## **CFWI – 3.3. Harmful saline water intrusion or harmful upconing resulting from fresh and brackish water withdrawals**

Saline water intrusion means the movement of water caused by withdrawals resulting in increases in total dissolved solids (TDS) or chloride concentrations. Saline water intrusion can occur laterally or vertically (the latter of which is termed “upconing”). Nothing in this section shall be used to determine whether a source qualifies as an alternative water supply, as defined in section 373.019, F.S, or qualifies for funding by a District. A withdrawal must not cause harmful saline water intrusion or upconing.

**3.3.1 Harmful saline water intrusion resulting from fresh and brackish water withdrawals**

The District shall not consider saline water intrusion as harmful if it is the result of seasonal fluctuations; climatic conditions, such as a drought; or operation of the Central and Southern Flood Control Project, secondary canals or stormwater systems. The Districts encourage the use of the lowest water quality for the use intended, while also providing for the long-term protection of the water resources.

To satisfy the requirements of this section, an applicant shall provide reasonable assurance that the applicant’s proposed use will not cause harmful saline water intrusion or upconing. The following factors must be considered:

1. Whether saline water intrusion will detrimentally affect the applicant or other existing legal uses of water.
2. Whether there is a movement of more saline water to a greater distance inland or towards a withdrawal point than has occurred as a result of seasonal fluctuations or drought.
3. Whether there is a sustained amount and rate of increase of TDS or chloride concentrations at the base of the aquifer(s) or producing zone(s) within the area of influence of the withdrawal point from that existing prior to the proposed withdrawal.
4. Whether other documented evidence demonstrates that the proposed use will cause harmful saline water intrusion or upconing.
5. If, based on evaluation of (a) - (d), above, there is evidence that harm to the water resources would be reasonably anticipated to occur, the applicant may further evaluate whether the harm can be avoided. A determination of whether the reasonably anticipated saline water intrusion is lateral or vertical can be assessed through an evaluation of whether there has been a detrimental change in the geochemistry of the groundwater at the base of the aquifer(s) or producing zone(s) within the area of influence of the wellfield towards a saline water composition.

**3.3.2. Technical Assistance**

1. The Supplemental Applicant’s Handbook Design Aid 3, titled “Calculation of the Maximum Safe Yield of Well for the Prevention of Upconing” and dated [Rule Adoption Date], is available solely to provide applicants with useful tools that may assist in presenting reasonable assurance that the withdrawal will not cause harmful upconing during the applicant’s preparation of for consumptive use permits under Chapter 62-41, F.A.C. This calculation may not be appropriate for every well – applicants should consult the Design Aid 3 for more information. The Design Aid 3 is not incorporated by reference in Chapter 62-41, F.A.C., and applicants are not required to use the tools or suggestions of this Design Aid when preparing its reasonable assurance nor is the district required to rely on its submittal as reasonable assurance.
2. Agricultural users under 100,000 gpd are encouraged to seek technical assistance from the Districts.

DESIGN AID 3

Calculation of the Maximum Safe Yield of Well for the Prevention of Upconing

This Design Aid 3 is intended solely to provide applicants with useful tools that may assist in presenting reasonable assurance that the withdrawal will not cause harmful upconing during the applicant’s preparation of for consumptive use permits under Chapter 62-41, F.A.C. The equation presented here is from Schmorak, S. and A. Mercado. 1969. “Upconing of Fresh Water-Sea Water Interface Below Pumping Wells, Field Study.” Water Resources Research, Vol. 5, No. 6, pp 1290 – 1311, and is based on a number of assumptions about the aquifer. The absence of applicable conditions may render the equation less relevant to an applicant’s well. Therefore, an applicant is cautioned on relying on the equation as the sole basis for demonstrating reasonable assurance that its water withdrawal will not cause harmful saline water intrusion due to upconing, especially in cases where the assumptions do not reflect the conditions at the well site. It is recommended the applicant consult the publication and assumptions to determine its applicability.

When those assumptions have been met, there is evidence of reasonable assurance that the maximum amount of pumpage from any well is constrained as follows:

$$Q=\left(\frac{2π}{3}\right)\left(b-l\right)^{2}\left(\frac{∆ρ}{ρ}\right)K$$

Where:

* *Q* is the maximum safe yield of well
* *b* is the thickness of freshwater
* *l* is the distance between top of aquifer and well screen
* $ρ$ is the density of freshwater
* $∆ρ$ is the change in density of freshwater
* *K* is the hydraulic conductivity of the aquifer