

## The Segmentation Process

It has been found that assessment unit IDs (AUIDs) that apply to an entire 14-digit hydrologic unit code (HUC) do not accurately represent the stream impairments within a watershed. As such, IDEM needed a process that allowed for systematically splitting AUIDs that applied to an entire 14-digit HUC into representative stream reaches. As such, IDEM has developed a process that uses available tools.

When determining whether segmentation is needed, IDEM examines various types of information, including:

- Hydrology
- Landuse
- National Pollution Discharge Elimination System (NPDES) Facility locations and outfalls
- Confined Feeding Operations (CFO)/Concentrated Animal Feeding Operations (CAFO) locations
- Aerial Photography
- Topographic maps

The segmentation process is guided in large part by the hydrology of a system. This is because the mechanisms of large streams and rivers are very different from those of small streams and tributary systems, making it logical to segment these into separate AUIDs. Varying land uses within a watershed are also considered because rural development is expected to have different impacts on a stream than urban areas, which in turn, have different impacts to a stream segment than forested areas. The presence of a NPDES facility also has the potential to impact water quality depending on the type of facility and whether the facility is operating efficiently. While CFO/CAFO facilities are not allowed by their permits to discharge, the presence of such a facility within five miles of a stream located in a heavily row-cropped area indicates the potential for impacts resulting from land application of animal wastes. Aerial photography is particularly important in determining appropriate segmentation within a watershed because it provides very recent and accurate information about the presence and thickness of riparian buffers, the presence and spatial extent of rural development, and the types of land use practices in the watershed, all of which help to determine where we might expect to see differences in water quality resulting from one/more of these factors. All of these factors are considered when determining whether segmentation should occur and where it should occur along the stream reach due to the potential impacts these factors can have on stream water quality.

The goal of the segmentation process is to identify streams and stream reaches that are representative for the purposes of assessment. In practice, this process leads to grouping tributary streams into smaller catchment basins of similar hydrology, land use, and other characteristics such that all tributaries within the catchment basin can be expected to have similar potential impacts. Catchment basins, as defined by the aforementioned factors, are typically very small which significantly reduces the variability in the water quality we might expect from one stream or stream reach to another. Given this, all tributaries within a catchment basin are assigned a single AUID. Grouping tributary systems into smaller catchment basins also allows for better characterization of the larger watershed. Variability within the larger watershed will be accounted for by the differing AUIDs assigned to the different catchment basins.

Currently, IDEM's segmentation is occurring simultaneously with the addition of high resolution segments (at the 1:24,000 scale) to Indiana's Reach Index. High resolution indexing is part of the process of revising and updating Indiana's Reach Index to take advantage of higher resolution geospatial data now available. A significantly higher number of first and second order streams appear at this scale than were previously indexed at the 1:100K scale. Therefore, the small catchment approach is also appropriate for the high resolution indexing process because it accounts for differences in hydrology resulting from stream size. It is anticipated that when Indiana's high resolution reach index is completed, the need to split segments using the segmentation process will be virtually eliminated.

## The Reassessment Process

Reassessment occurs when new data become available. New data are examined to determine the representativeness of the sample point.

When completing a reassessment of the watershed with new data, IDEM also examines:

- Whether the AUID(s) are currently on the 303(d) list.
  - If so, for what parameters?
  - What are the locations of the samples that put the AUID(s) on the list?
  - What is the magnitude of impairment between the sites?
- Whether a TMDL has been completed for these AUID(s), if so, for what parameters.
- The notes taken by staff that sampled the site
- Hydrology
- Land use
- National Pollution Discharge Elimination System (NPDES) Facility locations and outfalls
- Confined Feeding Operations (CFO)/Concentrated Animal Feeding Operations (CAFO) locations
- Aerial Photography

The information from the above factors aids in identifying the extent of the impairment. The parameters listed above are utilized to determine potential impacts to stream segments. Understanding potential impacts helps identify the similarities between a stream reach and its tributaries and thus aids in the determination of the extent of an impairment. Based on the new data and the above factors, the AUID(s) will be assessed as impaired, not impaired, or not assessed for a particular parameter. All AUIDs within the watershed will be examined to determine applicability of the data to each AUID. AUIDs will receive the same assessment if it is determined that the data are applicable.

Sometimes segmentation is necessary in order to accurately apply new data. As sampling is an on-going effort, it is necessary to perform reassessments on areas where the reach indexing effort at high resolution (1:24,000) has not yet been completed. In these situations, the segmentation process is followed and tributary systems of similar characteristics will be grouped into catchment basins with one AUID and the applicability of the assessment to each AUID will be examined.