

lators to measure nutrient treatment effectiveness in lakes, reservoirs, rivers, and streams is the amount of chlorophyll-a in algae.

- Problems caused by excessive nutrients include: low dissolved oxygen, high pH, fish kills, algal toxins, bad tastes and odors, and diminished recreational uses.
- While disinfection byproduct formation is possible, it is extremely rare.
- Total phosphorus treatment has been used by itself successfully to control noxious blue-green algae growth.
- The relationship between total nitrogen and algae impacts is imprecise at best.
- However, a greater than 10 to 1 ratio of nitrogen to phosphorus appears to be helpful in controlling algae.

Some of the specifics of the new Control Reg. 85 and Reg. 31 that Tamburini said would apply to treatment facilities as of July 1 were:

- Reg. 85 limits become effective when a facility's discharge permit is scheduled to be renewed—2017 for the Tri-Lakes facility.
- The effluent limit in the next Tri-Lakes discharge permit for total phosphorus will be 1 milligram per liter.
- The Tri-Lakes WWTF must install TP treatment equipment under its next discharge permit, which will be issued after 2016—Tri-Lakes does not currently have a TP discharge permit limit
- The effluent limit in the next Tri-Lakes discharge permit for total inorganic nitrogen will be 1 milligram per liter—Tri-Lakes effluent averages 5 mg per liter for TIN currently.
- The chlorophyll-a limit in warm water streams will be 150 milligrams per square meter.
- The commission can also decide to apply Reg. 31 TN limits as early as 2017 in an individual stream segment, but Tetra Tech does not expect that to apply to the Tri-Lakes WWTF.

Tamburini listed these probable new capital system requirements for the Tri-Lakes facility for total phosphorus treatment under Reg. 31:

- Chemical addition to coagulate TP.
- Filtration to separate the coagulants.
- Tertiary sedimentation may have to be added before the filter system to better separate the TP.

The probable new capital system requirements for the Tri-Lakes facility for TN treatment under Reg. 31 will

likely include:

- A four-stage or five-stage activated sludge process to replace the existing two-stage Tri-Lakes system.
- Carbon addition after the anoxic stage of treatment.
- A separate re-aeration basin.
- Denitrification filters at the current limit of technology.
- A four-stage system would cost about \$10 million to \$15 million.
- The volume of wastewater being treated by the plant due to a longer process time would increase by about 30 percent.
- These additions would not be required until the first new discharge permit is issued after 2022.

Tamburini reiterated that these proposed systems for additional nitrate removal can reduce TIN concentrations to about 1 ppm. However this new system still cannot remove unbiodegradable dissolved organic nitrogen nor achieve compliance with the state's proposed 2.01 ppm interim value much less the EPA's criteria of only 0.88 ppm.

He said that while some reverse osmosis systems can remove unbiodegradable dissolved organic nitrogen to approach the state's interim value of 2.01 ppm in a sea coast setting, reverse osmosis is utterly impractical for Colorado because of its extremely toxic byproducts and makes about a third of the treated effluent too toxic to safely transport much less recycle or release to a stream or reservoir, "a disastrous consequence for the state of Colorado." He added that the state and EPA are "hoping that new technologies will emerge that can treat to lower numbers."

There was further technical discussion of technical options and how various systems operate. Tamburini speculated on the possible lengths of compliance schedules for various combinations of technologies, but none of this has yet been defined in any division regulations, policies, or guidance documents. There was also a general discussion about whether initial new capital projects that will be constructed under Reg. 85 or Reg. 31 could become obsolete as new tighter restrictions are approved by the commission or the EPA.

In other matters, the JUC approved a recommendation from Bill Burks, the Tri-Lakes facility manager, to delay the start of operations of the previously approved total phosphorus pilot plant until 2013 due to unexpectedly high costs of its chemicals and system operation. The costs would exceed the amount approved and appropriated in the 2012 facility budget. Burks will have to apply for recertification of the pilot plant from the division in

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