. GDS - SWMM module reads connections and draws them with text id (05/21/13).

38. GDS - SWMM module: energy grade lines (06/21/13).
39. GDS - SWMM dialog was revised to add the flapgate option (6/25/13).
40. GDS - Changes were introduced to the SWMM dialog to add the inlet type 4 (rating table condition) (6/25/13).
41. GDS - SWMMFLORT.DAT is created to contain the rating table for all inlets type 4 (6/25/13).
42. GDS - FLO-2D Graphical User Interface has been expanded to plot the inflow and return flow hydrographs as well as the hydraulic and energy grade lines of the drain system (6/25/13).
43. GDS PRO: SWMM dialog with inlet type dropdown list with values 1 to 5. (7/20/2013).
44. GDS PRO writes “Professional Model - Build No. 13-07-05" instead of the previous "Professional Model - Build No. 12.01.01" at the end of the first line of CONT.DAT. (7/31/2013).
45. EPA SWMM GUI - Recompiled to activate the option to review the FLO-2D – EPA SWMM storm drain results in the EPA SWMM GUI once a run has been successfully completed (6/25/13).
46. GDS PRO: stage-time channel and floodplain. Reads/write OUTFLOW.DAT with these changes: the first lines are "K" or/and "O" with stage-time (only the cell number). The corresponding "N" (followed by ""S") lines are written later. At the end of the file, "O" lines without hydrograph are written. (8/14/2013).
47. GDS PRO: drop down list in the dialog to set tail water effect with values 0, 1, or 2. It also reads/writes that variable in HYSTRUCT.DAT file. (9/23/2013).
48. GDS PRO: improved levee interpolation for polyline with few points. (9/26/2013).
49. GDS PRO: SWMM omit BR U and BR D lines in .g01 and .g0? files. (10/2/2013).
50. GDS PRO: reads XSEC.DAT with tabs between values. (10/8/2013).
51. GDS PRO: Channel segment identified with a number in Channel Segment dialog, according with order in CHAN.DAT. (10/13/2013).
52. GDS PRO: Infiltration is off when project loaded. If component is off, it is turned on when created. (10/13/2013).
53. GDS PRO: optional adjustment to the levee interpolation when reading a file of points. After applying the first algorithm GDS shows a dialog with the points and intersected cells, and asking if user want to apply the second adjustment. (10/30/2013).
54. GDS PRO: improvements to levee interpolation. (10/30/2013)
55. GDS – Channel connection feature - Add a Pair button removed (10/30/213)
56. GDS – XSEC.DAT file is written completely when Save As is used (10/30/13).
57. GDS – Help Menu linked to GDS PDF file (10/30/13).
58. GDS – EPA SWMM Inlet Dialogs : flat gate text changed to "flapgate" (10/30/13).

59. GDS - Increased size of coordinates in TOPO.DAT to make room for larger coordinates (10/30/13).
60. GDS – Turn infiltration view of when project loaded (10/30/13).
61. GDS – Outflow conditions were fixed in the IN/OUT dialog (10/30/13).
62. GDS PRO: assigns sediment size fractions to cells in 2 ways: from the Mud and Sediment Transport dialog and with a new command "Grid. Assign Parameters to Selection. Variable Sediment Size Fraction". The cells assigned a sediment group are written as "G" lines in SED.DAT. (11/9/2013).
63. PROFILES - The program will now read any order of cross section number in CHAN.DAT and XSEC.DAT. The only requirement s are for XSEC.DAT to have an equal number or more cross sections than CHAN.DAT and the CHAN.DAT must have a corresponding cross section number in XSEC.DAT. The cross sections in CHAN.DAT and XSEC.DAT can initially be in any order (11/15/13).
64. GDS PR: highlights channel cells when user clicks a row in the table inside the Channel Dialog. (12/17/2013).
65. GDS PRO: SWMM doesn't need to read/write project path in first line of SWMMFLO.DAT. (12/17/2013).
66. PROFILES – A revision was made to renumber the natural cross section numbers in CHAN.DAT correctly when a channel element is deleted (12/18/13).
67. GDS –Outfall Nodes Dialog was created to read the outfall nodes from SWMM.inp file and write the data on the SWMMOUTF.dat file. This file contains the switch that turn ON or OFF the discharge of an outfall from SWMM to FLO-2D. (01/10/14)
68. GDS PRO: SWMM message when more than one inlet is in same cell. (1/22/2014).
69. GDS PRO: clear Green-Ampt dialog tables when loading new project. (2/5/2014).
70. Mapper++: reads elevations below sea level. (2/11/2014).
71. GDS PRO: fix problem when reading FPLAIN.DAT with name in lower cases. (2/11/2014).
72. Mapper++: fix problem with long project long path and name. (2/12/2014).
73. GDS Basic: interpolation from multiple elevation files changed from .DLL in Fortran to VB6. (2/12/2014).
74. GDS PRO: Manning interpolation from shapefile improved. (2/17/2014)
75. GDS – Recognize the channel confluences for those channel segments with DEPINITIAL equal to -1. (03/17/14)
76. Mapper++: fix displacement of values in cells. (3/19/2014).
77. GDS PRO: Solves the problem when creating a levee with polyline that disappeared after reading it. (4/15/2014).
78. GDS PRO: Interpolation issue between 2 values when creating levees with polyline was solved. (4/16/2014).

79. Mapper VB6: reads TIMDEP.OUT with 6 columns. Reads DEPTH.OUT to produce the Max Combined Channel and Floodplain Flow Depths. (4/17/2014).
80. GDS PRO: changes to confluences dialog. Add confluence pair. (4/18/2014).
81. Mapper++: Reads TIMDEP.OUT with 6 columns. (4/30/2014).
82. GDS PRO: Reads .INP files and gives a message indicating that there are conduits with length less than 20 feet. Writes a file SMALL_CONDUITS.CHK and opens Notepad with the contents of the file. (5/2/2014).
83. GDS PRO: compares [OUTFALLS] in .INP files with SWMMOUTF.DAT to see if they are in the same order. If not, gives a message. (5/3/2014).
84. GDS PRO: SMALL_CONDUITS.DAT file name changed to SHORT_CONDUITS.DAT with header: "Name Inlet Node Outlet Node Length". (5/4/2014).
85. GDS PRO: SWMM new curb height column. (5/6/2014).
86. GDS PRO: enhancements for SWMM interface can be summarize as follow:

- Message for inlets in the same cell now only shows the ones that are not junctions.
- Sixth column in SWMM inlets dialog has the title "Height(1) Area(2) Surcharge(5)".
- In "Notes" a line was added: "v. For Drain Type 5: Range 0 to 5 (see guidelines)".In "Notes" line "ii. For Drain Type 3 and 5" changed to "ii. For Drain Type 3:". (5/18/2014).

87. GDS PRO: problem solved in Infiltration dialog. Grid Element Infiltration are now saved. (5/20/2014).
88. GDS – Storm Drain Inlet New Data was added to the SWMMFLO.DAT. A feature option and a Curb Height were added to last columns in the dialog (06/12/14). Build No. 14-07-08.
89. GDS – Type 5 Inlet was added to the SWMMFLO Dialog for manholes with surcharge condition (06/12/14). Build No. 14-07-08.
90. GDS - Error messages are reported now by GDS and new reported files are created (06/12/14). Build No. 14-07-08.
91. Mapper PRO and Mapper++: fix to max. flow plot when value is zero. (6/12/2014).
92. GDS PRO: Writes LEVEE.DAT lines with negative cell number like F -56732, when the Global checkbox is checked in the levee dialog for prescribed failure. (6/19/2014).
93. GDS PRO: caption "Global – Apply this failure data to all model levee directions" in the levees dialog. (6/26/2014).
94. GDS gives a message when SWMM.INP has a [RAINGAGES] group with TIMESERIES (it should be FILE). (6/22/2014).
95. GDS PRO: ITIMTEP in the FLO-2D variables dialog is a dropdown list with 0,1,2,3, and 4. A value of TIMTEP is needed for 1 to 4 but not for 0. (6/22/2014).
96. GDS PRO: has a checkbox in the inflow/outflow dialog to assign the hydrograph interval (IHOURDAILY). (7/4/2014).

97. GDS PRO and Basic: reads Courant coefficient correctly from TOLER.DAT. (7/21/2014).

98. GDS PRO: Street Elevation Adjustment. Dialog with these capabilities: (from March 2014):

    - See selected street element elevations and its neighbor's elevations, elevation differences, distance between its centers, slope between them, and Manning coefficients.
    - Elevations and Manning values can be changed to all or selected street elements.
    - Adjust Curb Height by assigning a minimum value to particular street elements or raising its value by an amount, or lowering the adjacent gutter elements.
    - Adjust Cross Slope from crown street elements to its left and right elements giving a slope percentage.
    - From the selected street elements, the cells with the maximum and minimum elevations can be modified.

99. Any two cells can be selected to observe a plot of the slope between them, and the elements that intersect the line that joins them. In the plot, the elevations of the cells between the two selected cells can be smoothed to make continuous leveled elevations

100. GDS PRO: a bug was solved for the confluences assignment. The confluences grid cells were incorrectly assigned for non-adjacent cells (8/01/2014)

101. GDS PRO: Hydraulic structure dialog was revisited to correctly read and write the F lines for Culvert Equations (8/01/2014)

102. GDS PRO: Project with only one confluence is correctly loaded. (8/02/2014).

103. GDS PRO: When a cell of a confluence pair is clicked, the pair is highlighted. (8/02/2014).

104. GDS PRO: CONT.DAT has the text "Professional Model - Build No. 14-08-09" at the end of first line. (8/04/2014).

105. GDS PRO: infiltration dialog checks that Global Soil Porosity is either 0.0 or within range 0.28 to 0.50. (8/10/2014).

106. GDS PRO: infiltration dialog gives a correct warning message associated with the Hydraulic Conductivity value, and gives a new range warning message for the Adjustment field. (8/10/2104).

107. GDS PRO: changes to texts in the Street Elevations Adjustment Tool: now it is called "Cell Elevation Adjustment" to make it more general and not only for street cells. All "Street" texts in the dialog and messages changed to "Cell". (8/11/2014).

108. GDS PRO: imports street elevations polylines and intersects them to cells. 3 street elevation types are imported: street proper, curb, and crown. (9/20/2014).

109. GDS PRO: improvements to the street polyline import and interpolation to cells according to type of polyline (street proper, curb or crown). (10/13/2013).

110. GDS PRO: All texts in SWMM dialogs and messages change from “EPA SWMM” to “Storm Drain” (10/21/2014).
111. GDS PRO: street polyline import and interpolation: After assigning cell elevations from the polylines, GDS draws the interpolated cells in color: curbs-blue, crown-yellow, and street-green. (11/12/2014).
112. GDS PRO: Hydraulic structures dialog: new checkbox in Flood Structure frame: “Channel to Floodplain”. (11/13/2014).
113. GDS PRO: new TOLSPATIAL.DAT file for individual cell tolerances. New dialog for the assignment of cell tolerances (individual or selection of cells). (01/10/2015).
114. GDS PRO: TOLSPATIAL.DAT written with cells in ascending order (01/10/2015).
115. GDS PRO: Tolerance value in Properties Dialog can be made zero (0) to exclude it (them) from individual tolerance assignment (01/12/2015).
116. GDS PRO: Multiple channels file, MULT.DAT, reads last possible empty lines (01/14/2015).
117. GDS PRO: FLO-2D control variables dialog: "EPA SWMM" text changed to "Storm Drain" (01/20/2015).
118. GDS PRO: Import Horton shapefile and assign Horton value to cells according to polygon intersections (02/05/2015).
119. GDS PRO: Multiple channel's new parameter Surface Sediment Size AVULD50 (02/28/2015).
120. GDS PRO: Import Manning shapefile: division by zero bug fix (03/03/2015).
121. GDS PRO: Turn components view on/off (03/26/2015).
122. GDS PRO: The Storm Drain FLO-2D Inlets dialog was changed for inlets type 2 and 3. The height of the inlet has to be entered for inlet type 2 instead of the area. Sag Height can be now entered for inlet type 3. (03/26/2015)
123. GDS PRO: Inflow/outflow .HYD files saved/read from .../InOutFlow subdirectory of project (03/26/2015).
124. GDS PRO: Import shapefile to define domain with polygon (04/03/2015).
125. GDS PRO: Initial Coordinates dialog: new adjust coordinates sub-dialog (04/15/2015).
126. GDS PRO: virtual memory increase message (04/17/2015).
127. GDS PRO and Mapper Classic: pgup, pgdn, home, end arrows movement (04/23/2015).
128. GDS PRO: The Reductions Factors dialog window has a new check box to assign building collapse elements as Potential Collapsed Cells. It saves/reads ARF.DAT, writing/reading T lines with negative cell values for totally collapsed cells or for individually selected cells (05/18/2015).
129. Mapper PRO: Fix combined floodplain and channel max flow depth plot due to change in FLO-2D version (05/23/2015).
130. GDS PRO: Enhanced Storm Drain error and warning messages (05/25/2015).

131. Mapper PRO: Plots the range values for all depth and velocity variables between selected minimum and maximum values. A new dialog box was implemented for this option (06/08/205).
132. GDS PRO: Now reads the SWMMOUTF.DAT with potential empty lines at the end fo the file without causing errors (06/09/2015).
133. GDS PRO: Calls Activator.EXE from Help command to activate the update license to simplify the activation process and avoid having to download the activator program. The command is: "Help. Activate..." (06/21/2015).
134. GDS PRO: Fixes an error in the street width assignment. It is now possible to assigns 0 (zero) value for street width directions in Street Realignment Tool (06/22/2015).
135. GDS PRO: Alignment of streets: assign 0 (zero) value to new width directions (06/22/2015).
136. GDS PRO: better response to “Cancel” button in several dialogs (06/29/2015).
137. GDS PRO: new dialog to select components before saving project (07/02/2015).
138. GDS PRO: improvements of error messages when reading data with errors (07/02/2015).
139. GDS PRO and Mapper PRO: improvements to calls to external programs and modules (07/04/2015).
140. GDS PRO: Inflow/Outflow conditions: error capturing when opening command with data errors (07/13/2015).
141. GDS PRO: new command: “View. Components. Storm Drain”, turns on/off plot of inlets, outlets, and connections (07/18/2015).
142. GDS PRO: new checkbox “Storm Drain” in Save Dialog (07/20/2015).
143. Mapper PRO: right click on variable plot to select range of values to plot (min to max) (08/27/2015).
144. Mapper PRO: creation of shapefile of selected range of variables to plot (08/27/2015).
145. Mapper PRO: better response and messages to data input errors (09/03/2015).
146. GDS PRO: SWMM: improved readings of .INP files where there are comment lines (09/26//2015).
147. GDS PRO: activate “View. Components. Levees” when importing levees (09/30/2015).
148. GDS PRO: activate “View. Components. Hydraulic Structures” when creating them (09/30/2015).
149. GDS PRO: activate “View. Components. Channel Confluences” when creating them (09/30/2015).
150. GDS PRO: select cells by intersecting a polygon shapefile (10/26/2015).
151. GDS PRO: SWMM. Recalculation of Max. Depths in [JUNTIONS] group and saving of .INP file (11/30/2015).
152. GDS PRO: SWMM. New dialog for the recalculation of Max. Depth in [JUNTIONS] group (11/30/2015).

153. GDS PRO: selection of elements and interpolation of elevations from DTM points (12/30/2015).
154. GDS PRO: improvements to redrawing of DTM points (12/30/2015).
155. GDS PRO: improvements to several file dialogs (12/30/2015).
156. GDS PRO: SWMM: skip comments in [OUTFALLS] group in .INP files (01/04/2016).
157. GDS PRO: new grid element outflow condition with depth discharge. Dialog changes, save and load of OUTFLOW.DAT file (01/27/2016).
158. GDS PRO: LIDAR elevations interpolation: error messages given in one final dialog and not when individual errors are found (01/30/2016).
159. GDS PRO: elevations profile plot along a polyline (03/28/2016).
160. PROFILES: Fixed a read error for natural cross section data bases that was introduced with the previous update (11/04/15). Also added left and right elevations to bed profile and water surface profile plots (11/19/15). Revised the array allocation for rectangular channels with the same bank elevations (1/21/16).
161. PROFILES: Revised to include corresponding low bank vertical extension modification the PRO model. The water surface elevation is now displayed on both sides of an island (3/28/16).
162. HYDROG: The HYCROSS.OUT file format for floodplain cross sections was revised with an addition column of resolved velocities. The HYDROG program was updated to correctly read and plot the discharge data (4/13/16).
163. PROFILES: Fixed the cross section water surface display when the cross section is raised or lower by eliminating the water surface line which no longer is appropriate (4/22/16).
164. GDS PRO: FLO-2D Control variables, Global Data: Shallow Flow n-value valid range was change to [0.0, 1.0] or -99 (04/12/2016).
165. GDS PRO: Command "Highlight Grid Element Number…" Zooms-In to cell with 20 or so surrounding boundary cells. New dialog allows zoom-in or out to 10% to 80%. (04/25/2016).
166. PROFILES: Added a new output file FLOW_AREA_VARIATION.OUT to report dramatic changes in flow area between contiguous channel elements and suggested new n-values to accommodate the flow area variation. Also corrected the bank elevations profiles plots when toggling upstream and downstream and fixed the plotting of the cross section water surface elevation lines which were intersecting the origin (5/19/16).
167. MAXPLOT, HYDROG, PROFILES: These programs were compiled for 64-bit computers (5/19/16).
168. GDS PRO: looks in "C:\Program Files (x86) \EPA SWMM5" for EPASWMM5.EXE" when using command "Tools | Storm Drain | Run Storm Drain GUI...". (06/02/2016).
169. PROFILES: Rectangular and trapezoidal cross sections can now be plotted and viewed in the PROFILES program. They cannot be edited according to the station-elevation displayed, however, because the input data representing these cross sections is depth,

bottom width and side slopes (trapezoidal cross sections) which can be edited graphically in the GDS. The purpose of this revision is to be able to display the cross section shape for all channel segments and review flow area, wetted perimeter and top width (5/24/16).

170. GDS PRO: The cell elevation can be now interpolated along a polyline using the elevations profile tool. (6/27/16).
171. GDS PRO: The inflow and returning hydrograph plots can be now drawn and save to a folder, this can be done for a single inlet or for all of the inlets in the storm drain simulation. Go to Tools | Storm Drain | Storm Drain Discharge Display. (6/27/16).
172. GDS PRO: The clogging factor data file can be created in the SWMMFLO.DAT data dialog for all types of inlets. (6/27/16).
173. PROFILES: Two water surface plotting errors were fixed for islands. (7/13/16).
174. PROFILES: Revisions were made to enable the program to renumber the channel cross sections upon saving when some channel elements and corresponding cross sections were cut out (8/9/16).
175. GDS PRO: InOutFlow subdirectory to store .HYD files, created when project loaded (08/27/2016).
176. GDS PRO: import levees from polyline when many points are in same cell: assign only one cell number (08/31/2016).
177. GDS PRO: reading polylines to create levees (XYZ files). Those polylines that extend to only a single cell can be excluded, the GDS displays a message asking about which option to take. (09/03/2016).
178. GDS PRO: when reading polylines to create levees, polylines outside the domain are excluded. (09/05/2016).
179. GDS PRO: messages and error detection when reading polylines for levees have been enhanced. (09/11/2016).
180. GDS PRO: The sediment specific gravity range have been changed in the Mud and Sediment Transport dialog [0.0, 3.0]. (09/29/2016)
181. GDS PRO: the writing function of the Storm Drain component was enhanced. The SDCLOGGING.DAT is not written if there is no Clogging Factor for any inlet. (10/05/2016)
182. GDS PRO: FLO-2D compares the rim elevation with the grid element elevation and reports the differences in the FPRIMELEV.OUT. The GDS was enhanced to show a table containing the current inlet depth as well as the new max depth based in the PRIMELEV.OUT changes. The user can reset the elevations in the inp by using the "View .INP Max. Depths…" button in the Storm Drain FLO-2D Inlets dialog, go to Tools|Storm Drain|View Storm Drain Inlets Dialog. (10/20/16). Build No. 16-06-16.
183. GDS PRO: TOLSPATIAL.DAT: values with zero tolerance are skipped (11/10/2016).
184. GDS PRO: Storm Drain: .INP file invert elevations and Max. Depth recalculated and written (11/11/2017).

185. GDS PRO: Storm Drain: new dialog for the recalculation of Max.Depth in .INP file (11/18/2016).

186. GDS PRO: Storm Drain: reading [CONDUITS] block with comments (12/13/2016).

187. GDS PRO: calls to FLO-2D models, FLOPRO.EXE or FLOPRO BASIC.EXE depending on user license (01/18/2017)

188. GDS PRO: call to execute SWMM 5.0 GUI from C:\Program Files (x86)\FLO-2D PRO\EPASWMM5.EXE (01/21/2017).

189. GDS PRO: license date checks from especial file (22/02/2017).

190. GDS PRO: creation of FPLAIN.DAT and CADPTS.DAT from TOPO.DAT and MANNINGS_N.DAT (03/09/2017).

191. GDS PRO: changes to value ranges of FLO-2D variables: laminar flow resistance and time lapse output (03/14/2017).

192. GDS PRO: INFIL.DAT read: message when INFMETHOD=1 (Green-Ampt) and 4th. Line missing (03/17/2017).

193. GDS PRO: new splash window with license checks and messages (03/31/2017).

194. PROFILES: the computation of the natural channel cross section flow area was modified to be consistent with the revised top of bank delineation to the highest top of bank in the FLO-2D model. This modification was made to be consistent with the HEC-RAS method of channel flow area. It only affects a small area on the side of the lowest top of bank and includes that volume in the channel instead of on the floodplain (01/23/2018).

195. GDS PRO: Cell's Manning's n-value calculation from shapefile: polygon algorithm improvement. (04/17/2017).

196. GDS PRO: CONT.DAT reading 4th. and 5th. lines when IFLOODWAY is zero. (04/17/2017).

197. GDS PRO: infiltration from shapefile: checks that selected shapefile variable has a valid range of values. (04/29/2017).

198. GDS PRO: new error capture during loading a faulty project. (04/29/2017).

199. GDS PRO: splash window: issue solved when loading it in some computers. (05/01/2017).

200. GDS PRO: reading elevation points from. PTS file: recovers when there are format errors in the input file. (05/19/2017).

201. GDS PRO: splash window: new texts clarifying model use. GDS PRO will always run model FLO2D.EXE, but with the limitations indicated in the splash window. (06/22/2017).

202. GDS PRO: will not create BREACH.DAT if there are no G-lines (global data). (07/10/2017).

203. GDS PRO: doesn't write or read the first line with column titles in SDCLOGGINGS.DAT. Column titles are omitted. (07/17/2017).

204. GDS PRO: new file SHALLOW_SPATIAL.DAT with cells with shallow n-value different to global shallow n-value. (08/09/2017).
205. GDS PRO: cell attributes dialog includes field for Spatial Shallow n-value. (08/09/2017).
206. GDS PRO: new command “Grid. Assign Parameters to Selection. Cell Shallow n-value. (08/10/2017).
207. GDS PRO: creation/editing of MODFLOW data. Writes files .dis, .lst,.ba6, .pcg, and .de4 for that model. (09/02/2017).
208. GDS PRO: new FLO-2D MODFLO-2D Manual. (09/24/2017).
209. GDS PRO: reads *.PTS files with enhanced error checks. (10/06/2017).
210. Mapper PRO: fix potential calculating error in the Hazard Map for the mud and debris flow. (19/10/2017).
211. GDS PRO: reads *.INP files skipping the SUBCATCHMENT block and identifies inlets as junctions starting with the letter “I”. (11/01/2017).
212. GDS PRO: license dialog show message when there are less than 30 days for its expiration. (11/21/2017).
213. GDS PRO: writes GUTTER.DAT with a character G at the beginning of each line 2 and displays the individual gutter cells in brown color. (11/23/2017).
214. GDS PRO: A gutter cell can have zero individual width and height, meaning that the global values will apply to them. To make a cell a 'gutter cell’, the direction has to be positive (1 to 8). There is also a "No Gutter" direction in the dialog to remove it from the gutters list. (11/29/2017).
215. GDS PRO: Creation of the SWMMFLO.DAT file and SWMMOUTF.DAT file was reviewed for those projects without sub catchments. (8/1/2018).
216. GDS PRO: Revised the Storm Drain Inflow Hydrograph creation for a simulation time that exceeds the 24 hr. Previous versions were not generating correctly the inflow hydrograph plots from the SWMM.RPT results. (10/5/2018)
217. PROFILES: The program was not correctly reading cross section data when natural cross section segments were split around a trapezoid cross section segment in the CHAN.DAT file (11/8/2019).
218. PROFILES: The water surface elevation line was not being plotted when maximizing and minimizing the cross section plot window (12/26/19).

Storm Drain Engine (VC2005-CON.dll)

Revisions and bug fixes in the FLO-2D storm drain engine include (most recent at the bottom):

1. Outfall Discharge is transferred from SWMM to FLO-2D (11/10/13)
2. FLO-2D WSE modify the water elevation of Outfall nodes for those cases that apply (11/10/13)
3. A variable that was initialized twice in SWMM Model was corrected (12/01/13)

4. An incorrectly assigned index was found on the SWMM reporting subroutine output_saveNodeResults (01/31/14)
5. The routing method was hardcoded to Dynamic Wave to account for backwater effects, entrance/exit losses, flow reversal and pressurized flow. The integrated model is directly comparing the FLO-2D WSE versus the SWMM Pressure Head that get from the dynamic wave subroutine in SWMM 5. On the previous versions of the FLO-2D SWMM code the integrated model ran using: Steady State, Kinematic Wave or Dynamic Wave. For that reason, the SWMM head was calculated using the FLO-2D area and the volume coming out from SWMM. In SWMM 5 and only for the dynamic wave, the routing is influenced by the water depths maintained at nodes, the excess volume is assumed to pond over the node with a constant water surface. (06/12/14). Build No. 14-07-08.
6. The inertial terms are hardcoded to Dampen option. The inertial terms are reduced when the flow comes closer to being critical and ignore for supercritical flows (06/12/14). Build No. 14-07-08.
7. The subcatchment area was hardcoded equal to the FLO-2D grid element area (06/12/14). Build No. 14-07-08.
8. The subcatchment width was hardcoded equal to the FLO-2D grid element side (06/12/14). Build No. 14-07-08.
9. The wet timestep was hardcoded equal to 1 min (06/12/14). Build No. 14-07-08.
10. The dry timestep was hardcoded equal to 1 min (06/12/14). Build No. 14-07-08.
11. The lengthening timestep is hardcoded as Routing Timestep divided by six (06/12/14). Build No. 14-07-08.
12. Control an input reported flags are hardcoded. The control data and input data are always reported to the *.rpt file (06/12/14). Build No. 14-07-08.
13. The Ponded Area array and Allow Ponding switch were hardcoded. The Allow Ponding switch is on and the Ponded Area is equal to the FLO-2D grid cell size. The pressure head at a node can be above the invert elevation + maximum depth and it is calculated by SWMM 5. In this case either flooding or ponding will only occur when the water depth computed at the node in question exceeds some maximum level. This level equals the sum of the Maximum Depth plus any Surcharge Depth when the node can't pond but just the Maximum Depth when the node can pond. The node cannot pond when it has zero Ponded Area or the Allow Ponding option was turned off (06/12/14). Build No. 14-07-08.
14. An -1#IO expression was found at the *.rpt output file on one inlet on a large project. This expression means undetermined division and it is a division by zero. The problem was identified on the expression that calculates the change in the node depth (dy) in the dynamic wave routing. The surface area on the node was being reset to 0 and a division by zero was triggering the issue. The problem was solved by setting to zero the change in the nodal depth when the surface area is equal to zero (06/12/14). Build No. 14-07-08.
15. FLO-2D WSE at outfall nodes were revised following the criteria discuss in the FLO-2D SWMM Guidelines (06/12/14). Build No. 14-07-08.

16. Simulation options: Start Analysis (time and date) and End Analysis (time and date) are automatically set based on the simulation time SIMUL in CONT.DAT file (11/4/2014). Build No. 14-11-08.
17. FLO-2D storm drain model crashed when the kinematic wave option was specified. This was fixed (11/4/2014). Build No. 14-11-08.
18. FLO-2D storm drain model was not holding the tailwater BC (outfall) on a specific case where the head in the upstream node of the conduit was higher than the head at the outfall node (12/1/14). Build No. 14-11-09.
19. A volume conservation issue was fixed on the channel component. The flow flowing backwards on the pipeline system through an outfall was incorrectly added to the CHVOLUME.OUT files (12/1/14). Build No. 14-11-09.
20. An -1.#QO expression was found at the *.rpt output file on one inlet on a large project. The problem was identified on the expression that initializes the nodal surface area in the dynamic wave routing. (01/23/15). Build No. 14-11-09.
21. An -1.#QO expression was found at the *.rpt output file on one inlet on a large project. The problem was identified on the expression that initializes the nodal surface area in the dynamic wave routing. (01/23/15). Build No. 14-11-09.
22. The SWMM.RPT file was modified to report all Highest Continuity Errors and Highest Flow Instability Indexes instead of just the first 10 errors (5/4/2015) Build No. 15.07.12.
23. The transfer of the outfall hydrographs from the storm drain system to the surface water system was inconsistent. The problem arose from multiple reporting conditions for outfalls nodes versus inlet nodes (5/5/2015). Build No. 15.07.12.
24. Oscillation flow in the storm drain inlet hydrograph was observed when the orifice equation was used. The discharge was reset to zero for some orifice conditions and generated spikes in the inlets (5/5/2015). Build No. 15.07.12.
25. Uniform flow in the storm drain inlet hydrograph was observed when the orifice equation was used. The discharge was hold after the peak for some orifice conditions and generated uniform flow in the inlets (5/10/2015). Build No. 15.07.12.
26. New storm drain returning approach has been implemented (06/10/15). Build No. 15-07-12.
27. Manhole subroutine was revised and modifies to correctly work with the new storm drain returning approach (06/10/15). Build No. 15-07-12.
28. An inconsistency in the transfer of parameters between the FLO-2D surface layer and the storm drain component was identified. This produces zero flow been routed in the storm drain system for some conditions in metrics (06/05/15). Build No. 15-07-12.
29. FLO-2D WSE at inflow and outfall nodes were revised following the criteria discuss in the FLO-2D SWMM Guidelines (06/05/15). Build No. 15-07-12.
30. Surcharge depth is assigned equal to 500 ft for junctions in the storm drain system. They are connections between pipes that should not flood. Inlet surcharge is equal to zero unless users set up something different in the SWMMFLO.DAT or in the SWMM.INP (06/05/15). Build No. 15-07-12.
31. Dampen Conditions for the Storm Drain Inflow was imposed to reduce inflow oscillations at inlets (10/22/15). Build No. 15-10-13.

32. Flooding results were averaged over the report timestep (10/22/15). Build No. 15-10-13.
33. Revisions for the inlet discharge and the flooding were made for those inlets under pressure conditions (10/22/15). Build No. 15-10-13.
34. The Storm Drain model was modified to write results to the SWMM.rpt and to the SWMM.out file when the user terminates the FLO-2D simulation early and before the total simulation time is reached (6/27/16). Build No. 16-06-15.
35. The timesteps between the surface water and storm drain engines were synchronized. The two systems now communicate on FLO-2D computational timestep basis. The storm drain system uses the smaller FLO-2D computational timestep for the water volume exchange as well as for the flow routing through the pipe system. With the more frequent water volume exchange at each FLO-2D computational timestep, the inconsistencies with the exchange volumes between the surface water and storm drain systems were eliminated. The storm drain routing timestep is defined using the following criteria:

    - If the user set up a fixed storm drain timestep instead of a variable timestep in the *.inp file for the storm drain system, then the FLO-2D timestep is used as the routing storm drain timestep.
    - If the user set up the switch for a variable timestep with an adjustment factor in the *.inp file, an internal variable time step is calculated using the selected adjustment factor that functions as a courant number. In the model enhancement, a variable timestep is calculated using the adjustment criteria. FLO-2D surface timestep is compared with the storm drain variable timestep, and the minimum timestep between them is imposed. If the storm drain minimum timestep is not multiple of the FLO-2D timestep, then a new minimum storm drain timestep is calculated with the condition that it has to be less than the variable timestep calculated by the Courant criteria in the dynamic wave routine, but it must be a multiple of the FLO-2D timestep.

    In most of the simulations, the FLO-2D timesteps are small enough for the storm drain solution to converge. If the user observes numerical instabilities in the storm drain results, it is recommended to use the variable timestep with an adjustment factor. The variable time step is calculated using the Courant condition for each conduit (6/27/16). Build No. 16-06-15.
36. When the storm drain flow reaches the soffit of a drop box, the pressure head dampening method is applied for a distance above the invert of 1.25 times the conduit pipe diameter. The surface area is exponentially reduced to the drop box diameter as the flow fills the drop box over this prescribed distance. To more effectively represent the physical system, the pressure head dampening algorithm was to allow the pressure head variation up to be exponentially reduced over to entire drop box to the RIM elevation (6/27/16). Build No. 16-06-15.
37. A new file SDManholePopUp.OUT was created when at least one manhole pops under pressure in the storm drain system (6/27/16). Build No. 16-06-15. This file contains the following information:
    - Manhole ID.
    - Time of occurrence
    - Pressure head

- Rim elevation + Surcharge Elevation
- FLO-2D WSE.

38. A storm drain blockage method was implemented using a clogging factor to simulate the reduction of the inlet capacity (6/27/16). Build No. 16-06-15. A new data input file (SDCLOGGING.DAT) was created with the following format:

ID	Grid Cell	Inlet ID	Clogging Factor - C_f (%)	Time for clogging -T_c (hr)
D	2694	I1	25	0.50
D	2409	I2	50	3.25

The inlet discharge calculated using the orifice or weir equations is subject to a reduction at the time for clogging specified by the user. The inlet discharge is calculated and then reduced using the clogging factor using the following equation:

$$Q_R = (1\text{-}C_f)\, Q_c$$

where:

Q_R = reduced inflow discharge

C_f = clogging factor

Q_c= calculated discharge using the orifice/weir equations.

39. The StormDrain_ERROR.CHK file contains all the Storm Drain errors and warnings. They were remove from the ERROR.chk (6/27/16). Build No. 16-06-15.

40. Revision of error and warning messages: Existing errors and warnings for the storm drain system were reviewed and some warnings/errors were expanded. Those error/warnings related to conflicts between storm drain features and surface components as well as the outfall elevations checks were revised. (6/27/16). Build No. 16-06-15.

41. Additional error/warning messages: Additional error checking includes pipe and junction connection elevations. Potential errors are reported to the StormDrain_ERROR.CHK file. Conduit elevations are also checked to avoid errors in the inlet and outlet offset data. (6/27/16). Build No. 16-06-15. The following message is written for a pipe and junction connection elevations error:

    THERE ARE CONDUIT ELEVATIONS WITH POTENTIAL ERRORS THAT CAN GENERATE CONNECTION ELEVATIONS ISSUES WITH NODES. PLEASE CHECK OFFSET ELEVATIONS FOR CONDUITS AND INVERT ELEVATIONS AND MAX DEPTHS FOR NODES."

42. Revisions were implemented to surface water and storm drain codes to improve the storm drain volume conservation reporting. The storm drain engine volume conservation typically ranges from 0.01 percent to 10 percent, although the goal is to achieve a volume conservation error of 0.1 percent or less. An improvement in the volume conservation reporting was achieved since the system capacity and inflow discharge are known exactly. Some volume conservation losses in the storage assessment were identified and fixed with verification test cases (6/27/16). Build No. 16-06-15. Some of the revisions that were implemented to the FLO-2D surface and storm drain codes are highlighted:

- For real number arrays, the data accuracy was increased from single precision (8 digits) to double precision (16 digits) to calculate the inflow discharge, returning flow, elevations, pressure head, and others.
- The return flow from the storm drain to the surface water was improved. The excess volume, remaining piping volume, pressure head and depth calculations were enhanced for the following two conditions:

  RIM < PH > FLO-2D WSE

  RIM < PH < FLO-2D WSE
- Some reported volumes were removed from the SUMMARY.OUT file because the recent code modifications.

43. New volumes are reported in the SUMMARY.OUT file (6/27/16). Build No. 16-06-15.

    a. STORM DRAIN SYSTEM STORAGE: storage volume in the pipe system at the end of the simulation.

    b. STORM DRAIN MASS BALANCE: mass balance volume conservation calculated as:

    Total Inflow - Total Outflow - Total Storm Drain Return Flow - Storm Drain System Storage
44. Pathname of the FLO-2D Storm Drain Projects was increased up to 254 characters. There is an intrinsic limitation (256 characters) in one of the functions that is used in C++ to open the inp/rpt files (3/20/16). Build No. 16-06-16.
45. The check for consistency between the SWMM.INP and the SWMMFLO.DAT files were extended for projects with and without subcatchments. The model will stop running if the number of features is different between the INP file and the SWMMFLO.DAT files and an error message will be written in the STORMDRAIN_ERROR.CHK (1/30/18). Build No. 18-01-18.
46. The manhole flooding calculation was modified when PH > FLO-2D WSE > RIM. The return flow to the surface water is equal to the flow volume in the timestep minus the volume in the vertical pipe (catchment basin or drop box). This volume fills the vertical pipe to the RIM elevation and originally did not include the volume in the pipe from the previous timestep. The revision ensures that all available return volume is transferred to the surface. The reported results now indicate an increase in the manhole return flow manhole node to the surface water for some verification cases as it was expected. (1/30/18). Build No. 18-01-18.
47. The calculation sequence for the two return flow cases: PH > FLO-2D WSE > RIM and FLO-2D WSE > PH > RIM was modified so that the return volume that leaves the storm drain system and enters the surface water is now deleted in the same computational loop where the PH and flooding is calculated for each node and timestep, volume stays in the vertical pipe until it is routed through the SD system or the PH rises above the FLO-2D WSE and then it is exchanged to the surface water. For the case where the FLO-2D WSE > PH > RIM, and the downstream pipe on the inlet has negative velocity (backwater effects in the pipe), the inlet inflow from surface is set up equal to zero regardless the

FLO-2D WSE, this was done to avoid fluctuations in the system. (1/30/18). Build No. 18-01-18.

48. The FLO-2D Storm Drain inflow and return flow reported in the SWMM.RPT, SWMMOUTFIN.OUT and SWMMQIN.OUT were modified so that they do not represent instantaneous results but rather are average results over the output interval (1/30/18). Build No. 18-01-18.

49. Revisions were made to the SUMMARY.OUT to make sure it correctly reports the total return flow to the surface (1/30/18). Build No. 18-01-18.

50. Revisions were made to the STORMDRAIN_ERROR.CHK and ERROR.CHK files and specifically to the warning and error messages for conflict between components (1/30/18). Build No. 18-01-18.

51. The calculation of volume in the vertical and horizontal pipes (drop-box) were reviewed, improvements in the final volume conservation of the FLO-2D Storm Drain model can be expected with this version (1/30/18). Build No. 18-01-18.

52. The following warning error was added to the STORMDRAIN_ERROR.CHK file: 'INLETS IN SWMMFLO.NEW FILE HAS BEEN ORDERED ACCORDING TO THE JUNCTION TABLE IN THE SWMM.INP, REVIEW SWMMFLO.NEW FILE AND RENAME IT AS SWMMFLO.DAT FILE.'. Those projects with no subcathments where the inlet order is different between the SWMM.INP [JUNCTION] table and the SWMMFLO.DAT file will show this message. The user needs to review the SWMMFLO.NEW file and renamed as SWMMFLO.DAT file. (8/30/18). Build No. 18-09-19.

53. The calculation of return flow was enhanced, this produce an enhancement in the calculations and a reduction in the volume conservation of the FLO-2D Storm Drain models (3/30/18). Build No. 18-12-20.

54. A Volume Conservation issue was fixed for a specific configuration of a storm drain system that was preventing one storm drain inlet to be reset to 0 when the surface depth was less than TOL. Volume that get into the storm drain system was larger than the total surface inflow. Verification cases and other projects do not show this problem. (5-13-2019). Build No. 18.12.20.

55. OpenMP was implemented in 10 Storm Drain subroutines and functions that include: initialization of the dynamic wave routine, calculation of areas in the conduits, convergence of the solution, the calculation of pipe capacity, the solution of the momentum and continuity equations, and the flow routing statistic calculations for each iteration. (7-23-2019). Build No. 18.12.20.