

DRAFT GUIDELINES FOR PARSING MS4 WASTELOAD ALLOCATIONS FROM TMDLs

Introduction

The Pennsylvania Department of Environmental Protection (DEP) has developed this document to assist owners and operators of municipal separate storm sewer systems (MS4s) that are required to develop Total Maximum Daily Load (TMDL) Strategies and Design Details under NPDES permits with alternatives available to “parse” wasteload allocation(s) (WLA(s)) from TMDLs to more accurately represent the pollutant load(s) the MS4 is required to achieve. For the purpose of this document, parsing is defined as a process resulting in the determination of the portion of WLA(s) that are applicable to stormwater entering the municipal separate storm sewer (MS3). Parsing is not required by NPDES permits and is therefore optional; however, MS4 permittees may benefit from parsing. Parsing must be consistent with the assumptions and conditions of the applicable TMDL.

Two possible parsing methods are outlined in this document. DEP may accept other methods proposed in TMDL Strategies and/or Design Details not identified herein if based on sound science. Note that DEP will generally not accept TMDL Strategies and Design Details that propose parsing but are not supported by map(s) and calculations demonstrating how parsing was done.

Parsing Methods

1. Land Area Approach

- A. Determine the total land area of the municipality within the TMDL watershed (e.g., 10,000 acres).
- B. Determine the total land area served by the MS3 within the municipality and within the TMDL watershed (e.g., 6,000 acres).
- C. Calculate the ratio of land areas determined in Step B to Step A (e.g., 6,000 acres / 10,000 acres) and apply it to both the existing MS4 pollutant load(s) and the WLA(s) that are assigned to the MS4 in the TMDL. The required percent (%) reduction of pollutant load should not change.

Example:

Inputs: Existing pollutant load = 5,000 lbs/year, WLA = 3,500 lbs/year, % reduction = 30%

- Step A: 10,000 acres
- Step B: 6,000 acres
- Step C: Ratio = 6,000/10,000 = 0.6

Outputs:

- Parsed existing load = 0.6 x 5,000 lbs/year = 3,000 lbs/year
- Parsed WLA = 0.6 * 3,500 lbs/year = 2,100 lbs/year
- New % reduction [(3,000 – 2,100)/3,000] x 100 = 30%

2. Weighted Land Use Approach

The principle of this approach may be stated as follows:

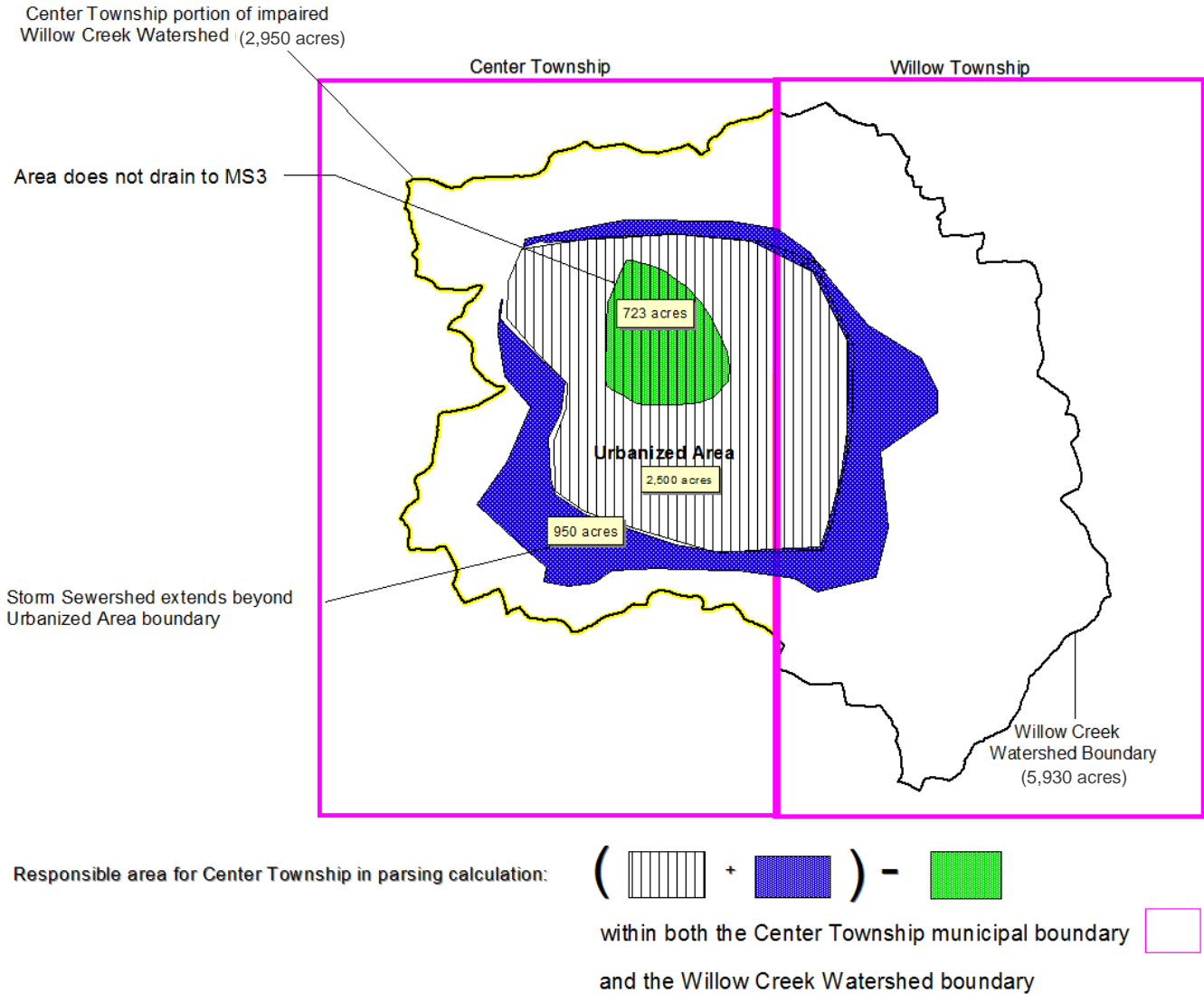
If the TMDL calculated the WLA based on the entire land area for a municipality that is contained in the impaired watershed, an MS4 permittee may parse the WLA based on just load generated from the “storm sewershed.” The term storm sewershed means the land area which drains to the municipal separate storm sewer from within the jurisdiction of the MS4 permittee.

- A. The first step is to determine the storm sewershed, which may be best explained through an example. See Figure 1, below. Center Township wishes to use the weighted land use approach to determine its

Draft Guidelines for Parsing MS4 Wasteload Allocations from TMDLs

parsed WLAs in the Willow Creek Watershed TMDL through parsing. The impaired watershed is 5,930 acres total, including municipalities outside of Center Township. The pink line represents municipal boundaries. The yellow line represents the impaired watershed boundary within Center Township (2,950 acres). The striped area is the UA within Center Township (2,500 acres), and the blue area represents land outside of the UA that drains into the MS3 (950 acres). The green area represents land within the UA that does not drain into the MS3 (723 acres). The storm sewershed is represented by the following formula: UA + Additional Land Draining to MS3 – Land within UA Not Draining to MS3. In this example, the storm sewershed is 2,727 acres (2,500 acres + 950 acres – 723 acres).

Figure 1: Example Storm Sewershed Analysis



- B. Once the storm sewershed area is calculated, determine the land use distribution within the storm sewershed. A GIS-based analysis or assessment using other mapping tools is generally necessary, as TMDLs generally do not contain this information.
- C. Recalculate the existing loads and WLAs using the existing and allowable loading rates by land use from the TMDL. Using the Center Township example from Figure 1, the following steps could be taken:

Draft Guidelines for Parsing MS4 Wasteload Allocations from TMDLs

1. Locate the table in the TMDL containing existing loads and loading rates for the impaired watershed (Figure 2):

Figure 2: Existing Loading Table in Example TMDL for Willow Creek Watershed

Source	Area (ac)	Sediment (lbs)	Unit Area Load (lbs/ac/yr)
HAY/PAST	50	3,095	61.9
CROPLAND	100	125,640	1,256.4
FOREST	500	2,600	5.2
WETLAND	150	405	2.7
TRANSITION	130	298,883	2,299.1
LO_INT_DEV	4,000	341,200	85.3
HI_INT_DEV	1,000	66,200	66.2
Stream Bank		702,500	
Total	5,930	1,540,523	

2. If available, locate the TMDL Existing Load (Figure 3) and WLA (Figure 4) tables for the portion of Center Township within the Willow Creek watershed (may be same table depending on TMDL).

Figure 3: Existing Loading Table in Example TMDL for Center Township

Source	Area (ac)	Sediment (lbs)	Unit Area Load (lbs/ac/yr)
HAY/PAST	25	1,547.5	61.9
CROPLAND	39	48,999.6	1,256.4
FOREST	262	1,362.4	5.2
WETLAND	20	54	2.7
TRANSITION	61	140,245.1	2,299.1
LO_INT_DEV	2,173	185,356.9	85.3
HI_INT_DEV	370	24,494	66.2
Stream Bank		349,473	
Total	2,950	751,532.5	

Figure 4: Allowable Loading (WLA) Table in Example TMDL for Center Township

Source	Area (ac)	Sediment (lbs)	Unit Area Load (lbs/ac/yr)	Reduction
HAY/PAST	25	1,025	41	34%
CROPLAND	39	32,136	824	34%
FOREST	262	1,362.4	5.2	0%
WETLAND	20	54	2.7	0%
TRANSITION	61	74,176	1,216	47%
LO_INT_DEV	2,173	97,785	45	47%
HI_INT_DEV	370	12,950	35	47%
Stream Bank		185,220		47%
Total	2,950	403,346		

3. Calculate the revised MS4 existing loads based on the storm sewershed area (Figure 5). The storm sewershed area would need to be delineated into land use areas (see Step B, above). For example, although the TMDL reported 25 acres of hay/pasture (HAY/PAST), the MS4 in this example determined that only 3 acres of hay/pasture lands exist in the storm sewershed.

Figure 5: Recalculated MS4 Existing Load for Center Township Based on Storm Sewershed

Source	Area (ac)	Sediment (lbs)	Unit Area Load (lbs/ac/yr)
HAY/PAST	3	185.7	61.9
CROPLAND	20	25,128	1,256.4
FOREST	85	442	5.2
WETLAND	15	40.5	2.7
TRANSITION	61	140,245.1	2,299.1
LO_INT_DEV	2,173	185,356.9	85.3
HI_INT_DEV	370	24,494	66.2
Stream Bank		323,055.2 ⁽¹⁾	
Total	2,727	698,947.4	

- Calculate the revised WLA based on the storm sewershed area (Figure 6). **The unit area loads (highlighted blue in Figure 4) and % reductions (highlighted gray in Figure 4) for each land use type must remain the same when calculating the revised WLA.**

Figure 6: Allowable Loading (WLA) Table in Example TMDL for Center Township

Source	Area (ac)	Sediment (lbs)	Unit Area Load (lbs/ac/yr)	Reduction
HAY/PAST	3	123	41	34%
CROPLAND	20	16,480	824	34%
FOREST	85	442	5.2	0%
WETLAND	15	40.5	2.7	0%
TRANSITION	61	74,176	1,216	47%
LO_INT_DEV	2,173	97,785	45	47%
HI_INT_DEV	370	12,950	35	47%
Stream Bank		171,218.5		47%
Total	2,727	373,215		

As a result of the weighted land use parsing approach, in this example Center Township’s WLA for sediment was reduced from 403,346 lbs to 373,215 lbs.

- If the TMDL is for sediment or siltation, siltation loads resulting from stream bank erosion may have been calculated in the TMDL. Parsing of stream bank erosion loads should attempt to ascertain how land use areas removed from the WLA calculation affect downstream channel scour/degradation. There are however no unit loading rates associated with the stream bank erosion loads in TMDLs that will allow for a simple recalculation of that load as would be done for the overland flow component. Ideally a tool that would allow for a re-modeling of the watershed would be used to quantify the impact of parsing on stream bank erosion. However, a total land area approach may be used if further modeling is not possible. In the example above, the recalculated existing load for stream bank erosion in Figure 5 is 92% of the existing load for stream bank erosion in the TMDL (Figure 3), determined by multiplying the ratio of TMDL watershed area for Center Township to the storm sewershed area for Center Township (2,727 acres / 2,950 acres) by the existing TMDL load for Center Township. The allowable load in Figure 6 for stream bank erosion was determined by multiplying the revised existing load by the percent reduction required.