Georgia's Savannah River Tributary Discharge Strategy

There are 24 dischargers that were modeled as part of the 5R process, 18 in Georgia and 6 in South Carolina. These discharges represent the bulk of the UOD (Ultimate Oxygen Demand) loading that had to be reduced. EPA developed the Savannah Harbor Loading Calculator (Calculator) for the Savannah Harbor and River dischargers that they used to derive the effluent limits for these 24 facilities. These effluent limits are the basis of the 5R and Ga EPD will be using these effluent limits to reissue the permits for the Savannah River main-stem facilities.

Columbia County operates four facilities that are permitted to discharge treated wastewater in the Savannah River Basin. The four water pollution control facilities are named Kiokee Creek, Crawford Creek, Reed Creek, and Little River. The Kiokee Creek, Crawford Creek, and Reed Creek facilities discharge to tributaries that flow into the Savannah River (River), and only the Little River facility has a direct discharge to the Savannah River.

During the initial development of the Savannah River Model all of the Columbia County facilities were lumped into one discharge located at the Little River facility's discharge to the Savannah River. When the Savannah River Model began to be used to evaluate the upstream loadings to Savannah Harbor the Columbia County facilities continued to be lumped together despite the fact that three of the facilities actually discharge to tributaries. This situation continued into the development of the Calculator used to determine allowable loadings to the Harbor from all of the facilities discharging directly to the River and Harbor. In hindsight the three Columbia County facilities that discharge to tributaries should not have been included in the Calculator. Now that loadings are being developed for discharges to tributaries to the Savannah River according to the 5R Plan it makes more sense to treat these three Columbia County discharges as tributary discharges and not direct discharges to the Savannah River.

GAEPD recommends the removal of the three Columbia County discharge facilities, Kiokee Creek, Crawford Creek, and Reed Creek from the Calculator, and for them to be treated as tributary dischargers. Since these facilities are located so far upstream from Savannah Harbor, this will have no effect on the facilities' permit limits and has minimal effect on the computed dissolved oxygen deficit for the Harbor as determined by the Calculator. The wasteload allocations developed using the Calculator resulted in no change in the permit limits for the three Columbia County facilities. The dissolved oxygen deficit attributed to these facilities as computed by the Calculator is 0.003 milligrams per liter (mg/L) or 3% of the allowable dissolved oxygen deficit of 0.1 mg/L. An analysis of the residual loadings from the individual facilities discharging to tributaries and their effect on the dissolved oxygen deficit in Savannah Harbor showed that the three Columbia County facilities contributed 0.0004 mg/L or 0.4 percent of the allowable deficit. This is due to the fact that there is additional time associated with the degradation of the wastes from these three facilities due to added distances associated with each facility: Kiokee Creek – 22.7 miles, Crawford Creek – 14.1 miles, and Reed Creek – 2.8 miles. In addition, to the added distances, the Kiokee Creek and Crawford Creek facilities are upstream from Stevens Creek and Augusta diversion dams, which also increase the travel time. The removal of the three Columbia County facilities, Kiokee Creek, Crawford Creek, and Reed Creek, as direct discharges to the Savannah River, and treating them as tributary discharges, does not change the wasteload allocations as outlined in the 5R Plan.

The 5R Plan addresses tributary dischargers as "background," meaning that as long as the residual load from these tributary dischargers reaches background levels before reaching the Savannah River, they are considered de minimus or have no significant impact on dissolved oxygen levels in the Savannah Harbor. The reasoning behind this is that most of tributary facilities have small discharges in terms of flow and their loads are thought to be assimilated upstream of the harbor. Therefore, these discharges have little impact on the dissolved oxygen levels in the harbor when compared to the main-stem discharges that are released directly to the Savannah River and Harbor. It is Georgia's perspective, and

we believe South Carolina's as well, that the tributary loads referenced in the 5R document are effectively the permitted loads from each tributary facility at the time of the 5R Plan development.

Initial modeling indicates that the distance to the main-stem of the river for each tributary may not be sufficient to decrease the UOD load due to the small decay rates. GA EPD believes the additional distance and travel time in the Savannah River to reach Hardeeville may be necessary to further assimilate the tributary discharge loads. GA EPD has modeled the system to the Savannah River at Hardeeville and determined the de minimus impact at this location rather than the mouth of the tributary, since Hardeeville is the downstream boundary of the Savannah River model and the upstream boundary of the Savannah Harbor.

A two-stage modeling approach was used to model the tributary discharges from their source on the tributary to the Savannah River at Hardeeville. First, a steady-state dissolved oxygen model, DOSAG, was developed and used to compute concentrations at the tributary's confluence with the Savannah River for varying streamflow rates for each discharger. This resulted in a table of values for tributary streamflows and constituent concentrations at the Savannah River confluence. Using this table and the estimated 1999 streamflows, a time series of streamflow and constituent concentrations was developed for each tributary. This time series was used as input into the 1999 hydrodynamic water quality model, EPDRiv1, to determine the daily average residual loading for the Savannah River at Hardeeville attributed to each tributary discharge. The results of this modeling indicates there are no dissolved oxygen impacts to the Savannah River upstream from Hardeeville and that Hardeeville is an appropriate location to look at the impact of background residual UOD loads since it is the Harbor's upstream boundary. The Table below provides each Georgia tributary facility's current permit limits for flow, $BOD_5$ and ammonia; the current permitted UOD Load; the background residual UOD load at Hardeeville; the percent reduction of the permitted UOD load seen at Hardeeville; the impact of each facility's discharge to the Savannah Harbor dissolved oxygen (DO) levels; and the percent the DO impact is to the DO deficit in the Savannah Harbor.

As long as the total background residual UOD load at Hardeeville attributed to the tributary facilities remains the same, the loads will be considered de minimums and have no significant impact on dissolved oxygen levels in the Savannah Harbor. This is equivalent to developing a Total Maximum Daily Load for the tributary dischargers and establishes a UOD cap of 4,687 lbs/day at Hardeeville for Georgia's facilities. All Georgia wasteloads in tributaries to the Savannah River downstream from Thurmond Dam will be evaluated with regard this residual UOD cap. It is our understanding that if we have concurrence from SC DHEC on our modeling and permitting approach regarding tributary dischargers, EPA will be agreeable.

**Table 1. Georgia's Current Permitted Condition**

| Facility | Permit Number | Tributary Watershed | Permitted Flow (MGD) | Permitted BOD5 (mg/L) | Permitted NH3 (mg/L) | Permitted Effluent UOD Load (lbs/day) | Daily Average UOD Residual Loading at Hardeeville (lbs/day) | Percent Reduction from Effluent Limits | Delta DO (mg/L) | Percent of DO Deficit | Effluent Limits Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sardis WPCP | GA0020893 | Brier Creek | 0.2 | 20 | 5 | 130 | 93 | 28% | 0.0002 | 0.20% | Permit B.1 |
| Thomson WPCP | GA0020974 | Brier Creek | 2.5 | 15 | 5 | 1,473 | 495 | 66% | 0.0009 | 0.90% | Permit (June-Nov) |
| Waynesboro WPCP | GA0038466 | Brier Creek | 2 | 20 | 10 | 1,682 | 671 | 60% | 0.0011 | 1.10% | Permit (May-Oct) |
| Wrens WPCP | GA0021857 | Brier Creek | 1 | 11 | 2.5 | 388 | 155 | 60% | 0.0003 | 0.30% | Permit B.2 |
| Sylvania WPCP | GA0021385 | Buck Creek | 1.51 | 30 | 2 | 994 | 676 | 32% | 0.0012 | 1.20% | Permit |
| Springfield | GA0020770 | Ebenezer Creek | 1.5 | 25 | 5 | 1,013 | 583 | 42% | 0.001 | 1.00% | Permit |
| Columbia County - Kiokee Creek WPCP | GA0038342 | Kiokee Creek | 0.3 | 20 | 7 | 218 | 56 | 74% | 0.0001 | 0.10% | Permit |
| Columbia County - Reed Creek WPCP | GA0031992 | Reed Creek | 4.6 | 10 | 2 | 1,573 | 7 | 100% | 0 | 0.00% | Permit |
| Augusta – Spirit Creek WPCP | GA0047147 | Spirit Creek | 2.24 | 30 | 17.4 | 2,789 | 1758 | 37% | 0.0029 | 2.90% | Permit |
| Hephzibah WPCP | GA0049433 | Spirit Creek | 0.09 | 30 | 17.4 | 106 | 0 | 100% | 0 | 0.00% | Permit |
| Columbia County - Crawford Creek | GA0031984 | Uchee Creek | 1.5 | 12 | 1.22 | 548 | 162 | 70% | 0.0003 | 0.30% | Permit |
| Harlem WPCP | GA0020389 | Uchee Creek | 0.25 | 30 | 17.4 | 311 | 31 | 90% | 0.0001 | 0.10% | Permit |
| | | | | | **Total** | 11,225 | 4,687 | | | | |

**Table 2.Georgia's Proposed Permitted Conditions**

| Facility | Permit Number | Tributary Watershed | Permitted Flow (MGD) | Permitted BOD5 (mg/L) | Permitted NH3 (mg/L) | Permitted Effluent UOD Load (lbs/day) | Daily Average UOD Residual Loading at Hardeeville (lbs/day) | Percent Reduction from Effluent Limits | Delta DO (mg/L) | Percent of DO Deficit | Effluent Limits Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sardis WPCP | GA0020893 | Brier Creek | 0.2 | 20 | 5 | 130 | 93 | 28% | 0.0002 | 0.20% | Permit B.1 |
| Thomson WPCP | GA0020974 | Brier Creek | 2.5 | 15 | 5 | 1,473 | 495 | 66% | 0.0009 | 0.90% | Permit (June-Nov) |
| Waynesboro WPCP | GA0038466 | Brier Creek | 2 | 20 | 10 | 1,682 | 671 | 60% | 0.0011 | 1.10% | Permit (May-Oct) |
| Wrens WPCP | GA0021857 | Brier Creek | 1 | 11 | 2.5 | 388 | 155 | 60% | 0.0003 | 0.30% | Permit B.2 |
| Sylvania WPCP | GA0021385 | Buck Creek | 1.51 | 30 | 2 | 994 | 676 | 32% | 0.0012 | 1.20% | Permit |
| Springfield | GA0020770 | Ebenezer Creek | 6 | 5 | 0.5 | 1,020 | 545 | 47% | 0.001 | 1.00% | Expansion |
| Columbia County - Kiokee Creek WPCP | GA0038342 | Kiokee Creek | 0.3 | 20 | 7 | 218 | 56 | 74% | 0.0001 | 0.10% | Permit |
| Columbia County - Reed Creek WPCP | GA0031992 | Reed Creek | 4.6 | 10 | 2 | 1,573 | 7 | 100% | 0 | 0.00% | Permit |
| Augusta – Spirit Creek WPCP | GA0047147 | Spirit Creek | 2.24 | 30 | 17.4 | 2,789 | 1758 | 37% | 0.0029 | 2.90% | Permit |
| Hephzibah WPCP | GA0049433 | Spirit Creek | 0.09 | 30 | 17.4 | 106 | 0 | 100% | 0 | 0.00% | Permit |
| Columbia County - Crawford Creek | GA0031984 | Uchee Creek | 1.5 | 12 | 1.22 | 548 | 162 | 70% | 0.0003 | 0.30% | Permit |
| Harlem WPCP | GA0020389 | Uchee Creek | 0.5 | 5 | 0.5 | 85 | 18 | 79% | 0 | 0.00% | Expansion |
| Grovetown WPCP | New Discharge | Butler Creek | 3 | 5 | 0.5 | 510 | 0 | 100% | 0 | 0.00% | New Discharge |
| | | | | | **Total** | 11,516 | 4,636 | | | | |