uses and other pending applications for a consumptive use permit under conditions, up to and including a 1 in 10 year drought event. These assurances can be provided through applicable historic monitoring data or modeling data, as defined below.

## 1.7.5.1 Monitor Data

Monitor data in support of a permit application shall be accurate and verifiable, and collected at the represented withdrawal rates requested in the permit application during: (1) at least a 1 in 10 year drought, as defined by the yearly total rainfall accumulation for regulatory rainfall stations (pursuant to SFWMD, Part B Water Use Management System Design and Evaluation Aids, Part V,. Supplemental Crop Requirement and Withdrawal Calculation, within Volume 3, Permit Information Manual for Water Use Permit Applications,); or (2) 90 days without effective recharge.

Pumpage data collected from a calibrated accounting method authorized in the previous permit is considered accurate and verifiable.

Water level and quality data collected pursuant to limiting conditions in a permit must provide a sufficient basis to determine if conditions of permit issuance will be met. Additional assurances will be required in cases where the monitor data does not represent the conditions of the resource as affected by the past withdrawals. An example would include wetland photographs without corresponding hydrologic data necessary to determine the withdrawal impacts on wetland hydroperiod, or water quality data from monitor wells that have collapsed or are constructed into zones that do not relate to potential for salinity movement.

The use of historic monitor data to prove conditions of permit issuance are met may be applied to permit renewals and to that portion of a modification that represents the historic use that was monitored. Additional assurances will be required in case where a modification renders the historic data non-representative. An example would include the use of new source of supply, a significant relocation of the points of withdrawal, or an increase in the allocation.

Other relevant information regarding the actual use of water or impact of the actual use of water will be considered. Such information could include identification of irrigated acreage that occurred over time, wellfield operations, and the use of a state approved functional assessment of wetland or other surface waters, to determine impacts of prior consumptive uses.

## 1.7.5.2 Modeling Data

Applicable modeling data may consist of basic analytic impact assessments or calibrated numeric system simulation models. The modeling impact assessments shall be conducted for the proposed withdrawal alone, as well as the proposed withdrawal combined with all other permitted uses and pending applications within the cone of depression of the proposed use. The cone of depression is defined by the 0.1 foot

drawdown contour for the proposed withdrawal from the water table aquifer and the 1.0 foot contour for the proposed withdrawal from a confined aquifer.

Α. Basic analytic impact assessments: Basic analytic impact assessments utilize an approved analytic equation(s), such as the Theis or Hantush-Jacob equation, applied to the requested maximum month allocation that simulates continued withdrawal for 90 days without recharge (which is considered for purpose of these simulations to be equivalent to a 1 in 10 year drought condition). Aquifer characteristics derived from approved aquifer performance tests (APT) or specific capacity tests (SFWMD, Part B Water Use Management System Design and Evaluation Aids, Part II Aquifer Performance Test) located within one mile of the project site are acceptable. If more than one set of aquifer characteristics data exists within one mile of the site, the value measured closest to the proposed project will be used unless the applicant can demonstrate that hydrogeologic conditions at the project site are not represented by such data. If the location of the nearest site where aquifer characteristics were measured is greater than one mile from the project site, the average of the nearest three APT or specific capacity test sites is acceptable providing that two of the three values are within one standard deviation of the mean. If this is not the case, the applicant shall demonstrate that the conditions of permit issuance are met for the highest and lowest values of the three sites, or the applicant may opt to conduct an APT or specific capacity test at the site.

The use of numeric models such as Modflow without calibration is acceptable under the following configurations: (1) the model represents the aguifer or aguifer system as no more than two layers; (2) each layer uses a single value for transmissivity/permeability, storage/storativity and a single value is used for leakance between the layers: (3) the simulation time is 90 days with no recharge; and (4) surface water recharge features are not represented. The modeling shall include separate runs using the highest and lowest measured values of transmissivity/permeability, storage/storativity, and leakance from the region, based on published data and pump test values calculated as described The selected high and low aquifer values will be approved provided they above. significantly overestimate the withdrawal impacts that would occur on the site. The use of a numeric model without calibration is acceptable for representing seepage irrigation systems where the applicant models the portion of the irrigation water that returns to the water table aquifer, provided the model is configured as described in this paragraph and the change in the water table elevation predicted by the model is field verified with water level data from at least one water table piezometer located adjacent to the irrigated field.

B. Calibrated numeric system simulation models: For complex systems that cannot be accurately evaluated pursuant to paragraph A, above, the applicant may provide assurances that the conditions for issuance will be met through a calibrated numeric simulation model, as described herein. District approved numeric system simulation models are used to simulate withdrawals from complex aquifer systems, such as multiple layered aquifers with varying degrees of hydraulic conductivity, integrated surface and groundwater systems, and withdrawals that involve density dependent flows or transport of contaminants.

Staff will approve simulations that utilize documented model codes that have undergone professional peer review and accurately represent the physical system. In order to demonstrate that a model is representative of the physical system, the applicant shall calibrate the model. An acceptable calibration method shall be identified between the applicant and District staff while taking into consideration the range of water levels across the model domain, location of available water level monitor data, and the degree to which the monitor data accurately reflects area ground water conditions versus sporadic influences of local pumpage. Whenever possible, the numeric models should be calibrated to within  $\pm$  1 foot for at least three monitor wells distributed randomly within the model domain for each month of the simulation period.

For the purpose of model calibration, when using monitor data that has daily measurements, the applicant shall average those daily values for each month. For monitor wells in which a single measurement was made for the month, in determining whether the calibration is acceptable, the pumpage and rainfall conditions immediately preceding or during the single sampling event shall be considered.

Model calibrations will be conducted using monthly time steps for a calibration timeframe of at least 18 months. The applicant may select the calibration period for the model based on availability of representative time variant data. When long term water level monitoring data is not available, the applicant shall calibrate the model to site specific pump test data. This calibration shall be based on a comparison of actual pump test water level changes with calculated water level changes derived from the model. The pump test shall be run for a sufficient time for the water levels to approach equilibrium for the production zone and the surficial aquifer.

The simulation model run shall be conducted using monthly time steps starting with a minimum of three months of average annual demand and rainfall, followed by twelve months of 1 in 10 year drought conditions, followed by a minimum of six months of average annual demand and rainfall. The applicant shall utilize SFWMD, Part B Water Use Management System Design and Evaluation Aids, Part V, Supplemental Crop Requirement and Withdrawal Calculation, within Volume 3, Permit Information Manual for Water Use Permit Applications, to determine the 1 in 10 year drought and average rainfall conditions for the purpose of evaluating drought recharge rates.

When District staff evaluates a calibrated model for approval, the range of parameters used in the model will be checked against published ranges of values for each parameter evaluated in order to determine the reasonableness of the values used in the model. Calibrations that are achieved using parameters outside of the range of acceptable values for south Florida will not be accepted. Steady state numeric models are not acceptable for the purposes of providing reasonable assurances.

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The location of all actual measured time invariant parameters used to estimate each data array shall be identified and documented for each layer in the model. Data arrays without at least three (3) actual measured values will require a sensitivity analysis to be conducted that evaluates the range of potentially acceptable values for the parameter in question. If a model is submitted that does not meet the calibration criteria, the applicant may collect additional data and revise the model. If a model is not calibrated to an acceptable level it will not be acceptable for providing reasonable assurances.

## 1.8 Definitions

**Allocation Coefficient** - A multiplier used in calculating permit allocations which accounts for the irrigation system efficiency and the effects on the relevant water storage system (see Resource Efficiency).

*Annual Withdrawal* - The quantity of water permitted to be withdrawn during any 12 month time period.

**Aquifer** - A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

**Aquifer Remediation** - A use of water involving the withdrawal of ground water for the authorized removal of contaminants for the purposes of restoring water quality.

**Aquifer Storage and Recovery** - Projects involving approved Class V injection wells for the injection and recovery of fresh water into a ground water reservoir.

**Area of Influence** – For groundwater systems the area of influence is defined by the cone of depression, and for surface water systems the area of influence is defined as the extent to which the withdrawal results in a measurable change in surface water levels or flows.

**Brackish Groundwater** - For purposes of the additional permitting requirements within the Central Florida Coordination Area (CFCA), brackish groundwater means groundwater in or below the Lower Floridan Aquifer that: has chloride concentrations at or above 1000 milligrams per liter (mg/L); has total dissolved solids concentrations at or above 1500 mg/L; or is located east of the C-35, C-36, and C-37 canals; south of latitude 28 degrees 7 minutes north; north of latitude 27 degrees, 54 minutes north and west of the District's boundary lying between these two latitude lines as described in section 373.069(2)(e), F.S., delineated on Figure 3-3.

*Certification or Certify* – means the formal determination by the District, through a validation process consistent with state and federal law, of the total amount of water made available for consumptive use by a water resource development project or project phase.