MONITORING AND ANALYSIS OF COMBINED SEWER OVERFLOWS (CSOS) IN TAEJEON CITY, KOREA

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Enormous amounts of efforts have been made for the abatement of pollutant sources to meet the strengthened water quality standards for urban rivers last decades. But the efforts for non-point sources have not been enough to significantly improve water-quality. The combined sewer overflows (CSOs) in urban areas are well-known for a heavy pollution load discharged directly into the receiving water such as rivers during wet weather periods. However, monitoring data for CSOs are not available enough to make a viable decision. In this research, the CSOs from urban watershed located in Taejeon city, Korea, were monitored for their discharge rate and pollutant concentrations. Recently, Taejeon city started the restoration project of major urban rivers to improve water quality, eco-system, and other amenity functions.

From the five rainfall events observed in the study area, the minimum total rainfall for CSOs to take place was found to be about 10mm. CSOs occurred only for the 2nd, 3rd and 5th rainfall events. It appeared that CSOs occurred when the discharge rate exceeded approximately 0.17m^3/sec. The runoff loads of CSOs were in the ranges of 64~89% of the total runoff loads, and the most runoff loads directly discharged into the receiving river. EMCs of CSOs in the wet weather were 2-16 times higher than the EMCs of sewer in the dry weather. The event mean concentrations (EMCs) ranged from 45~812mg/L for SS, 199~671mg/L for $TCOD_{cr}$, 60~198mg/L for BOD, 13.8~20.3mg/L for TN and 7.1~19.4mg/L for TP, which were much higher than the background levels. The relative strengths of first flush from the first flush phenomenon analysis employing the M(V) curve were in the order of SS > $TCOD_{cr}$ > TP > BOD > TN. The first flush coefficients were found to have very close relationship with rainfall intensity, with the person coefficients ranging from 0.759 to 0.851, especially, the max rainfall intensity showed a closer relationship than the average rainfall intensity and suspended solid showed the closest relationships with discharge and other pollutants. Optimum storage volumes for each rainfall event were estimated using suspended solids. The trend of the curve for all of the pollutants considered is very similar to that of the curve for suspended solid, which implying that other contaminants such as organic carbons and nutrients can be effectively decreased by reducing the suspended solid. The optimum storage volumes estimated using the point of inflection in the cumulative runoff mass and volume curves ranged from 15~30% of total discharged volume, corresponding cumulative volumes of 1600~3900m^3. In the 3rd rainfall event which shows the highest first flush effect approximately 70% of the total cumulative mass can be decreased by intercepting about 30% of the discharged volume.

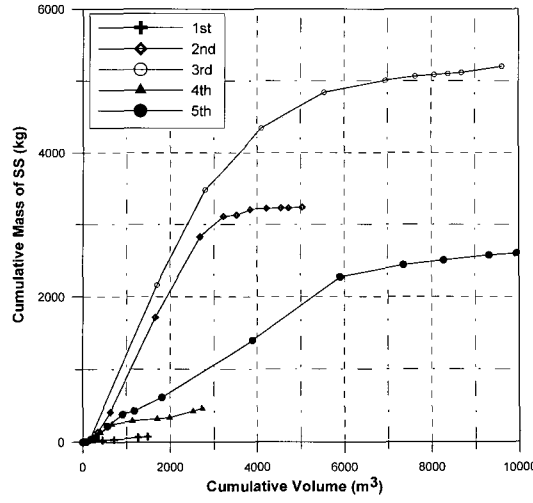

Fig. 6 Cumulative runoff mass vs. volume curves for all rainfall events.

REFERENCES

Kwun S. K., 1998. Management Improvement and Perspective on Nonpoint Source of Water Pollution in korea. J. of KSEE, Vol. 20, No. 11, pp. 1497-1510(in Korea).

Bertrand-Krajewski J., Chebbo G., and Saget A., 1998. Distribution of Pollutant Mass vs Volume in Stormwater Discharges and The First Flush Phenomenon. *Wat. Res.* Vol. 32, No. 8, pp. 2341-2356.