1,2,3-TRICHLOROPROPANE (1,2,3-TCP)

APPLICATION BRIEF

Previously TCP has been used as as a degreaser, paint remover, and cleaning agent. Currently TCP is utilized as a chemical intermediate in the manufacture of various organic chemicals. The result of these uses is occurrence at Superfund sites in Southern California since the late 1990s. In the Great Central Valley of California much of the occurrences are a result of TCP being an impurity in a soil fumigant used to control nematodes. This occurrence (Fig. 3) is mainly in the Merced, Kern, and Fresno counties as a result of land application in agricultural areas.

There is no Federal Maximum Contaminant Level (MCL) for TCP. The California Department of Public Health (CDPH) established a notification level of 0.005 µg/L in 1999. In order to accomplish this detection level, The CDPH developed a modified version of US EPA 524. The EPA method resulted in a detection level of 0.5 µg/L in 2002. The preliminary staff recommendation by the Division of Drinking Water (DDW) is an MCL of 0.005 µg/L (5 ppt). Following the Public comment period, Departmental and Peer review, adoption of the MCL is expected to be Spring 2017 with implementation Summer 2017.

Meeting the aforementioned levels of TCP in drinking water is a challenge to most water utilities. While some studies have attempted to demonstrate in situ treatment, the most reliable and prevalent means of removing TCP is pump and treat through Granular Activated Carbon (GAC) as shown in Figure 1 below.

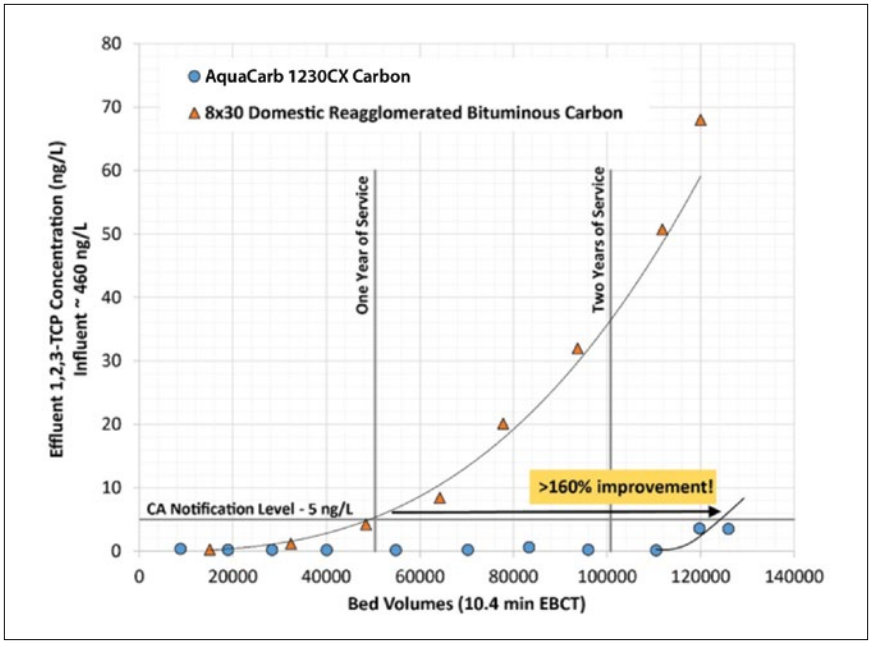

Figure 1

Evoqua Water Technologies is unique in that we offer a comprehensive range of activated carbon, equipment and services which can be utilized to meet water utilities needs for compliance. With regard to GAC products: Evoqua offers the most comprehensive menu of GAC products the market has to offer. Our approach will start by evaluating the most effective base material for each application to ensure maximum efficiency.

AquaCarb® CX enhanced coconut shell GAC combines the benefits of an activated carbon with a high micropore structure of coconut shell GAC and faster kinetics of a bituminous coal. The result is an excellent capacity for difficult to adsorb organics as well as adsorptive performance for other background organics. The result is longer bed life and lower life cycle costs as shown in Figure 2.

The AquaCarb family of carbons are ANSI®/NSF® 61 classified for use in potable applications. They fully conform to the physical, performance and leachability requirements established by ANSI/AWWA® B604, including Food Chemical Codex. Our detailed quality assurance program administered by our State certified laboratory guarantees consistent quality from lot to lot and shipment to shipment.

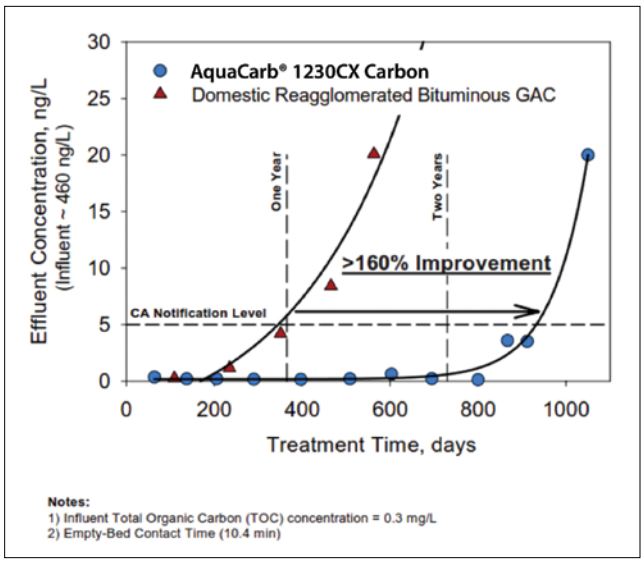

Figure 2

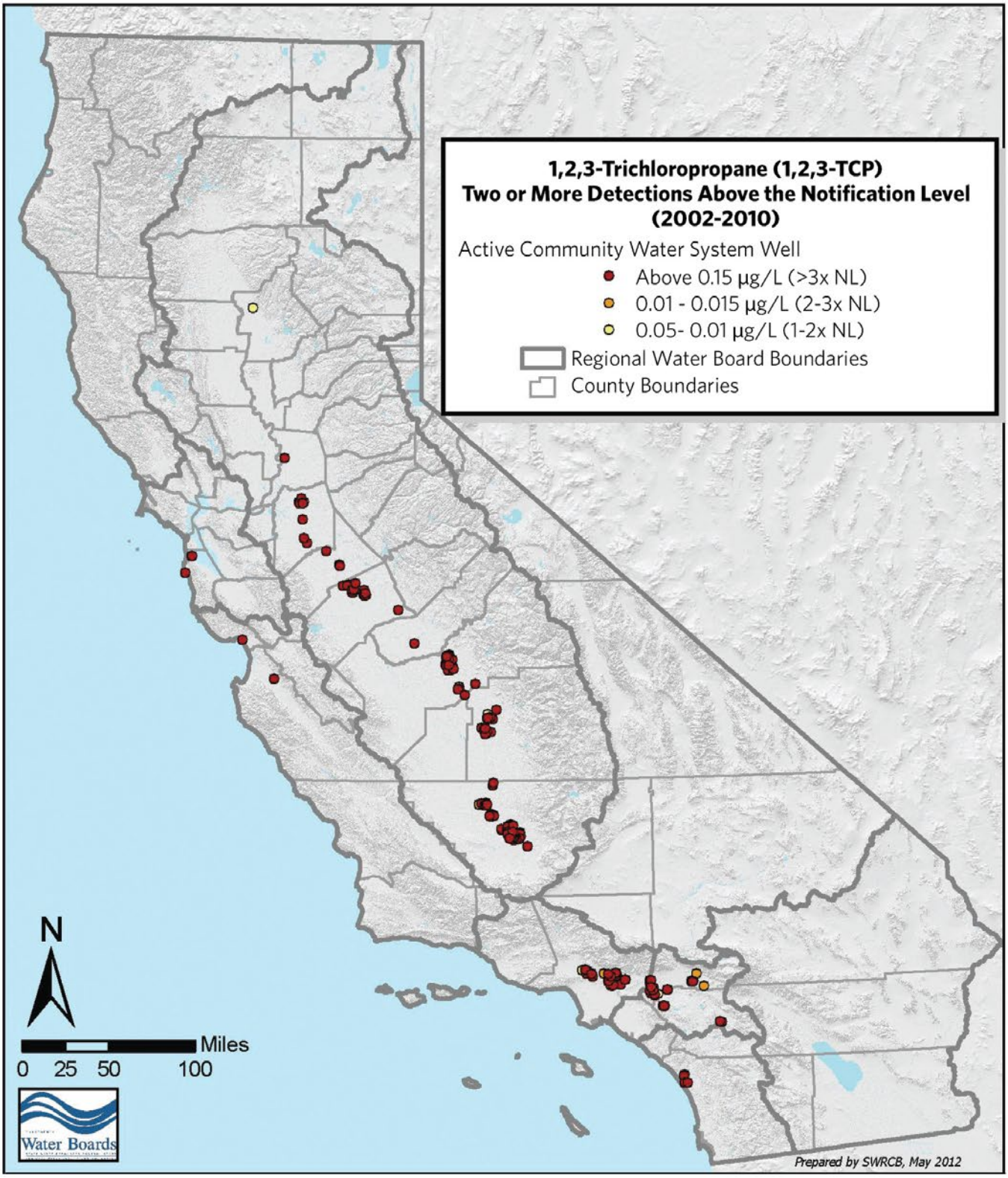

Figure 3: 1,2,3-Trichloropropane in Active Community Water System Wells (251) with Two or More Detections above the Notification Level of 0.005 µg/L (Maximum Concentration Observed, 2002-2010)

Graphic provided courtesy of the California State Water Resource Control Board

EVOQUA METHODS FOR EVALUATING AND REMOVING TCP

- Bottle Point Isotherm evaluation for individual sites containing TCP.
- Adsorption Design Software (AdDesignS) Modeling for Sites where competitive adsorption needs to be evaluated.
- Rapid Small Scale Column Tests (RSSCT).
- State of California accredited ELAP laboratory providing extensive QA/QC of all carbons according to ASTM and AWWA B 604 procedures.
- Technical support from R&D, application engineering and designated management team to evaluate findings, implementation and training.
- Voting members of ASTM and AWWA B 604 to assure compliance with test methods and development of new test methods for activated carbon.
- Full line of NSF 61 Virgin Westates® activated carbon. The AquaCarb® family consists of coal and coconut shell GAC.
- Adsorption system design and fabrication of systems treating 2 to 2000 gpm from our Red Bluff, CA facility.
- Evoqua Water Technologies can provide NSF Standard 61 permitted custom reactivation and return service utilizing our Red Bluff, CA facility.
- Utilizing NSF reactivated carbon can **reduce costs by up to 40%** without compromising performance.
- Successful projects have been approved and completed under NSF permit for custom segregated reactivation and return on drinking water applications throughout California.
- Evoqua's proprietary enhanced coconut AquaCarb1230CX carbon offers exciting opportunities for increasing throughput and reducing life cycle costs.

EVOQUA WATER TECHNOLOGIES

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