**To:** Central Florida Water Initiative Steering Committee

**Through:** Central Florida Water Initiative Management Oversight Committee

**From:** Central Florida Water Initiative Regional Water Supply Plan Team

**Date:** February 24, 2017

**Subject:** Background and Fact Sheet Regarding Agricultural Irrigation Self-Supply Water Demand Projections for the 2020 CFWI RWSP

**Introduction / Purpose**

The Central Florida Water Initiative (CFWI) Regional Water Supply Plan (RWSP) Team Scope of Work (Task B) for the 2020 CFWI RWSP calls for the Population and Water Demand Subgroup (PWDS) of the CFWI RWSP Team to:

* investigate options for consistent methodologies for projecting water demand for each water use class in five-year increments, and
* update the 2015 CFWI RWSP population and water demand projections, as well as reclaimed water availability projections, through 2040.

Task B, Item C, is further refined that the CFWI RWSP PWDS will reach agreement on each water demand and population projection and distribution methodology in the CFWI RWSP Area, and that the CFWI RWSP Team will present them to the Management Oversight Committee (MOC) and Steering Committee (SC) for consensus and approval, and if necessary decision recommendations if consensus is not reached.

The CFWI RWSP PWDS is investigating two methodology options for projecting future agricultural irrigation self-supply water demand for planning purposes. This fact sheet has two components:

1. Background – Includes: 1.) the history of the 2015 CFWI RWSP agricultural irrigation self-supply water demand and acreage projections, 2.) the legislation passed in 2013 as a result of the 2015 CFWI RWSP development and 3.) the creation of the Florida Department of Agriculture and Consumer Services’ (FDACS) product known as the Florida Statewide Agricultural Irrigation Demand (FSAID) model.
2. Methodologies Under Investigation – Describes the two agricultural irrigation self-supply water demand methodology options being investigated by the CFWI RWSP PWDS. It is recognized that there may be policy considerations for each methodology option that will be presented if necessary to the MOC and SC in the future for guidance and direction. Information and analysis of the two demand projection methodology options initiated by the RWSP Team will serve to assist the SC in any needed decision making.

**Background**

During the development of the agricultural irrigation self-supply water demand and acreage projections for the 2015 CFWI RWSP, the St. Johns River, South Florida and Southwest Florida Water Management Districts (Districts) all used differing methodologies for both water demand and future acreage projections. Crop types, classification and nomenclature amongst the Districts were also different. These varying methodologies within the single 2015 CFWI RWSP made it difficult for the Districts and FDACS to articulate to agricultural stakeholders a single consistent message on the calculation of future agricultural water demand and acreages. These inconsistencies prompted FDACS to pursue creating a single statewide planning methodology for projecting both irrigated agricultural acreages (both for permitted agricultural areas as well as non-permitted agricultural areas) and agricultural irrigation self-supply water demand.

In 2013, legislation was passed that requires the state’s five water management districts (WMDs), in developing RWSPs and in determining the best available data for agricultural self-supplied water needs, shall consider the agricultural water demand projections produced by FDACS [Section 373.709(2)(a)1b, F.S.]. FDACS, through a contract with The Balmoral Group, developed future agricultural acreage and water demand projections for the State of Florida. The first version of the FSAID report and model was released on September 22, 2014, and has been updated annually since. FDACS, in close coordination with the state’s WMDs, is currently working on FSAID IV and it is anticipated that a draft will be released in April 2017, with the final version released in June 2017. FSAID IV updates will include revised estimates of 2015 agricultural acreage and water use. Updated agricultural acreage and water demand projections will incorporate recent land use, parcel data, irrigated areas, market trends and an expanded data set of historic water use. FSAID IV will provide projections through the year 2040. In addition, any adjustment or deviation in a RWSP made by the WMDs to the data provided by FDACS must be fully described and the original data provided by FDACS must be presented along with the adjusted data [Section 373.709(2)(a)1b, F.S.].

It is important to note that one of these two water demand projection methods generate numbers that will be used in RWSP decisions within the 2020 CFWI RWSP. Permitting decisions will continue to be made on a case-by-case basis following applicable statutes and rules. Thus, as with any previous RWSP, use of one water demand projection method in the RWSP process does not bind the permitting process to the use of the same method.

**2015 CFWI RWSP Methodologies**

For the 2015 CFWI RWSP, the Districts used varying methodologies that relied on projecting agriculture acreages and applying per acre water use rates.

South Florida Water Management District **–** Projected acreage based on historical trends by crop type and input from agricultural industry groups and permittees. Projected demands estimated using Agricultural Field Scale Irrigation Requirement Simulation model (AFSIRS) crop irrigation requirements.

St. Johns River Water Management District **–** Projected acreage based on a geographic information system analysis of the effects of population growth on agriculture lands. Projected demands based on historical use rates.

Southwest Florida Water Management District –Projected acreage based on historical trends by crop type. Projected demands estimated using a soil-moisture based model (AGMOD) crop irrigation requirements.

**2020 CFWI RWSP Methodologies Under Investigation**

***Agricultural Acreage Projections***

The CFWI RWSP PWDS has reached consensus that the FSAID IV acreage estimates (2015) and projections (2040) should be used, and both proposed water demand projection methods being considered for agricultural irrigation self-supply use these acreage projections.

The FSAID acreage projections are based on 2015 irrigated acreage and take into account historic (1987-2012) trends in the proportion of agricultural lands for irrigated acreage in each county. It should be noted that the historical irrigated acreage data used in FSAID are based on reported agricultural acreages (from USDA) being irrigated from year to year. These acreage estimates may differ from permit-based acreage estimates, in which irrigated acreages typically represent the total amount of acres that could be cultivated in any given year and the actual land that is irrigated from year to year may be less than what has been permitted. The FSAID acreage projections provide spatial locations and crop types vary in each five-year increment according to the projected trends.

***Agricultural Water Demand Projections***

Once projections of future agricultural acreage have been made, the next step is determining the water use per acre to produce the final agricultural water supply demand. There are two options under consideration for this step in the process: 1.) FSAID’s econometric statistical model and 2.) AFSIRS

Option 1 – FSAID: for agricultural irrigation self-supply water demand uses the latest water demand projections from FSAID IV. Water demand is estimated using an econometric model and incorporates agronomic variables (crop type, location, climate, etc.), engineering or physical factors (irrigation equipment, plot size) and economic or behavioral factors (crop prices, share of land irrigated). The econometric model was calibrated using historical water use, derived from metered or reported pumpage data. The FSAID model projections take into account the following:

* Reported historic water use data by crop type
  + Econometric Model – Takes into account historical reported water use data (2007-2014, 2015 being incorporated in FSAID IV)
* Market trends
* Irrigation behavior / practices by the grower
  + Accounts for efficiencies for various irrigation methods and weather impacts

Use of water demand projections from FSAID IV would produce simulated water use rates using an econometric model developed using field-level agricultural water use. This method uses agricultural water use that is collected in a variety of ways including metered data and data that is self-reported by the producer using clocks on pumps and converting this time to estimated use, as well as other accepted non-metered methods.

Use of FSAID IV would require minimal District staff time to prepare tables and summaries for the 2020 CFWI RWSP. Distribution for groundwater modeling scenarios would require translation to monthly time series. The FSAID IV model water demand projections are provided statewide for both average year (5-in-10) and 1-in-10 drought year conditions. It should be noted that the projection methodologies used for the other water use categories in RWSP (with the exception of golf courses which will use AFSIRS), also take into account historic water use data to project future water demand. Projections produced via the FSAID IV econometric model have consistent regional inputs and could be reproducible by others with guidance available by FDACS and Balmoral. Upon request, the model could be provided for use.

FSAID projections are updated yearly and are available via FDACS’ website. Use of FSAID water demand projections would be supported by FDACS in stakeholder outreach and explanation of methodology in technical and public workshops. Of note, as FSAID only provides estimates at the annual level, if transient groundwater model simulations were needed, District staff would have to create monthly values of water demand projections.

Option 2 – AFSIRS: for agricultural irrigation self-supply water demand would utilize a manual batch run the AFSIRS model using the acreage projections from FSAID in each five-year increment. Water use would be modeled for both average year (5-in-10) and 1-in-10 drought year conditions. Crop irrigation requirements for crop production is the amount of water, exclusive of precipitation, that must be applied to meet a crop's evapotranspiration (ET) requirements. The AFSIRS model is based on a water budget of the crop root zone and crop ET can be estimated from reference ET and crop water use coefficients to estimate water demand for various crops. The water budget includes inputs to the crop root zone from rain and irrigation, and losses from the root zone by drainage and ET.

AFSIRS also incorporates agronomic variables (crop type, soil type, location, climate) and engineering or physical factors (irrigation equipment, plot size, etc.). AFSIRS directly models the water balance in the soil over time to determine supplemental irrigation requirements over time. AFSIRS also has the ability to model crops at varied stages or growth, for example, to determine irrigation needs at planting as compared to harvest periods, including local farming practice (share of land irrigated). The AFSIRS model does not take into account historic water use, but is designed to provide an estimate to field level irrigation needs for different crops. If AFSIRS is implemented for a planning level exercise, water demand projections produced via an AFSIRS batch run will need consistent CFWI specific inputs that will be documented, so that it can be reproduced by others. Currently, the Districts each use different crop water demand models for agricultural consumptive use permitting.

It should be noted that AFSIRS is the primary tool for water use estimations being investigated by the CFWI Regulatory Team for consumptive use permitting consistency in the CFWI RWSP area. Staff from the University of Florida Institute of Food and Agricultural Sciences, in coordination with FDACS and the Districts are working to update the latest version of AFSIRS. This effort includes developing consistent approaches on inputs and the use of AFSIRS, as well as permitting levels of certainty. If AFSIRS is determined to be the most appropriate model for agricultural water demand projections, it could allow the use of a consistent model in future CFWI consumptive use permitting and RWSP.

Similar to the 2015 CFWI RWSP and the development of projections for other water use sectors, use of AFSIRS in developing water demand projections would require District staff support in stakeholder outreach and explanation of methodology in technical and public workshops. Use of AFSIRS would also require District staff to fully describe the adjustments and deviations made to the data provided by FDACS, as well as present the original FDACS’ FSAID data in the 2020 CFWI RWSP. Of note, AFSIRS can provide estimates at the annual, monthly and daily level, to support transient groundwater model simulations. AFSIRS was also utilized to develop water use data for the FSAID1 effort in 2014 and can utilize many of the same input datasets developed for the FSAID effort.

AFSIRS model projections can take into account the following:

* Total supplemental crop irrigation requirements
* Irrigation requirements for average year (5-in-10) and 1-in-10 drought year conditions, or other statistical rainfall conditions or historical rainfall conditions.
* Multi-crop years and differing growing seasons
* Specific soils types in the region to estimate water use
* Efficiencies for various irrigation methods

**Planning and Permitting**

In analyzing the two agricultural water demand projection methods under consideration, the RWSP Team has been discussing the appropriateness or desirability of having a model for determining agricultural water use per acre that is consistent between the planning and permitting programs. While it is recognized that there are appropriate differences between these two processes, using water demand projection methods that result in substantially different water demands could have significant consequences. If the planning method projects significantly higher water demands than would be needed for the same acreage, more projects (water conservation, alternative water supply, etc.) would be identified in the 2020 CFWI RWSP and potentially built than are actually needed. Conversely, if the planning projections are significantly lower than the actual demand for the same acreage, then too few projects would be identified in the 2020 CFWI RWSP and water may not be available for future reasonable-beneficial uses. The “next steps,” discussed below, should provide information that will be helpful in determining the significance of this issue.

**Next Steps**

The CFWI RWSP Team will further evaluate the two water demand projection methodologies to determine how different the respective water demand projections are. Efforts are underway to develop a batch AFSIRS run that will be compared to the FSAID IV water demand projections. Where significantly different results are produced by the two projection methodologies, the PWDS will determine what factors are causing different results. Ultimately, the water demand projections used in the 2020 CFWI RWSP must be reasonably accurate to avoid the over or underestimation of water conservation, water supply and water resource development projects that need to be implemented. The CFWI RWSP Team will present a single method for consensus or the two method options for recommendation and action to the MOC and SC in April.