**EXHIBIT 12-C**

## 6.2 Impacts of Source Water Changes

Changes in source water can have a significant impact on water quality, corrosion control treatment effectiveness, and lead and copper release. Examples of source changes include:

- Switching from a purchased treated water source to an untreated water source that requires treatment;
- Switching from a purchased treated water source to a different treated source;
- Changing from a ground to surface water source; and
- Adding a new source, such as a new ground water or purchased source, in the distribution system.

Not only can source water changes directly impact corrosion control treatment (e.g., pH, alkalinity, dissolved inorganic carbon (DIC), and corrosion inhibitor concentration), but they can also impact the effectiveness of corrosion control treatment through changes in water quality parameters such as natural organic matter (NOM), metals (e.g., iron and manganese), ions such as chloride and sulfate, oxidation-reduction potential (ORP), and buffer intensity. See Section 2.3 for information on how water quality can impact the release of lead and copper into drinking water.

The literature includes examples of how source water changes have impacted lead and copper release (Boyd et al., 2006; 2008). For example, changes in lead release associated with blending groundwater, treated surface water, and desalinated seawater sources were determined to be a function of temperature, alkalinity, pH, chloride and sulfate (Taylor et al., 2005; Tang et al., 2006). Total copper release has been attributed to changes in temperature, alkalinity, pH, sulfate, and silica (Imran et al., 2006; Xiao et al., 2007). In another study (Zhang et al., 2012), lead release from leaded solder increased with blending of desalinated seawater in pilot-scale pipe loops.

Source water changes can impact trace inorganic contaminant release from deposits or scales in the distribution system (Lytle et al., 2004; Schock, Hyland, and Welch, 2008; Friedman et al., 2010; Peng et al., 2012). As discussed in Section 2.3.9, dissolved lead can react with iron and manganese and form deposits on lead service lines and other pipe materials (Schock, Cantor, et al., 2014). Shifts in water chemistry (e.g., changes associated with blending disparate sources) can potentially affect release and remobilization of these contaminants in the distribution system (Schock, Lytle, et al., 2005; Hill et al., 2010; McFadden et al., 2011; Friedman et al., 2016), which can then impact the formation of passivating scales on lead- and copper-containing materials.

## 6.3 Impacts of Treatment Changes

Treatment changes that can potentially affect the corrosivity of treated water are identified in several references (USEPA, 2003; USEPA, 2007b; MOE, 2009; Schendel et al., 2009; Grigg, 2010), and discussed in more detail below.