

## MEMORANDUM

**TO:** ERWSD & UERWA Board Members  
**FROM:** Linn Brooks, Assistant General Manager  
**DATE:** August 17, 2010  
**RE:** Aquatic Health Index/Nutrient Study Presentation

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### Background

In 1997, the Environmental Protection Agency (EPA) initiated a nationwide effort to address eutrophication of the nation's surface waters resulting from excess nutrient enrichment. An important component of this effort, based upon the assumption that nutrients regulate algae growth, involves the development of water quality nutrient criteria for total nitrogen (TN) and total phosphorus (TP). In 2001, EPA recommended that states and tribes prepare plans and schedules for the development and adoption of nutrient criteria as water quality standards. In response to this initiative, the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD), issued a "Nutrient Criteria Development Plan for Colorado" (WQCD 2004).

The State's plan for establishing nutrient criteria for lakes and streams called for the use of a flexible approach that is scientifically defensible, specific to the unique conditions found within Colorado, and considerate of stakeholder concerns. To that end, the CDPHE convened a Nutrient Criteria Workgroup that has been meeting regularly since May of 2004. The Eagle River Water & Sanitation District ("District") has been an active participant in this Workgroup that has included approximately thirty individuals representing municipalities, consulting firms, law firms, environmental groups, and state and federal agencies.

Under current water quality regulations, the District's Discharge Permits for the Vail, Avon and Edwards Wastewater Treatment Facilities do not include wasteload allocations (effluent limits) for TN and TP because there are no applicable water quality standards or control regulations in place to provide the basis for such restrictions. The State's adoption of water quality standards for TN and TP will likely result in effluent limits that will be included in future permits for the District's wastewater treatment facilities. Meeting such limits will likely require modifications and improvements to the District's wastewater treatment facilities that could be costly. In addition, the adoption of nutrient standards will result in greater regulatory emphasis on the control of non-point sources of nutrients such as soil erosion and urban runoff.

### The WQCD's Approach and Proposed Standards

Nutrients are vital components of the food chain and essential to virtually all forms of life, but when excess nutrients are added to streams and lakes they can cause accelerated growth of algae and aquatic plants. Excessive algae and plant growth affects the suitability of the water for municipal, recreation and aquatic life uses and can result in impairment of beneficial uses. The primary complicating factor for development of numeric nutrient criteria is that nutrients are not directly toxic to aquatic life, nor are they solely responsible for the excessive growth of aquatic plants. Physical factors, such as sunlight, water velocity, drought, temperature, suspended sediment, substrate, presence of zooplankton, and other biological factors also contribute to excessive algae and plant growth. These factors combine to

increase the technical complexity of the process of determining appropriate nutrient standards for rivers and streams.

The WQCD is seeking to develop water quality criteria for TN and TP for rivers and streams based on levels necessary to protect the aquatic life using the macroinvertebrate community as the surrogate for the aquatic life use. The health of the macroinvertebrate community is measured using a multimetric index (MMI) that incorporates taxa richness, community composition, pollution tolerance, and ecological functions. The MMI was developed to discriminate between minimally disturbed sites and those with significant anthropogenic influences.

In conjunction with the effort to develop nutrient criteria, the WQCD has collected a large amount of macroinvertebrate and nutrient data from many representative locations around the state. From their analysis and interpretation of this data, the WQCD has concluded that the health of the macroinvertebrate community as determined by the MMI declines as concentrations of TN and TP increase. The WQCD derived the relationship between MMI scores and nutrient concentrations with an EPA-recommended statistical analysis tool (quantile regression). It is important to note, however, that MMI scores are influenced by many aquatic life stressors other than nutrients including habitat disturbance and the potential presence of other pollutants. There is continuing debate as to whether or not the statistical relationship between MMI scores and nutrient concentrations adequately differentiates the impacts of nutrients from other stressors.

The WQCD's proposal for numeric criteria for TN and TP for rivers and streams is now scheduled for a rulemaking hearing before the Water Quality Control Commission (WQCC) in June 2011. If adopted, it is likely that numeric standards for TN and TP would be incorporated as water quality standards for the Eagle River and Gore Creek during the rulemaking process for the triennial review of water quality standards for the Upper Colorado River Basin in June 2014.

### **Nutrient Study Purpose and Goals**

In June of 2007 the WQCD requested assistance from interested entities with their efforts to collect paired macroinvertebrate and nutrient data. The District has spearheaded and participated in many monitoring and water quality assessment efforts over the last 30 years that have been designed for purposes ranging from assessment of potential impacts associated with individual projects (e.g. Black Lakes) to evaluation of regional water quality conditions and trends. These ongoing efforts are needed to develop and support water resources planning, management and stewardship strategies that are scientifically based.

Building upon previous studies, the District chose to participate in the WQCD's data collection effort. The District's "nutrient sampling and data collection plan" was initiated in 2008, in cooperation with the WQCD, the US Forest Service, and the USGS. The sampling plan was designed to characterize reference (minimally impacted) conditions and to bracket potential nutrient loading sources including the District's wastewater treatment facilities and sources associated with land use activities such as urban runoff, construction activities, golf courses, tributary drainages, etc. (See attached map and list of sampling sites). In addition, the study process will serve to develop a good working relationship between the District and the WQCD, and it will help to inform the District and WQCD about potentially unique conditions that may differentiate Gore Creek and the Eagle River from other streams. The Town of Vail via the Eagle River Watershed Council and Eagle County have made significant financial contributions to this effort which are much appreciated.

After preliminary data analysis, the District modified its sampling plan in 2009 to include a more quantitative macroinvertebrate sampling method, an additional “spring run-off” sampling set, and the addition of new sites intended to further evaluate impacted areas. The District plans to continue collecting data in 2010, and based on the results, will further refine the sampling plan as needed to assess water quality conditions and potential management strategies. The long-term plan for data collection and analyses will be further modified as needed to track changes and evaluate the effectiveness of water quality improvement measures.

### **Nutrient Study Preliminary Results**

On Thursday, August 26, Bob Weaver, Leonard Rice Engineers, and Dave Rees, Timberline Aquatics, will present preliminary data analysis results of the nutrient study in a joint meeting of the District and Authority Boards. In summary, the analyses of nutrient and macroinvertebrate data indicated the following conclusions:

- Macroinvertebrate MMI scores for Gore Creek through areas in East Vail and Vail Village, above the Vail WWTP outfall were much lower than reference conditions indicating stresses associated with urban runoff or land use activities. The MMI scores for this area were below the “impairment threshold” proposed by the WQCD for aquatic life use.
- Concentrations of TN and TP in Gore Creek above the Vail WWTP outfall were generally below the standards proposed by the WQCD.
- MMI scores for Gore Creek below the Vail WWTP were somewhat improved from the areas in East Vail and the Village and above the proposed “attainment threshold” for aquatic life use.
- Concentrations of TN and TP in Gore Creek below the Vail WWTP outfall were higher than the numeric standards proposed by the WQCD during low-flow, high occupancy periods (November through April) and generally below these proposed standards during May through October. However, concentrations of TN and TP during September and October were generally at, or slightly above, the proposed standards.
- MMI scores for the Eagle River below the Gore Creek Confluence were generally above the proposed threshold for aquatic life use attainment with the exception of the site located below the Arrowhead Golf Course.
- MMI scores for locations immediately above and below the effluent outfalls for the Avon and Edwards WWTPs did not show significant changes, but there was a noticeable improvement in the MMI scores for Gore Creek below the Vail WWTP.
- Concentrations of TN and TP in the Eagle River above the Avon WWTP outfall were generally below the numeric standards proposed by the WQCD.
- Concentrations of TN and TP in the Eagle River below the Avon WWTP outfall were higher than the proposed numeric standards during September through April and below the proposed standards during May through August.
- Concentrations of TN and TP in the Eagle River above Edwards WWTP outfall were above the proposed standards during December through April and below the proposed standards during May through November.
- Concentration of TN and TP in the Eagle River below the Edwards WWTP outfall were higher than the proposed numeric standards throughout the year.
- For Gore Creek and the Eagle River, higher nutrient concentrations do not appear to be correlated with low MMI scores.

In summary, it is important to note that the District’s ongoing nutrient study is a work in progress. The preliminary conclusions outlined above are based upon direct comparisons with the MMI thresholds and

nutrient criteria currently being discussed by the WQCD and the Nutrient Work Group. The WQCD has not developed any guidance that can be used for determining how these proposals would actually be applied and implemented.

### **Next Steps (Where we go from here)**

Continued efforts toward monitoring, investigation, evaluation, and mitigation, where necessary, are key to ensuring that water quality and watershed health is protected and managed appropriately. Next steps toward this effort include:

- Continue data collection and data analyses efforts as needed to identify stressors within the Gore Creek and Eagle River study segments and further evaluate watershed conditions.
- Continue involvement in the Nutrient Criteria Workgroup and provide input to the WQCD's process toward setting and implementing numerical standards for nutrients.
- Continue involvement with the Aquatic Life Use Workgroup and provide input to the WQCD's process for setting biomonitoring protocols and tools for analysis (MMI).
- Investigation and implementation of control strategies and opportunities for reducing nutrient concentrations in WWTP discharges.
- Work with other stakeholders to investigate control strategies and opportunities for reducing pollutant input from other point and nonpoint sources within the watershed.
- Continue investigating the feasibility of arrangements designed facilitate attainment of watershed goals by providing regulatory flexibility, such as watershed-based permitting and water quality trading.
- Continue involvement with projects designed to improve water quality and aquatic health within the watershed. (e.g. ongoing efforts to reduce sediment loading to Black Gore Creek.)
- Continue monitoring to track changes and evaluate the effectiveness of water quality improvement measures.

All of the District's efforts to date have focused on gaining the best understanding possible of source water quality and aquatic health conditions within our watersheds. Watershed compliance with nutrient water quality standards as currently proposed by the WQCD will result in broad impacts on municipal, urban, and land management related activities. Effective watershed management is an ongoing process that requires thoughtful planning based on sound scientific investigations, stakeholder involvement and collaboration, and the flexibility to adapt to the constantly changing regulatory, social, economic and natural environments.