

WSRC-TR-2002-00470 (U)

**STREAM II-V4: Revision for STREAM II-V3 to Allow
Mouse-Driven Selection of Release Location from a Graphical
User Interface (U)**

Kuo-Fu Chen
Gary L. Snyder

Savannah River Technology Center

Publication Date: October 9, 2002

DOES NOT CONTAIN
UNCLASSIFIED CONTROLLED
NUCLEAR INFORMATION

ADC &
Reviewing
Official:

A. L. Boni

Date: 10-25-02

**Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808**

This document was prepared in connection with work done under Contract No. DE-AC09-96SR18500
with the U. S. Department of Energy

This document was prepared in conjunction with work accomplished under Contract No. DE-AC09-96SR18500 with the U. S. Department of Energy.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced directly from the best available copy.

**Available for sale to the public, in paper, from: U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161,
phone: (800) 553-6847,
fax: (703) 605-6900
email: orders@ntis.fedworld.gov
online ordering: <http://www.ntis.gov/help/index.asp>**

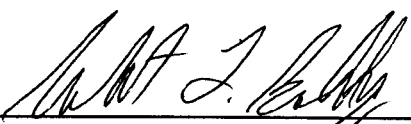
**Available electronically at <http://www.osti.gov/bridge>
Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from: U.S. Department of Energy, Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831-0062,
phone: (865)576-8401,
fax: (865)576-5728
email: reports@adonis.osti.gov**

DOCUMENT: WSRC-TR-2002-00470

TITLE: STREAM II-V4: Revision for STREAM II-V3 to Allow Mouse-Driven Selection of Release Location from a Graphical User Interface (U)

TASK:

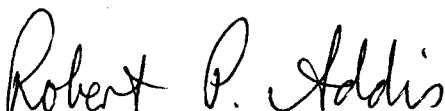
TECHNICAL REVIEW



Robert L. Buckley
SRTC/Measurement Technology Department/Nonproliferation Technologies Section

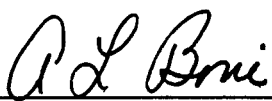
Date: 10/22/2002

APPROVALS



R. P. Addis, Manager, ATG
SRTC/Measurement Technology Department/Nonproliferation Technologies Section

Date: 10/22/2002



A. L. Boni, Manager, NTS
SRTC/Measurement Technology Department/Nonproliferation Technologies Section

Date: 10-25-02

(Blank Page)

ABSTRACT

STREAM II-V3 is an aqueous transport module of the Savannah River Site emergency response Weather INformation Display (WIND) system. STREAM II-V3 predicts peak concentration and peak concentration arrival time at downstream locations for releases from the SRS facilities to the Savannah River. Fifteen pre-determined potential release locations from SRS facilities were built into the current STREAM II-V3 model. Therefore, STREAM II-V3 can not be used for situations in which release locations differ from the fifteen pre-determined locations. To eliminate this limitation, STREAM II-V3 was upgraded. The revised STREAM II-V4 allows users to select the release location anywhere along the specified SRS main streams or the Savannah River by mouse clicking on a map displayed on the computer monitor.

TABLE OF CONTENTS

1. Introduction	1
2. Implementation	1
2.1 Determination of the Stream Model Receiving the Discharge	1
2.2 Determination of the Computational Node Receiving the Discharge	2
3 Conclusion	2
References	3
Appendix 1	16

LIST OF TABLES

Table 1. Mapping between the Stream Models and the Shapefile Points on the Map	4
--	---

LIST OF FIGURES

Figure 1. STREAM II-V3 User Interface Screen for Data Input	5
Figure 2. Shapefile Points Representing the Segment Center in Red	6
Figure 3. Model Schematics for Savannah River (not to scale)	7
Figure 4. Model Schematics for Upper Three Runs Creek (not to scale)	8
Figure 5. Model Schematics for McQueen Branch (not to scale)	9
Figure 6. Model Schematics for Tims Branch (not to scale)	10
Figure 7. Model Schematics for Beaver Dam Creek (not to scale)	11
Figure 8. Model Schematics for Fourmile Branch (not to scale)	12
Figure 9. Model Schematics for Pen Branch (not to scale)	13
Figure 10. Model Schematics for Steel Creek (not to scale)	14
Figure 11. Model Schematics for Lower Three Runs Creek (not to scale)	15

(Blank Page)

1. Introduction

STREAM II-V3 [1] is an aqueous transport module of the Savannah River Site emergency response Weather INformation Display (WIND) system [2]. STREAM II-V3 predicts peak concentration and peak concentration arrival time at downstream locations for releases from the SRS facilities to the Savannah River. Fifteen pre-determined potential release locations from SRS facilities were built into the current STREAM II-V3 model, as shown in Figure 1. Therefore, STREAM II-V3 can not be used for situations in which release locations differ from the fifteen pre-determined locations. To eliminate this limitation, STREAM II-V3 was upgraded. The revised STREAM II-V4 allows users to select the release location anywhere along the specified SRS main streams or the Savannah River by mouse clicking on a map displayed on the computer screen.

2. Implementation

STREAM II solves a finite difference approximation of the transport equation for a model network that represents the important characteristics of the real water body. The model network divides the real water body into segments. Each segment represents a computational node. The idea is to develop a procedure to map the mouse selected release location to the computational model. The mapping procedure is presented next.

2.1 Determination of the Stream Model Receiving the Discharge

The STREAM II graphic user interface map, shown in Figure 1, is based on data from the ArcView GIS system [3]. ArcView GIS is a desktop computer based geographic information system. ArcView GIS displays the geographic features on a map and stores information about the features in a database and links the information to the features. This information is referred to as attribute information. ArcView GIS uses three basic shapes (point, line and polygon) to represent geographic features. For example, ArcView GIS represents buildings as points, streams as lines, and countries as polygons. The file structure of ArcView GIS to store the location, shape and attribute information of a geographic feature is referred to as a shapefile. Figure 2 shows the onsite main streams and part of the Savannah River. ArcView GIS was used to develop a point shapefile along the SRS main streams and the Savannah River, shown in red points in Figure 2. Each point has a unique identification number and a map coordinate (attribute information), as shown in Appendix 1. These points correspond to the center of the model segment. The distance between the points is 500 meters except the points for Fourmile Branch. The distance between the points for Fourmile Branch is 150 meter [4]. There are 928 points. Table 1 shows the mapping relationship between the stream models and the shapefile

point IDs. For instance, point numbers 1 to 550 correspond to the Savannah River model segments. Successively higher number points correspond to other major streams within SRS.

When a user selects a release location by clicking the mouse at the map on the screen, the coordinates of that location are passed to the computer code. The distances between the mouse selected location and the shapefile points are calculated. The shapefile point that has the shortest distance (closest to the mouse selected location) is selected to receive the discharge. Then, the stream that receives the discharge, thus the stream model, is determined from Table 1. It is very important to note that this assumption is limited to the situation that the selected location is very close to the streams. If the selected location is far away from the streams, the topographic shape of the surface instead of the shortest distance will control the flow direction of the released material.

2.2 Determination of the Computational Node Receiving the Discharge

Figure 3 to 11 shows the computational model for the Savannah River, Upper Three Runs Creek, McQueen Branch, Tims Branch, Beaver Dam Creek, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs Creek, respectively. For a given shapefile point ID and stream model, the computational node that receives the discharge is determined from Table 1.

The selected stream model and the receiving node are used in the transport calculation.

3. Conclusion

The release locations in STREAM II-V3 are pre-determined. Therefore, STREAM II-V3 can not be used for situations in which releases occur at sites other than the pre-determined locations. To eliminate this limitation, STREAM II-V3 was upgraded to handle releases to the SRS main streams and the Savannah River for points other than the pre-determined locations. The revised STREAM II-V4 allows users to select the release locations anywhere along the specified SRS main streams and the Savannah River by mouse clicking at the map shown on the computer screen. It is assumed that the shapefile point with the shortest distance to the mouse selected location is selected to receive the discharge. Therefore, it is very important to note that this assumption is limited to the situation that the selected location is very close to the streams. If the selected location is far away from the streams, the topographic shape of the surface instead of the shortest distance will control the flow direction of the released material.

References

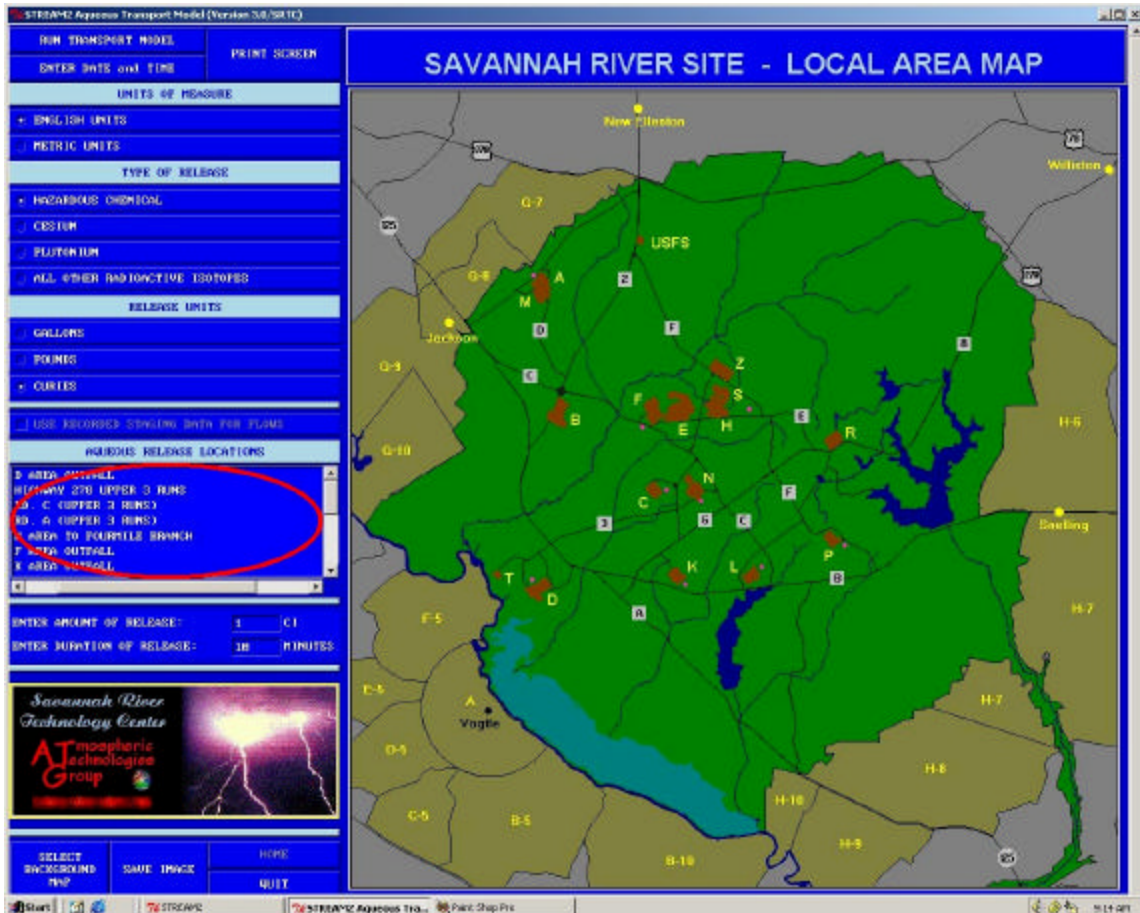
1. Chen, Kuo-Fu, “STREAM II-V3: Revision for STREAM II-V2 to Include the Sedimentation Effects on a Release from H-Area (U),” WSRC-TR-2001-00539, Savannah River Site, December 1, 2001.
2. Hunter, C. H., “Weather Information and Display (WIND) System User’s Manual,” WSRC-TM-90-14, Savannah River Site, 1990.
3. ArcView GIS Version 3.0a, Copyright ©, Environmental Systems Research Institute, Inc.
4. Chen, Kuo-Fu, “STREAM II for SRS Aqueous Release Emergency Response (U),” WSRC-TR-98-00234, Savannah River Site, June, 1998.

Table 1 Mapping Between the Stream Models and the Shapefile Points on the MAP

	Shapefile Points		Computational Nodes		
	Point ID		Node ID		
	From	To	From	To	Note
Savannah River	1	550	1	550	(1)
Upper Three Runs Creek	551	617	553	619	(2)
McQueen Branch	618	626	621	629	(3)
Tims Branch	627	644	621	638	(4)
Beaver Dam Creek	645	656	553	564	(5)
Fourmile Branch	657	797	553	693	(6)
Pen Branch	798	839	553	594	(7)
Steel Creek	840	856	553	569	(8)
Lower Three Runs Creek	857	928	553	624	(9)

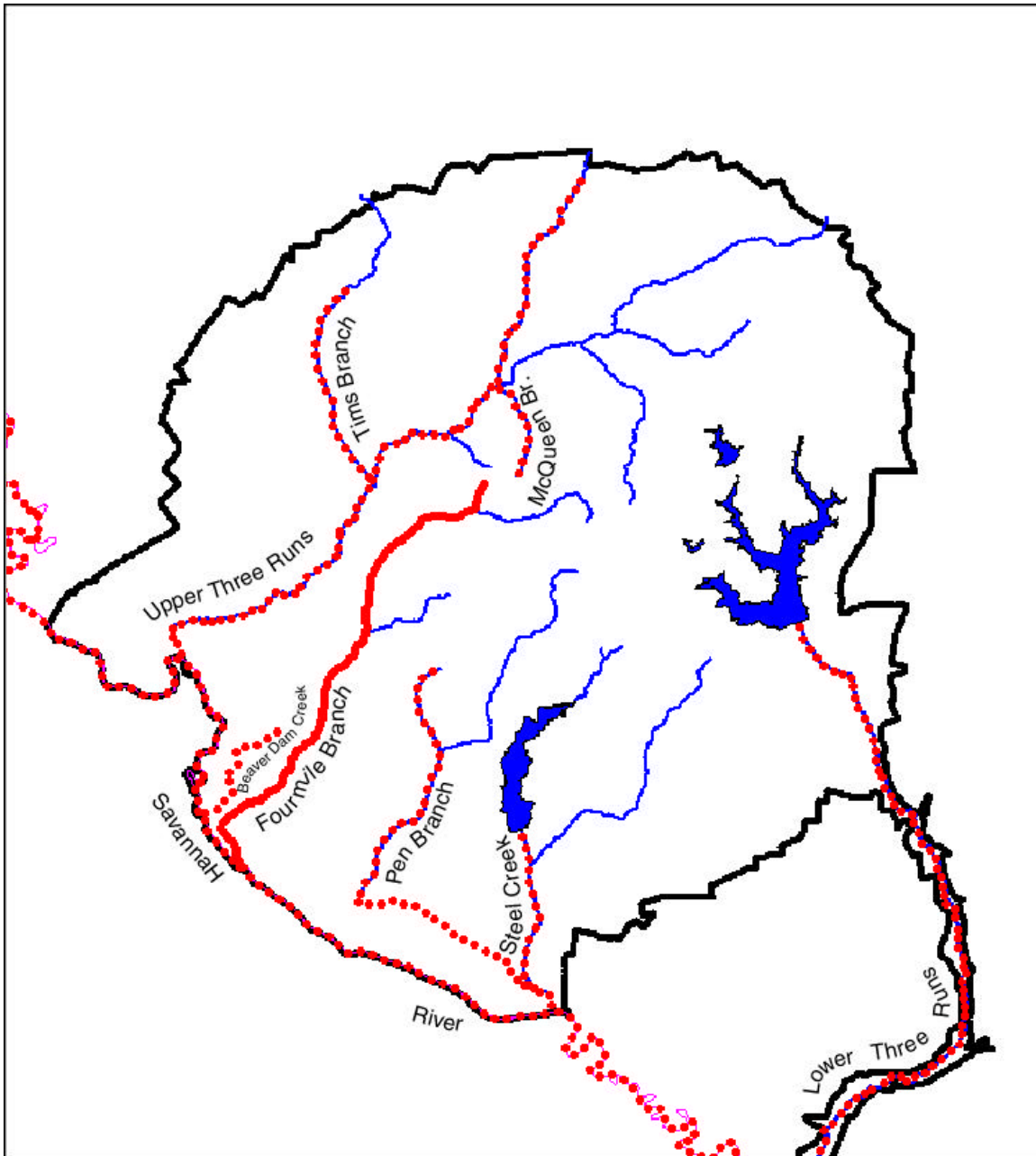
- (1): Refer to Figure 3
- (2): Refer to Figure 4
- (3): Refer to Figure 5
- (4): Refer to Figure 6
- (5): Refer to Figure 7
- (6): Refer to Figure 8
- (7): Refer to Figure 9
- (8): Refer to Figure 10
- (9): Refer to Figure 11

Figure 1 STREAM II-V3 User Interface Screen for Data Input



The pre-defined release locations are circled in red color.

Figure 2 Shapefile Points Representing the Segment Center Shown in Red



Note: The space between the points is 500 meters except the points for Fourmile Branch. The space between the points for Fourmile Branch is 150 meters.

Figure 3

Model Schematics for Savannah River (not to scale)

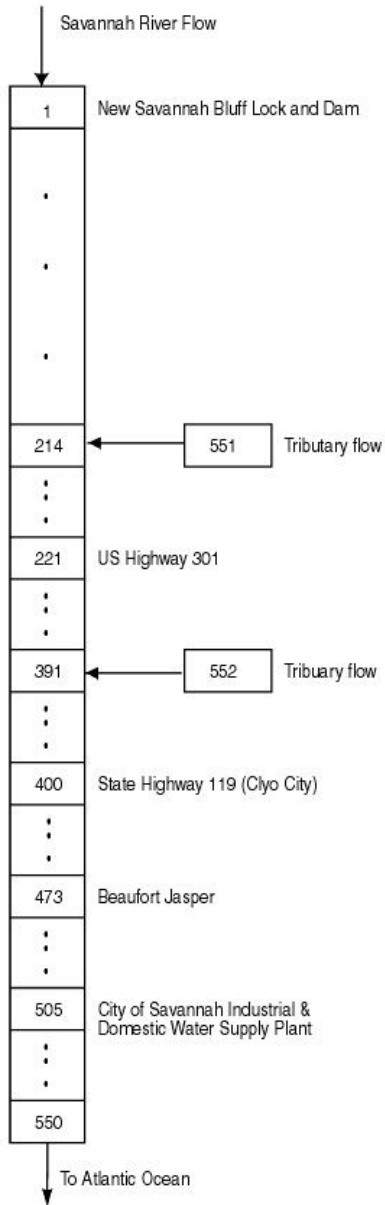


Figure 4
Model Schematics for Upper Three Runs Creek (not to scale)

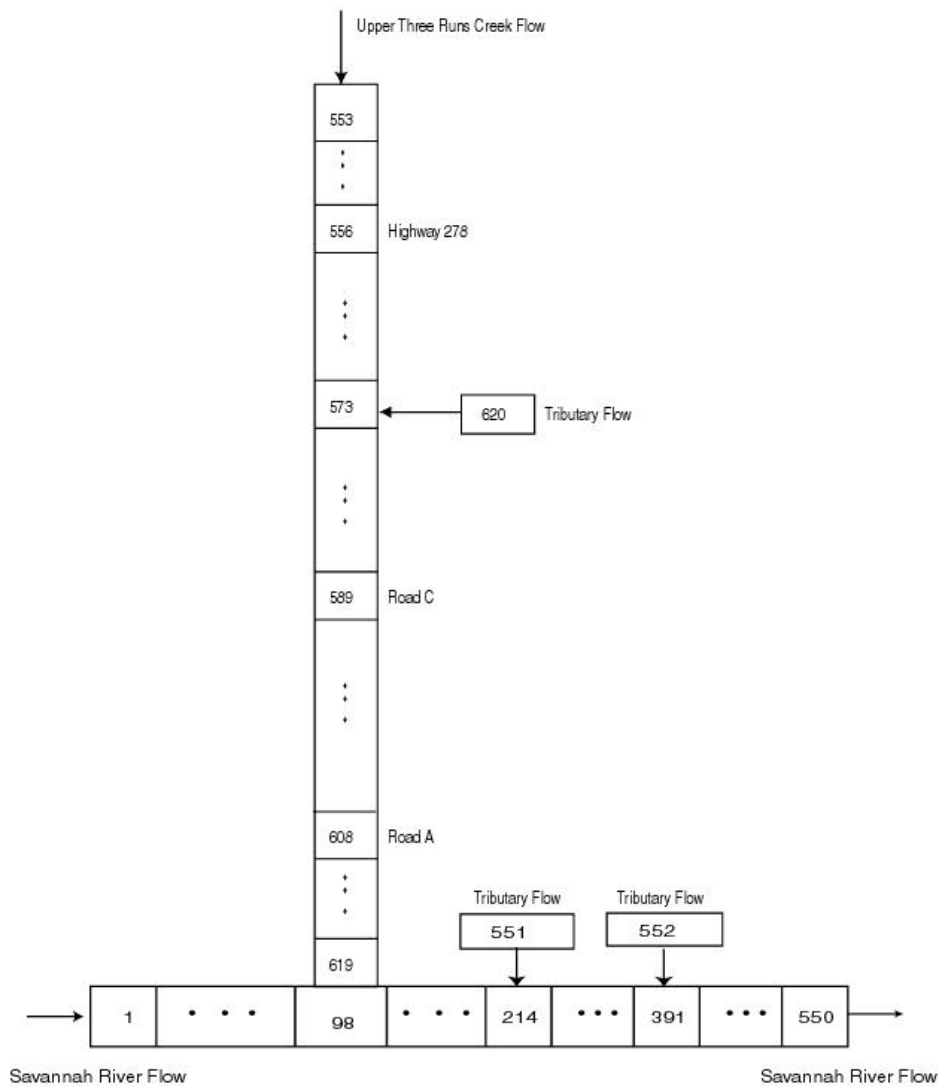


Figure 5
Model Schematics for McQueen Branch (not to scale)

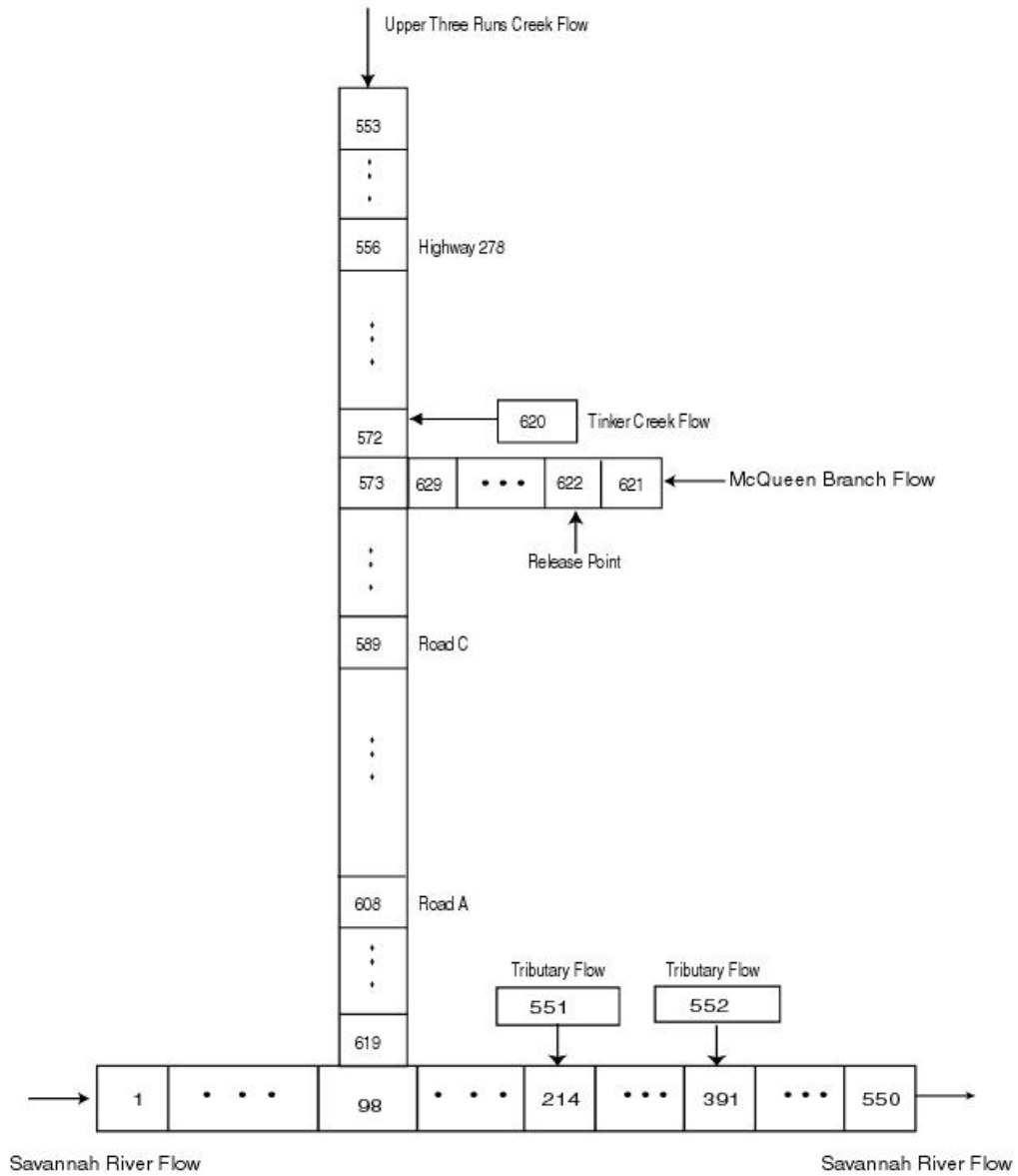


Figure 6

Model Schematics for Tims Branch (not to scale)

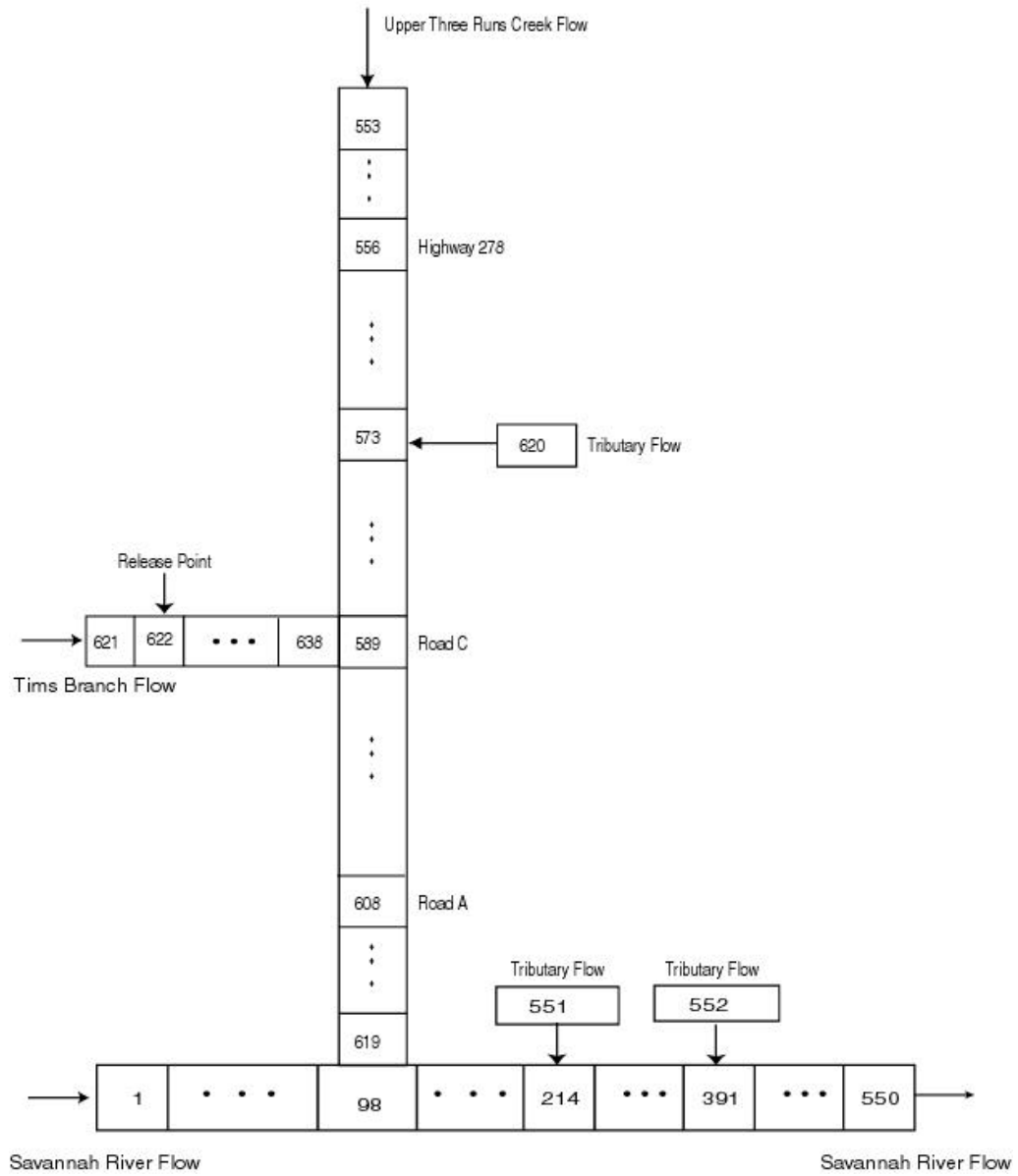


Figure 7

Model Schematics for Beaver Dam Creek (not to scale)

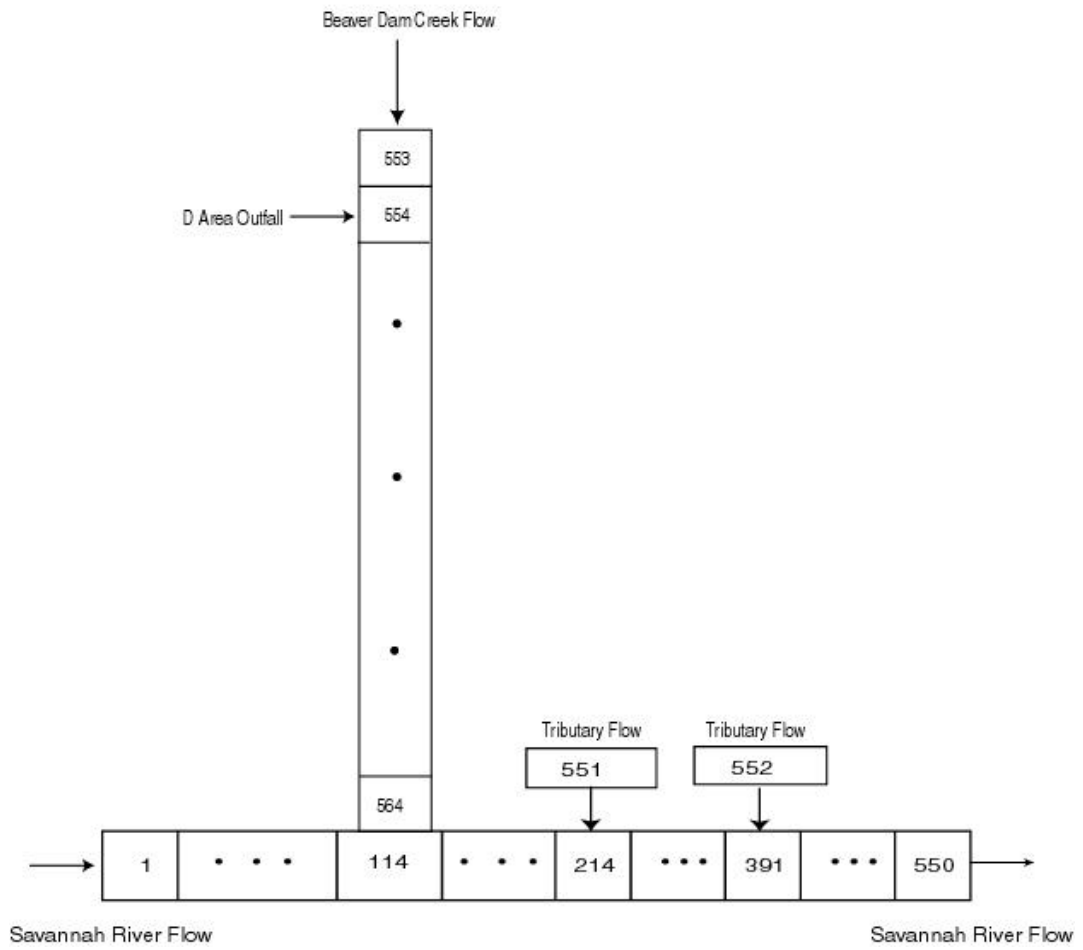


Figure 8

Model Schematics for Fourmile Branch (not to scale)

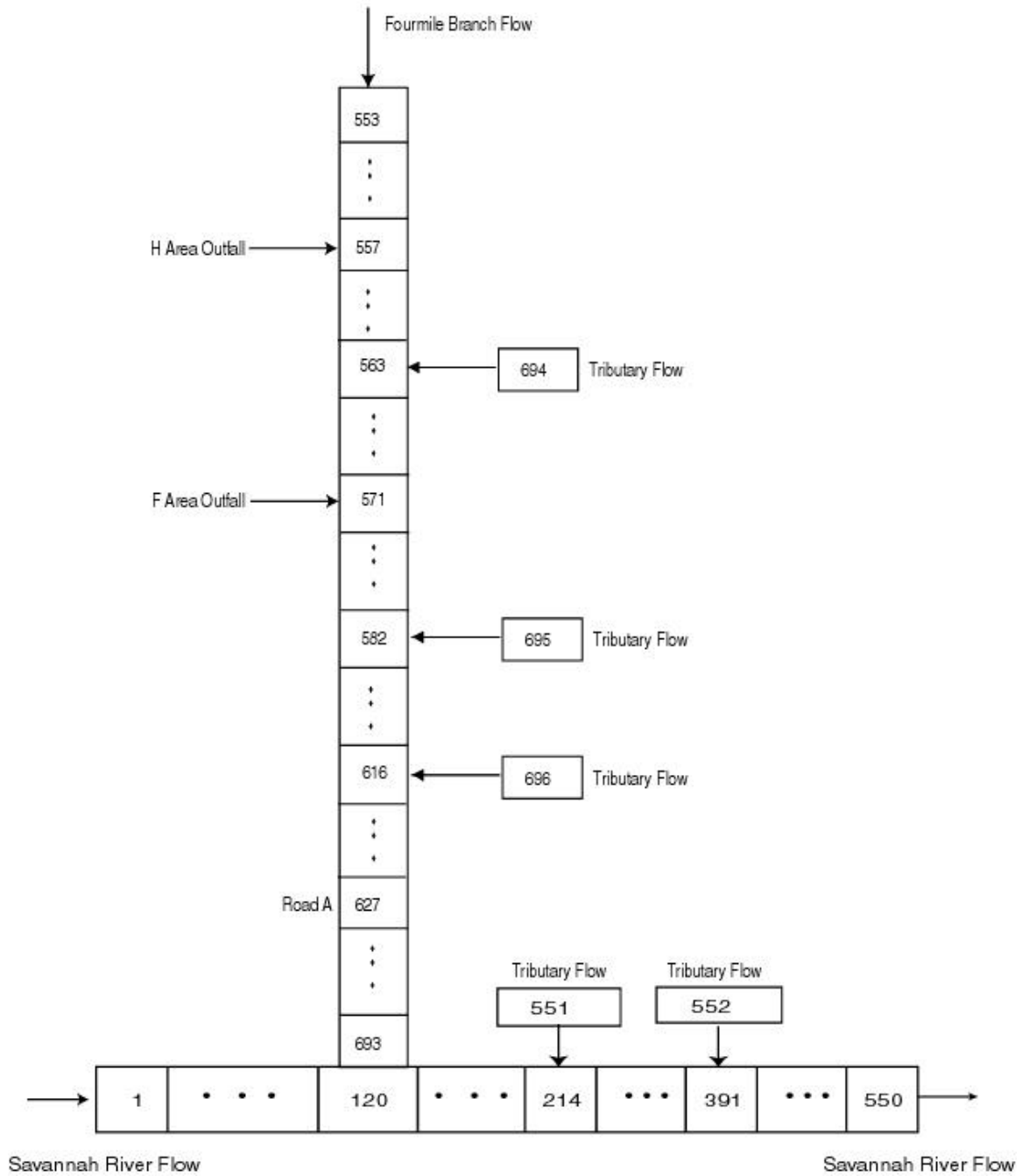


Figure 9
Model Schematics for Pen Branch (not to scale)

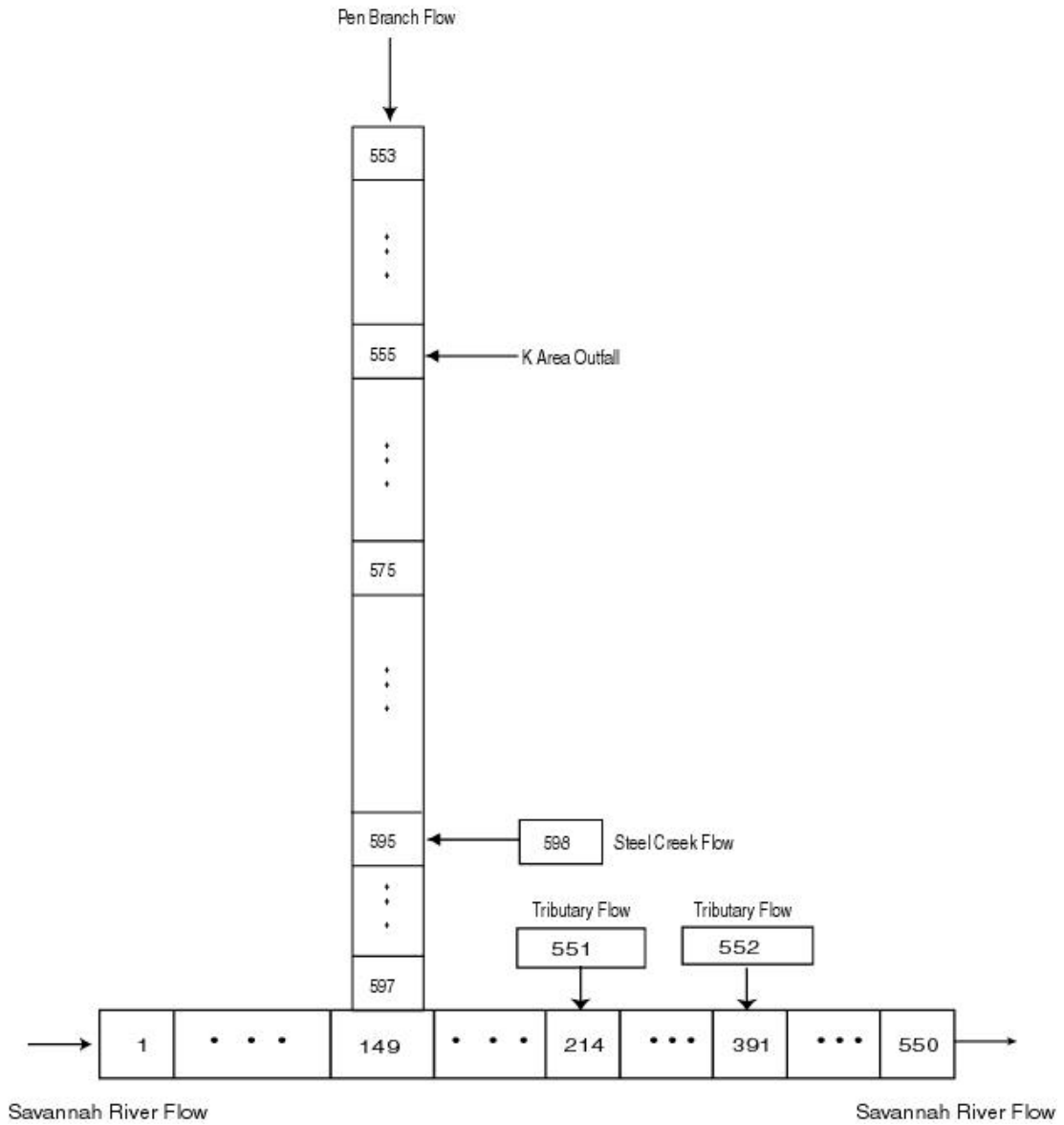


Figure 10

Model Schematics for Steel Creek (not to scale)

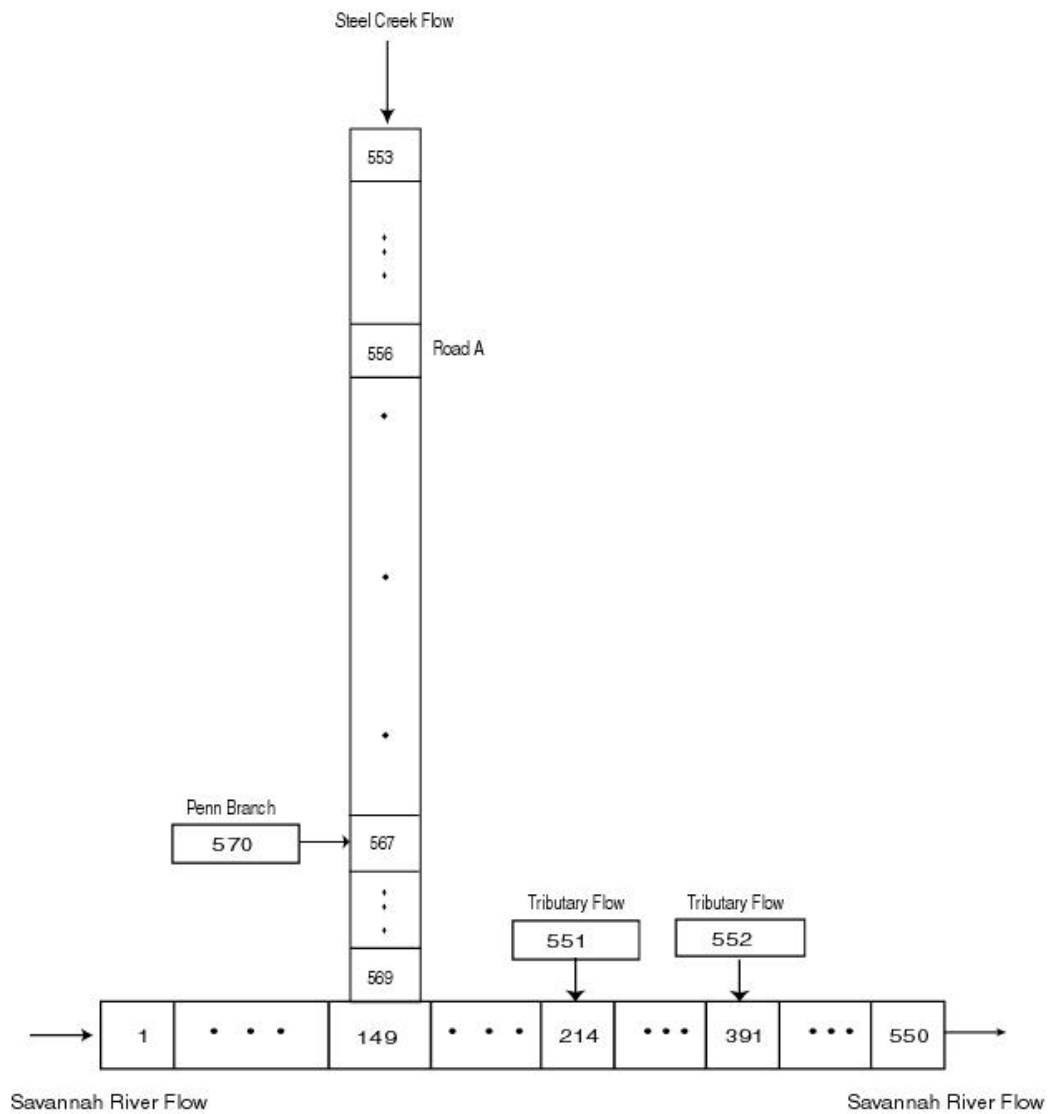
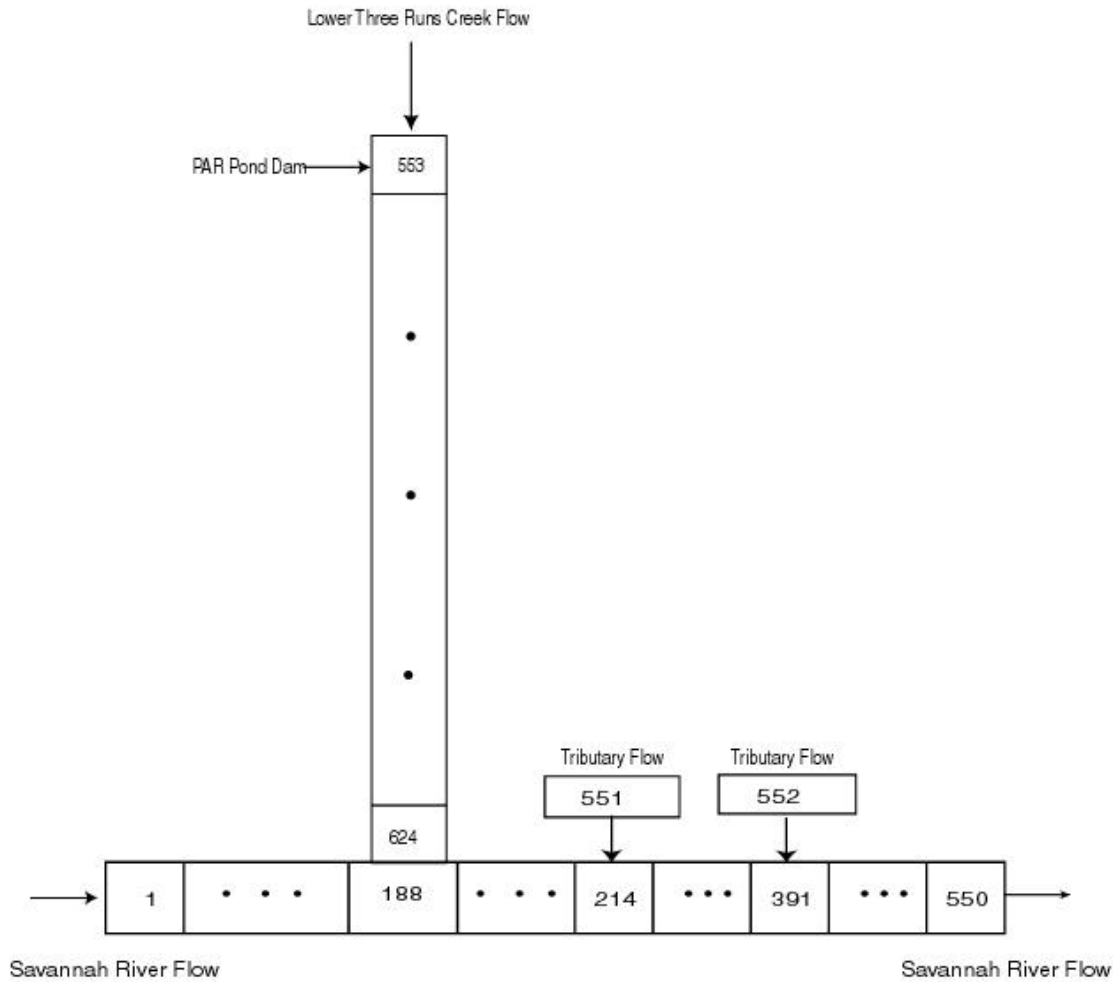


Figure 11

Model Schematics for Lower Three Runs Creek (not to scale)



Appendix 1 Shape File Points (Coordinates of the Segment Center)

Shape File Point ID	Coordinate in Lambert Projection for SRS		Coordinate in Lambert Projection for Southeast US	
	Longitude m	Latitude m	Longitude m	Latitude m
1	112170.60	41685.52	2418221.88	1216791.89
2	111867.51	41333.40	2417998.14	1216385.06
3	111998.93	40860.43	2418224.21	1215949.68
4	112319.51	40480.24	2418616.11	1215644.06
5	112719.03	40184.14	2419067.86	1215436.93
6	112984.89	39782.50	2419410.68	1215099.04
7	112823.16	39323.66	2419347.20	1214617.00
8	112498.30	38954.57	2419105.67	1214189.07
9	112639.32	38531.28	2419330.89	1213804.25
10	113128.76	38481.39	2419819.78	1213856.43
11	113596.26	38639.74	2420244.26	1214107.71
12	114060.65	38578.06	2420711.09	1214143.21
13	114368.60	38184.26	2421093.48	1213821.67
14	114484.43	37994.39	2421245.91	1213659.89
15	114591.67	37859.57	2421378.60	1213550.19
16	114416.04	37407.77	2421300.07	1213072.16
17	114769.02	37085.29	2421711.78	1212829.64
18	115201.89	36841.90	2422185.28	1212680.94
19	115474.13	36654.47	2422490.18	1212553.84
20	115692.49	36572.45	2422720.63	1212518.69
21	115933.97	37002.65	2422868.00	1212989.20
22	116110.66	37223.38	2422995.23	1213241.50
23	116398.69	37107.68	2423300.77	1213187.80
24	116442.33	36653.96	2423437.06	1212753.12
25	116262.60	36236.36	2423347.48	1212307.67
26	116677.65	36047.76	2423792.27	1212208.90
27	117143.97	36042.05	2424249.45	1212299.53
28	117003.88	35609.33	2424201.75	1211847.48
29	116986.98	35268.06	2424255.65	1211510.26
30	117422.63	35494.20	2424635.00	1211821.31
31	117849.02	35431.47	2425064.91	1211847.96
32	117808.58	34962.87	2425122.07	1211381.37
33	117619.42	34537.36	2425024.90	1210926.23
34	117854.73	34122.85	2425340.56	1210569.44
35	118134.08	33918.42	2425655.93	1210427.19
36	118369.25	34353.27	2425796.15	1210900.96
37	118692.87	34722.42	2426036.43	1211328.74
38	119003.77	35107.52	2426260.98	1211769.49
39	119405.52	34963.95	2426683.47	1211712.02
40	119515.07	34480.62	2426890.36	1211261.98
41	119449.82	33996.78	2426926.42	1210775.37
42	119763.60	33960.36	2427240.78	1210804.52
43	120071.21	34323.46	2427466.64	1211223.09
44	120329.49	34737.64	2427633.73	1211681.41
45	120745.66	34517.74	2428086.08	1211552.28
46	121132.21	34237.38	2428521.96	1211357.91
47	121046.64	33798.94	2428528.78	1210911.49
48	120902.77	33658.26	2428417.13	1210744.23
49	120744.38	33532.82	2428288.14	1210588.87
50	120611.71	33494.01	2428166.41	1210523.53
51	120138.71	33542.56	2427693.84	1210473.37
52	119723.11	33338.08	2427329.62	1210187.63

53	119717.88	32851.44	2427424.95	1209710.66
54	119566.85	32381.21	2427374.32	1209219.64
55	119856.45	32001.13	2427735.97	1208907.73
56	120326.42	31838.81	2428229.07	1208846.00
57	120819.14	31762.74	2428726.62	1208873.31
58	121257.03	31758.21	2429155.78	1208959.27
59	121335.27	31292.41	2429328.44	1208519.90
60	121623.81	30896.59	2429692.33	1208192.38
61	121846.61	30664.14	2429958.19	1208011.06
62	122037.28	30577.91	2430162.46	1207966.09
63	122153.91	30429.19	2430307.21	1207844.73
64	122161.60	29937.38	2430416.27	1207365.35
65	122089.19	29616.86	2430411.63	1207036.96
66	121961.55	29508.53	2430309.16	1206904.67
67	121784.63	29483.22	2430141.37	1206843.39
68	121504.94	29822.22	2429797.86	1207117.17
69	121050.42	29862.01	2429345.16	1207062.26
70	121010.36	29394.64	2429402.45	1206596.92
71	121157.70	28929.21	2429642.63	1206172.18
72	121624.17	28795.58	2430126.41	1206137.78
73	121540.06	28468.92	2430111.58	1205800.96
74	121073.78	28319.50	2429686.42	1205558.57
75	120607.36	28274.78	2429239.52	1205418.55
76	120537.60	27849.43	2429259.09	1204988.17
77	120873.87	27511.27	2429657.76	1204726.88
78	121128.02	27088.14	2429993.66	1204365.53
79	121572.61	26869.50	2430473.60	1204243.48
80	122002.17	26629.28	2430943.30	1204097.23
81	122355.05	26284.59	2431359.57	1203832.99
82	122665.59	25900.63	2431742.56	1203521.59
83	123018.25	25601.35	2432149.25	1203301.70
84	123491.62	25461.96	2432640.98	1203263.12
85	123928.83	25228.99	2433116.68	1203125.55
86	124397.70	25066.50	2433608.78	1203063.45
87	124632.39	24651.60	2433923.99	1202706.13
88	124640.76	24159.90	2434033.70	1202226.98
89	124871.03	23756.64	2434342.18	1201880.13
90	125356.67	23754.01	2434817.69	1201977.84
91	125825.91	23632.83	2435301.63	1201956.23
92	126267.63	23401.68	2435781.37	1201821.38
93	126757.88	23348.90	2436271.75	1201871.01
94	127244.05	23482.60	2436719.62	1202102.18
95	127524.83	23857.07	2436916.89	1202526.40
96	127398.33	24327.37	2436696.04	1202960.23
97	127210.71	24741.02	2436427.12	1203326.03
98	127665.62	24831.13	2436853.41	1203508.11
99	128046.02	24547.33	2437284.05	1203309.12
100	128397.60	24214.67	2437696.61	1203056.39
101	128510.42	23740.87	2437904.80	1202616.31
102	128695.04	23280.05	2438180.54	1202203.76
103	128811.63	22796.82	2438394.38	1201755.23
104	129197.12	22496.85	2438833.36	1201541.49
105	129355.67	22088.92	2439072.68	1201175.27
106	129118.11	21667.97	2438927.30	1200714.50
107	129003.10	21191.10	2438913.31	1200224.34
108	128533.49	21057.88	2438481.53	1199997.05
109	128395.61	20594.85	2438442.32	1199515.70
110	128638.01	20175.59	2438766.00	1199155.72

WSRC-TR-2002-00470**October 2002**

111	128495.02	19885.20	2438686.13	1198842.17
112	128274.27	19622.84	2438524.41	1198539.97
113	128460.08	19169.78	2438799.73	1198135.23
114	128424.66	18753.80	2438851.01	1197721.05
115	128727.94	18406.01	2439219.47	1197443.53
116	128800.31	17915.85	2439391.51	1196979.06
117	129142.70	17555.46	2439800.84	1196697.30
118	129445.56	17160.83	2440178.58	1196373.88
119	129757.72	16775.95	2440563.41	1196061.92
120	130167.43	16517.68	2441017.50	1195893.94
121	130444.06	16151.28	2441363.76	1195592.72
122	130777.97	15812.27	2441760.40	1195330.12
123	131196.62	15546.97	2442224.70	1195157.12
124	131591.30	15254.28	2442671.20	1194952.37
125	132000.40	14971.16	2443129.85	1194759.98
126	132352.42	14617.46	2443547.24	1194486.75
127	132658.08	14222.61	2443927.80	1194163.71
128	133080.40	13961.99	2444394.73	1193996.05
129	133533.20	13760.89	2444879.17	1193892.91
130	133901.36	13428.93	2445307.88	1193644.29
131	134274.83	13102.32	2445740.67	1193402.00
132	134763.47	13154.44	2446207.85	1193553.96
133	135234.46	13005.20	2446699.38	1193505.32
134	135704.87	12841.41	2447193.35	1193442.32
135	136179.15	12690.72	2447688.40	1193392.95
136	136652.61	12539.84	2448182.69	1193343.22
137	137071.59	12273.14	2448647.63	1193168.96
138	137519.34	12051.23	2449131.46	1193044.45
139	137986.63	11880.11	2449623.90	1192973.65
140	138436.40	11668.72	2450107.52	1192859.86
141	138838.49	11377.57	2450561.01	1192658.18
142	139177.14	11013.33	2450967.55	1192371.91
143	139572.36	10711.25	2451416.58	1192158.14
144	140017.01	10500.85	2451895.01	1192044.26
145	140510.13	10480.45	2452381.57	1192126.25
146	140992.45	10586.43	2452831.43	1192329.63
147	141483.13	10640.37	2453300.23	1192483.83
148	141976.02	10697.42	2453770.56	1192641.54
149	142465.74	10761.39	2454236.35	1192805.36
150	142919.10	10572.13	2454718.92	1192713.98
151	143158.48	10149.10	2455040.54	1192349.70
152	142997.19	9710.22	2454973.53	1191887.05
153	142752.67	9314.79	2454816.11	1191449.71
154	143015.74	9050.77	2455128.03	1191245.86
155	143429.80	9327.47	2455475.83	1191602.13
156	143708.46	9730.20	2455665.12	1192053.68
157	144008.45	9512.29	2456003.61	1191902.56
158	144246.52	9071.81	2456327.57	1191520.94
159	144063.72	8664.23	2456233.04	1191084.46
160	143648.80	8434.17	2455874.76	1190773.62
161	144047.06	8182.78	2456316.30	1190610.07
162	144532.53	8251.53	2456776.96	1190777.72
163	144963.14	8054.25	2457238.96	1190673.80
164	145304.49	7703.46	2457645.41	1190401.26
165	145561.36	7279.56	2457984.33	1190039.73
166	145916.35	6940.67	2458401.66	1189781.65
167	146365.34	6921.20	2458844.88	1189855.47
168	146630.84	6515.51	2459188.49	1189513.54

169	146893.63	6115.69	2459528.24	1189176.80
170	147321.13	6196.29	2459929.75	1189344.07
171	147683.63	6398.78	2460242.46	1189617.12
172	147772.08	5924.46	2460427.09	1189171.44
173	147443.78	5644.82	2460163.79	1188829.99
174	147149.62	5460.26	2459914.21	1188588.62
175	147551.95	5180.57	2460365.63	1188398.24
176	148009.50	4998.46	2460850.86	1188314.75
177	148488.39	4956.34	2461328.03	1188372.60
178	148766.74	5355.12	2461517.82	1188820.27
179	149182.35	5555.40	2461882.93	1189102.16
180	149378.19	5148.34	2462158.70	1188744.49
181	149519.19	4667.24	2462396.15	1188303.05
182	149871.79	4367.82	2462803.01	1188083.10
183	150290.92	4574.04	2463170.33	1188371.53
184	150634.12	4447.06	2463532.32	1188318.32
185	150684.96	3992.83	2463676.02	1187884.51
186	151033.96	3633.45	2464091.77	1187605.17
187	151432.08	3342.53	2464541.40	1187402.96
188	151921.69	3282.64	2465032.74	1187445.68
189	152320.52	3037.93	2465473.51	1187288.82
190	152215.81	2565.50	2465468.83	1186805.02
191	152473.39	2161.30	2465804.43	1186462.92
192	152422.24	1698.40	2465850.18	1185999.52
193	152212.17	1320.48	2465722.88	1185586.36
194	152606.15	1330.40	2466106.23	1185677.59
195	152668.09	1805.05	2466068.61	1186154.71
196	153094.25	1771.37	2466492.45	1186209.95
197	153365.79	1368.14	2466841.52	1185871.69
198	153817.91	1166.02	2467325.62	1185767.53
199	154008.48	833.70	2467580.81	1185481.88
200	153529.42	713.52	2467137.05	1185265.18
201	153201.85	388.24	2466883.92	1184879.20
202	153504.78	67.62	2467246.60	1184628.24
203	153985.88	-35.77	2467738.63	1184626.66
204	154019.17	-489.00	2467864.99	1184190.18
205	153694.70	-835.25	2467619.23	1183784.31
206	153673.97	-1264.85	2467687.85	1183359.76
207	153679.16	-1702.65	2467783.52	1182932.55
208	153732.98	-2176.31	2467934.20	1182480.32
209	153557.39	-2640.43	2467858.48	1181989.94
210	153396.28	-3109.49	2467797.93	1181497.73
211	153328.76	-3602.98	2467834.00	1181000.98
212	153106.20	-4013.32	2467701.19	1180553.50
213	152644.13	-3867.36	2467218.94	1180600.67
214	152235.01	-3909.49	2466827.42	1180474.79
215	152278.78	-4404.15	2466972.60	1179999.92
216	152355.80	-4895.66	2467149.66	1179535.01
217	152560.34	-5341.01	2467441.92	1179141.65
218	152905.17	-5694.23	2467852.37	1178867.44
219	153274.96	-6020.09	2468281.57	1178625.18
220	153076.82	-6468.73	2468180.58	1178145.26
221	152961.03	-6940.52	2468164.94	1177659.73
222	153208.49	-7360.84	2468494.02	1177299.73
223	153679.07	-7502.98	2468983.82	1177258.05
224	153957.12	-7913.83	2469340.88	1176913.64
225	154376.84	-8165.95	2469803.69	1176753.85
226	154731.66	-8519.28	2470223.96	1176481.60

WSRC-TR-2002-00470**October 2002**

227	154609.13	-8939.79	2470191.11	1176044.84
228	154390.32	-9285.78	2470048.65	1175661.05
229	154826.31	-9405.68	2470500.03	1175633.98
230	155037.73	-9692.23	2470766.18	1175397.40
231	155007.62	-10151.02	2470831.68	1174942.29
232	155142.85	-10611.17	2471059.23	1174520.09
233	154988.55	-11072.16	2471003.69	1174037.13
234	155366.65	-11312.27	2471423.31	1173880.47
235	155735.62	-11629.55	2471849.99	1173646.42
236	155889.02	-11371.27	2471946.60	1173930.87
237	155930.49	-10911.85	2471892.08	1174388.95
238	156388.67	-11024.03	2472363.57	1174374.03
239	156502.81	-11453.39	2472564.13	1173977.58
240	156165.01	-11783.62	2472301.98	1173584.56
241	155812.59	-12085.40	2472019.65	1173216.36
242	155391.20	-12347.72	2471661.66	1172872.47
243	155233.65	-12798.29	2471600.78	1172399.02
244	155225.47	-13218.76	2471679.82	1171985.94
245	155579.68	-13532.54	2472091.32	1171752.26
246	156056.48	-13623.63	2472576.69	1171761.83
247	156241.64	-13228.93	2472676.15	1172186.34
248	156604.74	-13282.99	2473042.60	1172208.61
249	156837.77	-13721.80	2473361.44	1171827.51
250	157275.87	-13913.70	2473829.81	1171730.45
251	157624.26	-14123.08	2474214.03	1171597.72
252	157733.62	-14606.14	2474421.03	1171147.72
253	157545.13	-15055.50	2474329.64	1170669.03
254	157537.42	-15539.70	2474422.34	1170193.68
255	157303.88	-15978.69	2474284.72	1169715.81
256	157195.12	-16461.67	2474278.29	1169220.72
257	157368.26	-16914.70	2474541.50	1168813.30
258	157545.12	-17242.18	2474782.34	1168529.49
259	157729.51	-16838.06	2474879.10	1168963.08
260	158132.27	-16572.89	2475218.28	1169305.92
261	158545.38	-16591.81	2475626.39	1169372.94
262	158536.44	-17077.39	2475718.19	1168895.98
263	158739.09	-17532.90	2476010.78	1168492.24
264	159130.84	-17511.01	2476389.56	1168594.78
265	159486.14	-17316.86	2476697.00	1168858.31
266	159930.11	-17525.71	2477174.65	1168745.89
267	160249.94	-17893.39	2477563.73	1168452.36
268	160526.32	-18302.42	2477918.85	1168109.37
269	160531.83	-18783.52	2478023.87	1167639.77
270	160171.05	-19095.88	2477735.54	1167259.43
271	160285.16	-19514.55	2477933.89	1166873.40
272	160468.08	-19924.79	2478197.82	1166509.86
273	160828.25	-20151.71	2478597.24	1166362.42
274	160650.54	-20615.66	2478519.43	1165871.64
275	160292.74	-20952.89	2478239.16	1165467.57
276	160194.17	-21341.76	2478223.24	1165066.66
277	160425.79	-21779.42	2478540.50	1164686.36
278	160017.84	-21872.06	2478160.51	1164511.24
279	160012.32	-22216.31	2478226.39	1164173.24
280	160142.52	-22690.69	2478452.04	1163736.02
281	160226.14	-23150.25	2478629.03	1163303.65
282	159917.27	-23511.13	2478401.52	1162886.55
283	160345.67	-23674.83	2478854.63	1162815.07
284	160258.85	-24034.00	2478844.05	1162445.64

285	159832.08	-23860.04	2478390.41	1162527.48
286	159616.95	-23997.48	2478208.37	1162348.45
287	159941.01	-24366.31	2478601.85	1162054.64
288	160408.69	-24490.64	2479085.24	1162029.83
289	160895.62	-24372.88	2479537.33	1162245.90
290	161085.81	-24652.52	2479781.35	1162011.65
291	160853.43	-25092.97	2479645.18	1161532.52
292	160369.73	-25121.09	2479177.68	1161404.83
293	159874.11	-25193.66	2478707.71	1161231.19
294	159494.42	-25420.56	2478383.16	1160930.52
295	159835.59	-25677.91	2478770.31	1160749.34
296	160324.45	-25616.57	2479235.98	1160910.61
297	160791.24	-25769.63	2479724.46	1160857.50
298	161199.43	-26026.59	2480177.12	1160690.58
299	161357.33	-26425.13	2480414.17	1160333.29
300	161189.82	-26892.58	2480347.06	1159841.17
301	160939.03	-27298.76	2480185.77	1159391.75
302	160633.17	-27673.16	2479964.00	1158962.02
303	160983.52	-27881.18	2480349.93	1158831.02
304	161468.43	-27755.47	2480798.42	1159054.47
305	161960.80	-27781.08	2481285.55	1159131.39
306	162007.92	-28261.32	2481431.13	1158671.19
307	161817.23	-28712.09	2481337.89	1158190.58
308	161352.34	-28869.40	2480915.53	1157940.34
309	161270.42	-29268.45	2480918.01	1157532.87
310	161243.03	-29653.88	2480971.04	1157150.01
311	160778.80	-29575.94	2480500.60	1157130.13
312	160904.43	-30007.41	2480712.90	1156733.91
313	160776.41	-30464.76	2480682.35	1156259.83
314	160571.00	-30880.90	2480567.51	1155810.04
315	160799.05	-31284.26	2480874.23	1155462.54
316	161060.55	-31678.44	2481211.78	1155130.94
317	160664.81	-31840.88	2480858.14	1154890.00
318	160356.31	-32139.97	2480618.19	1154533.42
319	160190.19	-32571.20	2480544.92	1154076.99
320	159888.65	-32966.92	2480331.78	1153627.27
321	160286.35	-33122.15	2480753.14	1153557.71
322	160605.33	-33433.67	2481129.83	1153318.91
323	160949.57	-33709.51	2481523.86	1153120.25
324	161413.63	-33798.95	2481996.55	1153128.84
325	161769.07	-34128.49	2482412.65	1152879.96
326	161899.16	-34568.66	2482631.15	1152476.13
327	161938.09	-34997.87	2482758.16	1152064.14
328	162296.24	-35315.13	2483174.38	1151827.83
329	162327.57	-35802.22	2483305.95	1151357.62
330	162147.52	-36267.97	2483226.21	1150864.50
331	162052.73	-36754.52	2483234.23	1150368.68
332	162332.93	-37149.83	2483590.35	1150039.84
333	162704.62	-37456.34	2484017.62	1149816.85
334	162598.73	-37904.80	2484006.89	1149356.00
335	162846.28	-38270.93	2484325.01	1149048.96
336	163080.19	-38647.20	2484631.90	1148729.15
337	162719.82	-38973.52	2484346.80	1148335.12
338	162360.87	-39307.37	2484064.65	1147934.01
339	161946.02	-39578.43	2483714.77	1147582.78
340	161452.55	-39626.28	2483241.71	1147433.72
341	161283.66	-39976.42	2483148.94	1147056.04
342	160962.53	-40201.63	2482881.29	1146769.09

WSRC-TR-2002-00470**October 2002**

343	160696.30	-40589.72	2482701.11	1146334.11
344	160698.13	-41083.51	2482805.18	1145851.19
345	161035.24	-41432.41	2483207.40	1145579.53
346	161268.53	-41830.13	2483518.12	1145238.58
347	161336.95	-42293.91	2483681.17	1144798.83
348	161738.94	-42523.13	2484122.11	1144657.75
349	161913.64	-42983.76	2484388.52	1144243.09
350	162282.77	-43318.58	2484819.19	1143991.85
351	162652.69	-43653.04	2485250.55	1143741.11
352	162974.27	-44028.80	2485643.16	1143439.95
353	163219.25	-44462.65	2485972.83	1143066.06
354	163485.21	-44881.97	2486320.02	1142710.74
355	163863.08	-45209.26	2486757.69	1142468.68
356	164269.25	-45495.73	2487214.61	1142272.44
357	164719.93	-45436.80	2487643.52	1142423.50
358	165100.18	-45213.81	2487969.51	1142720.55
359	165299.95	-45586.25	2488242.22	1142397.41
360	165310.58	-46026.13	2488343.77	1141969.05
361	165783.80	-46118.61	2488826.12	1141976.59
362	165677.34	-46541.56	2488809.57	1141540.54
363	165597.03	-46898.26	2488804.87	1141174.76
364	166004.25	-46700.18	2489162.41	1141453.03
365	166257.11	-46298.67	2489326.72	1141898.43
366	166690.90	-46516.83	2489796.52	1141774.79
367	166613.74	-46916.69	2489803.86	1141367.41
368	166355.72	-47264.49	2489623.39	1140973.50
369	166740.14	-47561.53	2490061.22	1140762.43
370	167214.74	-47710.28	2490556.60	1140715.19
371	167658.85	-47931.38	2491037.13	1140590.81
372	168100.50	-48160.15	2491516.84	1140458.41
373	168567.96	-48333.02	2492010.23	1140386.10
374	169006.66	-48573.15	2492489.41	1140241.98
375	169462.22	-48758.75	2492973.80	1140154.73
376	169952.54	-48823.49	2493467.16	1140192.99
377	170443.38	-48731.87	2493928.61	1140384.42
378	170937.61	-48675.44	2494400.68	1140542.10
379	171423.86	-48570.52	2494854.88	1140745.60
380	171904.79	-48443.26	2495299.25	1140969.86
381	172245.21	-48734.44	2495692.82	1140755.43
382	172026.16	-49171.68	2495569.05	1140282.03
383	172189.87	-49515.28	2495800.53	1139979.65
384	172589.99	-49249.44	2496137.06	1140322.81
385	172510.07	-48777.31	2495960.96	1140768.38
386	172671.86	-48517.52	2496065.46	1141056.20
387	172875.15	-48947.49	2496353.59	1140677.49
388	172818.82	-49430.12	2496398.51	1140193.39
389	172940.79	-49768.31	2496588.02	1139887.66
390	173264.28	-49439.64	2496836.51	1140276.43
391	173528.63	-49172.31	2497039.84	1140592.91
392	173796.57	-49564.09	2497383.34	1140264.98
393	173566.32	-49980.80	2497244.36	1139809.35
394	173848.44	-50333.61	2497593.66	1139522.50
395	174155.12	-50626.04	2497954.48	1139299.85
396	174076.73	-51106.35	2497977.34	1138813.44
397	173964.04	-51355.24	2497918.64	1138546.46
398	174066.32	-51589.38	2498067.31	1138338.47
399	174347.60	-51976.94	2498423.00	1138017.43
400	174729.88	-52266.22	2498857.18	1137813.54

401	175126.42	-52558.15	2499305.87	1137610.00
402	175530.86	-52846.56	2499761.57	1137411.55
403	175907.70	-53166.51	2500196.80	1137176.51
404	176310.27	-53457.76	2500651.26	1136974.89
405	176788.92	-53426.33	2501113.27	1137104.92
406	177248.94	-53562.91	2501591.90	1137066.64
407	177703.43	-53536.40	2502031.29	1137186.84
408	178115.12	-53727.11	2502473.84	1137085.54
409	178067.21	-54168.33	2502518.44	1136643.71
410	177603.69	-54289.77	2502089.90	1136428.70
411	177580.57	-54767.00	2502166.24	1135956.75
412	177928.68	-55115.90	2502579.37	1135687.42
413	178020.47	-55595.83	2502768.76	1135236.66
414	178409.86	-55889.05	2503210.75	1135030.39
415	178773.34	-56229.18	2503637.11	1134772.83
416	179102.19	-56600.32	2504036.00	1134477.73
417	179370.53	-57025.59	2504386.89	1134117.08
418	179712.19	-57379.83	2504794.83	1133841.18
419	180073.43	-57718.55	2505218.71	1133584.54
420	180426.28	-58078.26	2505638.74	1133305.61
421	180750.31	-58456.79	2506034.47	1133002.29
422	181094.14	-58819.52	2506446.30	1132718.52
423	181488.40	-59126.56	2506895.96	1132499.74
424	181939.21	-59311.10	2507375.55	1132412.62
425	182396.22	-59360.12	2507833.10	1132459.45
426	182320.54	-59788.55	2507847.91	1132024.35
427	181876.87	-59990.35	2507455.45	1131734.74
428	182045.09	-60396.33	2507704.35	1131372.21
429	181761.29	-60687.67	2507486.97	1131028.13
430	181360.00	-60479.25	2507050.89	1131148.91
431	181095.07	-60593.15	2506815.17	1130982.45
432	180773.42	-60794.74	2506542.11	1130718.37
433	180618.45	-61264.69	2506487.90	1130226.16
434	181054.42	-61384.71	2506939.59	1130199.11
435	181279.46	-61787.93	2507243.55	1129851.05
436	181012.25	-62167.35	2507060.68	1129424.18
437	180576.30	-62406.89	2506683.59	1129099.23
438	180540.55	-62833.92	2506737.18	1128673.76
439	180685.56	-63312.07	2506978.34	1128235.75
440	180747.20	-63798.83	2507139.67	1127772.01
441	180925.11	-64212.36	2507399.63	1127404.07
442	181229.97	-64611.75	2507780.96	1127076.32
443	181509.27	-65025.15	2508140.16	1126729.54
444	181830.90	-65406.72	2508534.21	1126422.71
445	182171.52	-65773.53	2508943.79	1126134.28
446	182413.48	-66211.24	2509271.50	1125755.96
447	182706.39	-66610.26	2509641.06	1125426.08
448	183032.88	-66985.86	2510038.63	1125126.11
449	183295.61	-67406.00	2510383.04	1124769.30
450	183343.61	-67893.55	2510531.20	1124301.93
451	183208.83	-68374.11	2510498.96	1123803.47
452	182960.69	-68799.69	2510344.33	1123335.32
453	183350.88	-69079.49	2510784.41	1123142.34
454	183637.38	-69485.65	2511149.19	1122804.15
455	184020.42	-69800.41	2511589.53	1122575.46
456	184216.06	-70205.23	2511865.09	1122219.72
457	184030.76	-70476.28	2511739.92	1121915.89
458	184164.95	-70787.23	2511935.83	1121639.30

WSRC-TR-2002-00470**October 2002**

459	184267.76	-71090.43	2512099.41	1121363.78
460	184686.01	-71345.15	2512561.78	1121201.19
461	184867.17	-71766.53	2512826.59	1120826.22
462	185008.98	-72120.62	2513038.93	1120508.97
463	185430.34	-72321.50	2513493.17	1120399.74
464	185368.20	-72714.92	2513513.98	1120001.65
465	185521.42	-72856.77	2513693.43	1119894.56
466	185819.60	-72669.40	2513946.50	1120139.91
467	186115.71	-72517.22	2514204.83	1120350.36
468	186038.08	-72198.34	2514062.64	1120646.46
469	186418.67	-71897.02	2514372.72	1121020.47
470	186768.15	-72173.62	2514772.31	1120822.20
471	186962.77	-72621.93	2515055.91	1120423.66
472	187311.66	-72895.27	2515454.24	1120228.45
473	187709.71	-72951.67	2515855.68	1120255.86
474	187919.62	-73371.01	2516148.25	1119888.86
475	187714.61	-73745.79	2516025.32	1119479.36
476	187388.46	-74081.21	2515775.61	1119083.24
477	187089.23	-74461.16	2515561.50	1118649.12
478	187242.43	-74904.29	2515803.49	1118247.04
479	187496.08	-75085.49	2516089.45	1118122.28
480	187680.35	-75298.78	2516314.15	1117951.69
481	187691.72	-75783.32	2516425.86	1117479.63
482	187796.26	-76263.72	2516627.95	1117030.95
483	187514.62	-76639.54	2516430.20	1116604.52
484	187905.97	-76832.13	2516853.37	1116497.18
485	188280.78	-76632.33	2517178.88	1116770.62
486	188519.92	-77054.77	2517500.73	1116406.64
487	188506.43	-77548.63	2517590.05	1115920.28
488	188399.77	-78039.37	2517587.49	1115417.62
489	188587.14	-78465.95	2517859.52	1115038.84
490	188769.34	-78925.66	2518133.36	1114626.54
491	188633.68	-79381.20	2518095.10	1114152.31
492	188166.73	-79537.52	2517670.33	1113902.31
493	188164.63	-79956.84	2517755.33	1113491.29
494	188429.66	-80349.25	2518096.31	1113162.06
495	188050.72	-80416.53	2517739.22	1113017.52
496	187663.49	-80560.42	2517389.92	1112796.23
497	187557.85	-81017.01	2517381.27	1112327.21
498	187257.58	-81265.48	2517138.83	1112021.57
499	187020.46	-81624.74	2516981.22	1111620.56
500	186568.00	-81752.06	2516564.59	1111401.96
501	186241.84	-81964.29	2516289.28	1111126.44
502	186387.80	-82389.84	2516520.54	1110740.04
503	186140.33	-82726.32	2516348.05	1110359.18
504	186291.46	-83162.22	2516586.54	1109963.70
505	185862.80	-83378.58	2516211.70	1109662.85
506	185430.00	-83622.90	2515838.60	1109333.76
507	185370.95	-84099.17	2515879.64	1108855.12
508	185612.16	-84512.30	2516201.60	1108500.64
509	185992.13	-84830.19	2516639.67	1108268.22
510	186412.47	-85095.28	2517106.33	1108095.90
511	186570.86	-85565.35	2517359.01	1107668.46
512	186361.68	-86005.38	2517245.52	1107194.13
513	186430.00	-86304.61	2517374.54	1106915.29
514	186868.99	-86514.82	2517848.07	1106800.57
515	187124.70	-86927.96	2518184.26	1106449.08
516	187264.45	-87387.68	2518416.56	1106027.90

517	187705.52	-87615.50	2518895.78	1105896.38
518	188044.07	-87966.52	2519300.20	1105622.92
519	188257.34	-88414.86	2519602.13	1105228.15
520	188456.11	-88858.02	2519888.80	1104835.43
521	188620.72	-89291.87	2520140.08	1104444.75
522	188639.34	-89564.18	2520214.86	1104181.94
523	188679.70	-89854.10	2520314.59	1103906.40
524	188886.76	-90227.89	2520594.98	1103583.34
525	188791.48	-90710.39	2520601.85	1103091.04
526	188670.31	-91160.78	2520576.71	1102624.79
527	188592.63	-91546.99	2520580.83	1102230.44
528	188252.99	-91907.30	2520323.03	1101807.06
529	187909.21	-92250.00	2520057.51	1101400.06
530	187939.22	-92662.10	2520172.46	1101002.70
531	188398.93	-92847.47	2520661.17	1100916.62
532	188475.53	-93314.45	2520833.15	1100475.19
533	188581.11	-93802.14	2521037.82	1100019.49
534	189007.70	-93965.76	2521489.58	1099947.82
535	189404.26	-94170.80	2521920.53	1099829.37
536	189238.57	-94563.22	2521839.75	1099410.64
537	188868.90	-94869.69	2521541.35	1099033.73
538	188785.00	-95352.19	2521559.38	1098543.75
539	188694.89	-95840.92	2521572.61	1098046.40
540	188965.12	-96202.30	2521912.31	1097748.58
541	189256.06	-96604.07	2522280.68	1097415.51
542	189264.32	-97096.94	2522391.12	1096934.50
543	189127.61	-97577.38	2522357.00	1096435.57
544	189154.51	-98023.66	2522476.02	1096004.07
545	189606.99	-98258.73	2522968.01	1095867.80
546	190072.93	-98419.25	2523457.69	1095807.35
547	190544.06	-98522.82	2523940.63	1095803.76
548	191046.26	-98481.43	2524423.89	1095948.60
549	191455.25	-98717.53	2524873.50	1095802.31
550	191666.46	-99155.54	2525171.34	1095417.19
551	143300.15	43768.97	2448228.98	1225256.64
552	143091.06	43421.27	2448096.42	1224873.47
553	142805.39	43045.62	2447894.76	1224447.15
554	142570.43	42645.13	2447747.80	1224007.03
555	142563.13	42155.62	2447841.84	1223526.92
556	142221.58	41800.68	2447581.24	1223109.29
557	141783.79	41581.33	2447198.53	1222804.34
558	141472.24	41218.11	2446968.99	1222384.82
559	141204.16	40804.17	2446792.41	1221924.69
560	141253.78	40339.49	2446936.97	1221480.61
561	141220.62	39860.33	2447003.56	1221005.25
562	141228.85	39383.23	2447110.21	1220540.46
563	141193.61	38889.58	2447177.77	1220050.50
564	141014.52	38441.48	2447095.27	1219575.35
565	140839.57	37998.56	2447015.74	1219106.11
566	140539.41	37700.54	2446783.84	1218752.67
567	140344.80	37261.75	2446684.23	1218283.42
568	140348.88	36778.45	2446788.10	1217811.68
569	140142.88	36339.67	2446677.36	1217340.07
570	140123.17	35846.01	2446760.09	1216853.29
571	139894.41	35546.95	2446598.22	1216513.59
572	139675.16	35244.74	2446446.29	1216172.78
573	139368.80	34974.67	2446202.52	1215845.37
574	139117.27	34664.22	2446020.73	1215489.83

WSRC-TR-2002-00470**October 2002**

575	138986.82	34210.94	2445986.84	1215019.64
576	138650.44	33950.18	2445711.80	1214695.15
577	138403.08	33858.10	2445488.95	1214553.99
578	138027.38	33620.12	2445170.74	1214243.64
579	137637.23	33701.92	2444772.33	1214243.02
580	137194.28	33664.72	2444346.87	1214115.11
581	136793.77	33758.95	2443935.77	1214124.50
582	136521.56	33481.62	2443726.89	1213797.07
583	136156.21	33346.09	2443397.63	1213589.05
584	135698.76	33187.81	2442983.01	1213339.76
585	135489.65	32764.55	2442865.98	1212882.67
586	135380.93	32298.86	2442855.88	1212404.81
587	135226.67	31867.31	2442794.19	1211950.94
588	135085.93	31516.01	2442729.15	1211578.33
589	134827.15	31146.58	2442552.42	1211163.60
590	134649.10	30818.53	2442446.08	1210806.02
591	134532.10	30417.00	2442414.62	1210389.18
592	134300.25	30191.41	2442234.50	1210120.69
593	133981.45	29883.05	2441986.45	1209753.27
594	133949.34	29642.95	2442004.65	1209511.84
595	133905.81	29203.12	2442052.95	1209072.73
596	133819.86	28846.08	2442042.67	1208705.82
597	133487.61	28512.88	2441786.58	1208311.33
598	133091.21	28325.62	2441437.62	1208046.30
599	132708.24	28030.72	2441124.03	1207678.79
600	132442.21	27613.68	2440950.01	1207216.00
601	132174.13	27391.21	2440733.81	1206943.05
602	131786.02	27266.04	2440380.11	1206740.47
603	131461.07	27418.22	2440030.89	1206822.17
604	131183.67	27088.12	2439827.79	1206442.04
605	130905.24	26830.47	2439608.72	1206132.55
606	130500.57	26737.38	2439232.20	1205957.93
607	130168.33	26557.36	2438944.47	1205713.24
608	129750.20	26404.25	2438567.17	1205477.14
609	129315.52	26349.46	2438153.39	1205333.78
610	128956.40	26311.23	2437810.08	1205222.21
611	128637.65	26311.27	2437498.33	1205156.42
612	128236.11	26377.57	2437091.95	1205138.33
613	127787.96	26198.60	2436690.63	1204870.74
614	127408.12	26040.31	2436351.85	1204637.49
615	127401.85	25660.50	2436424.16	1204264.75
616	127609.83	25416.23	2436678.01	1204068.81
617	127768.11	24979.47	2436923.00	1203674.35
618	140941.89	32119.74	2448330.79	1213378.81
619	141062.00	32597.87	2448349.42	1213871.17
620	141222.47	33069.77	2448408.79	1214365.79
621	141323.94	33514.78	2448416.05	1214821.91
622	141320.89	33998.09	2448313.17	1215293.88
623	141074.63	34431.75	2447982.74	1215667.03
624	140815.94	34846.78	2447644.02	1216019.40
625	140589.35	35272.16	2447334.53	1216388.51
626	140195.07	35526.80	2446896.37	1216556.02
627	134182.44	39369.36	2440223.25	1219070.98
628	133832.60	39059.97	2439945.10	1218696.19
629	133502.43	38691.59	2439698.35	1218267.78
630	133248.82	38272.48	2439536.95	1217805.60
631	133156.66	37779.88	2439548.58	1217304.89
632	133043.79	37291.42	2439539.12	1216803.95

633	133025.10	36815.36	2439619.18	1216334.59
634	133095.42	36336.19	2439786.92	1215880.57
635	133250.59	35863.22	2440036.36	1215450.14
636	133415.09	35436.82	2440285.29	1215067.17
637	133666.52	35015.58	2440618.17	1214707.20
638	133720.27	34522.95	2440772.49	1214236.59
639	133696.40	34037.58	2440849.43	1213757.04
640	133909.54	33584.27	2441151.49	1213357.79
641	134168.21	33157.85	2441492.53	1212994.24
642	134452.76	32745.91	2441855.88	1212650.21
643	134761.11	32350.54	2442239.10	1212327.29
644	135115.01	32002.76	2442657.02	1212060.32
645	131529.80	21903.42	2441237.36	1201442.96
646	131142.69	21620.94	2440917.11	1201086.72
647	130712.12	21368.48	2440548.15	1200750.86
648	130265.03	21333.36	2440118.13	1200624.15
649	129897.59	21090.21	2439808.99	1200310.44
650	129954.43	20603.78	2439965.07	1199846.44
651	129677.02	20332.68	2439749.76	1199523.98
652	129624.18	19961.14	2439774.82	1199149.68
653	129780.39	19510.92	2440020.60	1198741.61
654	129473.99	19171.51	2439791.04	1198346.35
655	129159.31	18795.88	2439560.85	1197913.96
656	128674.94	18682.12	2439110.60	1197702.64
657	139594.85	31751.40	2447089.69	1212740.22
658	139516.36	31631.51	2447037.72	1212606.76
659	139438.15	31505.17	2446987.34	1212467.05
660	139384.97	31367.45	2446963.80	1212321.38
661	139336.45	31225.71	2446945.65	1212172.75
662	139347.89	31076.41	2446987.69	1212029.12
663	139301.16	30935.71	2446971.07	1211881.87
664	139268.96	30790.34	2446969.63	1211733.07
665	139173.97	30691.91	2446897.08	1211617.19
666	139037.68	30639.51	2446774.63	1211537.78
667	138897.66	30580.18	2446649.97	1211450.82
668	138762.04	30524.48	2446528.85	1211368.33
669	138644.03	30430.25	2446432.93	1211251.79
670	138501.03	30397.57	2446299.84	1211190.28
671	138353.98	30411.84	2446153.09	1211173.85
672	138204.11	30409.00	2446007.12	1211140.10
673	138058.84	30445.05	2445857.61	1211145.34
674	137912.50	30475.89	2445708.14	1211145.25
675	137764.43	30473.54	2445563.83	1211112.35
676	137619.25	30441.18	2445428.55	1211050.71
677	137471.11	30418.42	2445288.38	1210997.85
678	137326.18	30381.57	2445154.27	1210931.86
679	137203.74	30297.27	2445051.96	1210824.12
680	137125.68	30169.26	2445002.07	1210682.81
681	137025.72	30060.77	2444926.74	1210556.06
682	136919.11	29954.18	2444844.51	1210429.79
683	136812.49	29849.02	2444761.98	1210304.92
684	136692.55	29766.22	2444661.80	1210199.18
685	136572.13	29682.00	2444561.44	1210091.94
686	136453.15	29591.12	2444463.86	1209978.48
687	136355.09	29479.77	2444390.99	1209849.33
688	136224.69	29418.87	2444276.04	1209762.83
689	136099.99	29336.08	2444171.21	1209656.10
690	135996.70	29230.44	2444092.03	1209531.45

WSRC-TR-2002-00470**October 2002**

691	135893.42	29120.05	2444013.83	1209402.15
692	135781.09	29021.07	2443924.44	1209282.15
693	135713.49	28891.16	2443885.18	1209141.14
694	135624.96	28770.77	2443823.47	1209005.11
695	135527.86	28657.51	2443751.92	1208874.30
696	135444.56	28531.41	2443696.51	1208733.77
697	135373.15	28399.59	2443653.92	1208590.11
698	135291.76	28275.39	2443599.98	1208451.83
699	135254.14	28131.67	2443592.89	1208303.51
700	135190.83	27995.10	2443559.19	1208156.86
701	135148.88	27856.82	2443546.74	1208012.97
702	135149.81	27706.91	2443578.62	1207866.56
703	135141.70	27557.95	2443601.47	1207719.21
704	135105.03	27414.23	2443595.31	1207571.09
705	135099.78	27265.27	2443620.95	1207424.33
706	135105.94	27114.89	2443658.05	1207278.53
707	135066.90	26973.07	2443649.17	1207131.78
708	134989.31	26846.01	2443599.54	1206991.49
709	134968.35	26699.91	2443609.23	1206844.28
710	134970.23	26552.38	2443641.56	1206700.39
711	134958.31	26403.42	2443660.68	1206552.26
712	134966.38	26253.99	2443699.45	1206407.78
713	134998.72	26109.30	2443760.97	1206272.97
714	134986.81	25961.30	2443779.90	1206125.77
715	134975.84	25813.29	2443799.75	1205978.76
716	134879.69	25703.85	2443728.34	1205851.86
717	134866.34	25556.79	2443745.67	1205705.28
718	134767.81	25444.02	2443672.61	1205574.63
719	134660.72	25342.66	2443588.82	1205453.39
720	134560.76	25232.74	2443513.78	1205325.23
721	134536.47	25084.74	2443520.60	1205175.47
722	134478.42	24955.33	2443490.57	1205036.91
723	134358.96	24868.25	2443391.72	1204927.07
724	134262.33	24758.81	2443319.84	1204800.08
725	134187.12	24628.42	2443273.22	1204657.02
726	134062.89	24545.15	2443168.94	1204549.92
727	133932.96	24471.88	2443057.00	1204451.41
728	133809.69	24388.14	2442953.75	1204344.05
729	133694.98	24291.07	2442861.62	1204225.41
730	133604.06	24180.19	2442795.61	1204098.20
731	133536.46	24047.42	2442756.93	1203954.38
732	133504.08	23901.80	2442755.35	1203805.27
733	133465.04	23758.56	2442746.76	1203657.12
734	133386.97	23640.54	2442694.79	1203525.57
735	133366.48	23496.34	2442704.55	1203380.31
736	133366.46	23345.96	2442735.60	1203233.23
737	133362.16	23194.62	2442762.66	1203084.33
738	133367.37	23048.99	2442797.85	1202942.98
739	133368.78	22904.31	2442829.11	1202801.78
740	133313.55	22765.35	2442803.81	1202654.47
741	133279.74	22623.06	2442800.14	1202508.32
742	133250.21	22478.39	2442801.16	1202360.73
743	133215.45	22336.57	2442796.46	1202214.84
744	133186.40	22199.99	2442796.26	1202075.26
745	133128.32	22061.98	2442767.97	1201928.29
746	133106.88	21926.83	2442774.93	1201791.68
747	133032.62	21817.38	2442724.92	1201669.29
748	132986.44	21682.23	2442707.67	1201527.57

749	132887.91	21570.88	2442634.31	1201398.31
750	132753.69	21525.69	2442512.39	1201326.38
751	132634.22	21437.18	2442413.83	1201215.14
752	132542.83	21328.21	2442346.96	1201089.69
753	132430.03	21231.15	2442256.69	1200971.44
754	132299.14	21165.49	2442142.24	1200880.19
755	132228.69	21037.48	2442099.78	1200740.44
756	132162.99	20908.04	2442062.27	1200600.27
757	132082.07	20811.92	2442002.99	1200489.54
758	132062.06	20670.10	2442012.72	1200346.70
759	132064.89	20522.09	2442046.06	1200202.53
760	131990.63	20397.89	2441999.09	1200065.71
761	131869.74	20341.27	2441892.55	1199985.36
762	131771.21	20236.11	2441817.91	1199862.16
763	131743.11	20096.20	2441819.33	1199719.51
764	131701.68	19954.38	2441808.12	1199572.25
765	131637.89	19821.61	2441773.15	1199429.21
766	131537.45	19709.79	2441698.02	1199299.09
767	131411.32	19627.48	2441591.67	1199192.53
768	131277.58	19563.73	2441474.03	1199102.55
769	131156.21	19475.22	2441373.61	1198990.92
770	131038.65	19382.44	2441277.79	1198875.88
771	130941.54	19268.71	2441206.31	1198744.59
772	130828.73	19170.69	2441116.23	1198625.41
773	130683.57	19135.50	2440981.53	1198561.00
774	130532.71	19123.62	2440836.42	1198518.22
775	130390.40	19079.39	2440706.38	1198445.56
776	130267.13	18993.27	2440603.60	1198335.86
777	130147.66	18900.96	2440505.82	1198220.90
778	130020.10	18820.55	2440397.67	1198115.90
779	129890.64	18744.43	2440286.77	1198014.70
780	129780.21	18645.45	2440199.21	1197895.09
781	129679.30	18536.96	2440122.93	1197768.13
782	129552.22	18460.36	2440014.45	1197666.96
783	129426.09	18381.38	2439907.41	1197563.65
784	129354.68	18250.51	2439864.60	1197420.91
785	129322.77	18102.04	2439864.06	1197269.09
786	129370.82	17966.87	2439938.97	1197146.81
787	129466.93	17852.63	2440056.58	1197054.94
788	129567.33	17740.78	2440177.88	1196966.27
789	129667.73	17630.35	2440298.89	1196879.00
790	129765.75	17518.97	2440417.77	1196790.31
791	129852.35	17398.07	2440527.45	1196689.96
792	129913.72	17259.57	2440616.08	1196567.17
793	129905.60	17112.51	2440638.52	1196421.66
794	129919.38	16969.74	2440681.50	1196284.85
795	129983.13	16834.09	2440771.87	1196165.35
796	130025.94	16711.77	2440839.01	1196054.56
797	130036.39	16563.29	2440879.91	1195911.48
798	137600.99	24338.39	2446671.84	1205078.82
799	137208.87	24076.53	2446342.47	1204741.68
800	136985.38	23645.18	2446213.04	1204273.65
801	136969.43	23180.65	2446293.44	1203816.05
802	137040.99	22696.42	2446463.49	1203357.26
803	137217.10	22232.71	2446731.56	1202940.15
804	137541.46	21887.08	2447120.22	1202669.16
805	137701.48	21418.66	2447373.52	1202244.11
806	137846.26	20974.80	2447606.85	1201839.93

WSRC-TR-2002-00470**October 2002**

807	137767.42	20498.79	2447628.12	1201358.09
808	137537.81	20067.69	2447492.66	1200889.01
809	137409.00	19595.92	2447464.18	1200400.98
810	137271.71	19119.92	2447428.28	1199907.06
811	137123.42	18672.72	2447375.67	1199439.03
812	136837.08	18323.79	2447167.72	1199038.58
813	136360.20	18256.09	2446715.30	1198873.82
814	136011.19	18007.97	2446425.22	1198559.01
815	135733.36	17607.46	2446236.26	1198109.88
816	135455.48	17219.57	2446044.63	1197673.06
817	135340.21	16744.41	2446030.08	1197184.50
818	135299.48	16270.09	2446088.27	1196712.16
819	134992.80	15907.61	2445863.21	1196294.25
820	134736.94	15489.22	2445699.41	1195832.15
821	134668.26	15121.79	2445708.17	1195458.58
822	135093.83	15020.86	2446145.28	1195447.80
823	135560.33	15079.20	2446589.50	1195601.27
824	136017.85	15160.93	2447020.12	1195775.76
825	136474.26	15053.16	2447488.80	1195764.68
826	136932.71	14988.23	2447950.63	1195795.92
827	137326.99	14740.58	2448387.46	1195635.18
828	137668.12	14451.47	2448780.87	1195422.91
829	138038.45	14158.96	2449203.55	1195213.35
830	138394.20	13869.45	2449611.35	1195003.71
831	138789.28	13613.00	2450050.79	1194834.54
832	139221.46	13415.98	2450514.24	1194731.17
833	139641.15	13193.55	2450970.72	1194600.37
834	140055.36	12984.23	2451419.14	1194481.25
835	140469.40	12764.88	2451869.46	1194352.30
836	140643.70	12372.90	2452120.98	1194004.93
837	140852.59	12028.39	2452396.52	1193711.14
838	141160.02	11834.49	2452737.32	1193585.03
839	141520.83	11660.79	2453126.15	1193489.73
840	141070.39	17765.63	2451423.49	1199367.68
841	141229.57	17300.59	2451675.31	1198945.75
842	141351.48	16869.43	2451883.68	1198549.26
843	141342.94	16379.01	2451976.71	1198067.83
844	141358.97	15909.75	2452089.40	1197612.17
845	141500.36	15447.25	2452323.30	1197189.05
846	141589.23	15008.48	2452500.94	1196778.26
847	141728.08	14534.97	2452734.64	1196343.83
848	141589.10	14091.99	2452690.29	1195881.83
849	141334.93	13669.35	2452529.06	1195415.90
850	141212.05	13188.26	2452508.32	1194919.93
851	141128.97	12710.54	2452525.83	1194435.50
852	141128.89	12219.26	2452627.32	1193954.95
853	141351.60	11792.32	2452933.43	1193583.40
854	141726.81	11563.56	2453347.72	1193437.22
855	142152.85	11418.66	2453794.40	1193383.57
856	142225.63	11009.53	2453950.18	1192998.43
857	151865.64	26059.07	2460266.08	1209710.76
858	151992.64	25594.04	2460486.47	1209282.27
859	152235.70	25188.30	2460808.09	1208935.76
860	152492.31	24857.93	2461127.37	1208665.77
861	152815.84	24536.03	2461510.35	1208417.89
862	153197.83	24347.95	2461922.81	1208312.99
863	153557.81	24229.33	2462299.38	1208271.45
864	153835.61	24031.09	2462612.06	1208135.06

865	153922.82	23706.67	2462764.46	1207835.84
866	153965.13	23267.91	2462896.61	1207415.51
867	154131.11	22860.47	2463143.21	1207051.39
868	154399.57	22465.73	2463487.42	1206720.90
869	154568.09	22034.57	2463741.42	1206334.11
870	154736.60	21581.39	2463999.98	1205925.78
871	154822.11	21162.95	2464170.18	1205534.25
872	154829.69	20755.52	2464261.88	1205137.37
873	154915.20	20353.17	2464428.75	1204761.57
874	155066.79	20069.40	2464635.72	1204515.41
875	155154.00	19686.53	2464800.22	1204159.02
876	155405.53	19355.31	2465114.75	1203887.14
877	155559.66	19013.94	2465336.11	1203585.17
878	155836.62	18783.52	2465654.65	1203417.12
879	156200.83	18644.57	2466039.60	1203356.59
880	156274.48	18250.69	2466193.14	1202986.61
881	156473.50	17883.90	2466463.67	1202669.07
882	156615.76	17471.37	2466688.17	1202295.06
883	156947.78	17219.77	2467064.95	1202117.69
884	157145.95	16863.99	2467332.38	1201810.74
885	157220.45	16476.88	2467485.35	1201447.56
886	157348.32	16109.25	2467686.49	1201114.47
887	157416.04	15743.32	2467828.45	1200770.60
888	157464.29	15418.05	2467942.95	1200462.46
889	157593.85	15058.89	2468143.99	1200137.99
890	157871.66	14846.25	2468459.71	1199987.52
891	157928.38	14482.01	2468590.56	1199643.02
892	158024.90	14067.79	2468770.68	1199257.87
893	158021.47	13699.33	2468843.59	1198896.78
894	158063.78	13291.89	2468969.29	1198507.04
895	158214.52	12881.90	2469201.57	1198137.24
896	158254.30	12563.41	2469306.39	1197833.96
897	158344.05	12269.47	2469455.01	1197565.05
898	158155.13	11952.69	2469335.79	1197216.12
899	158257.58	11595.22	2469509.99	1196887.69
900	158261.79	11287.74	2469577.73	1196587.82
901	158333.75	10941.29	2469719.82	1196263.85
902	158293.90	10594.00	2469752.73	1195915.92
903	158168.50	10204.36	2469710.71	1195508.87
904	158193.03	9876.55	2469802.55	1195193.31
905	158066.77	9475.05	2469762.16	1194774.47
906	157733.00	9206.57	2469491.26	1194442.79
907	157384.83	8888.11	2469216.61	1194059.24
908	157009.55	8622.18	2468904.58	1193721.46
909	156733.37	8330.82	2468694.75	1193379.32
910	156356.42	8195.33	2468354.07	1193168.78
911	156036.20	7964.12	2468088.71	1192876.36
912	155813.45	8173.37	2467827.52	1193034.93
913	155405.17	8195.44	2467423.60	1192972.03
914	155119.67	7905.78	2467204.29	1192629.62
915	154691.88	7672.04	2466834.22	1192312.47
916	154375.91	7530.62	2466554.42	1192108.76
917	154066.70	7301.10	2466299.46	1191820.27
918	153728.70	7076.67	2466015.28	1191530.81
919	153427.10	6701.46	2465797.91	1191101.39
920	153115.34	6334.72	2465568.84	1190678.15
921	152810.36	6020.49	2465335.53	1190307.68
922	152872.99	5608.81	2465481.98	1189917.95

WSRC-TR-2002-00470

October 2002

923	152672.18	5203.94	2465369.33	1189480.36
924	152537.45	4781.27	2465324.99	1189039.04
925	152367.99	4480.59	2465221.45	1188709.85
926	152144.33	4174.82	2465065.92	1188364.48
927	152118.86	3687.76	2465141.78	1187882.76
928	152018.85	3316.76	2465120.72	1187499.16