

As per Agenda Packet Item III.A: Technical and Policy Issues this part of the presentation introduces the Sustainability Criteria.

# Sustainability Criteria

## Recap from November 2017 AC Meeting

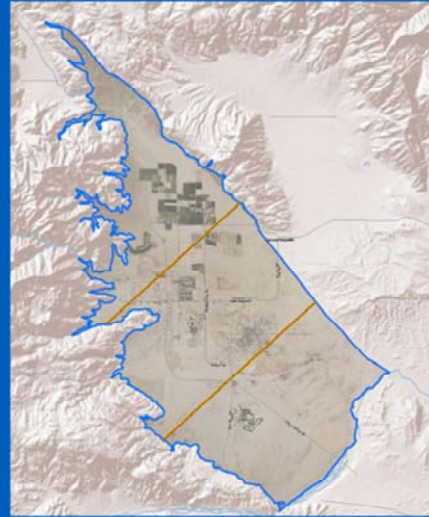
**Management Areas:** Three management areas have been proposed for the Subbasin

**Sustainability Indicators:** Three primary indicators for the Subbasin:

- Lowering groundwater levels
- Reduction in storage
- Degraded water quality

**Critical Terms:**

- Measurable Objectives
- Interim Milestones
- Undesirable Results
- Minimum Thresholds



DUDEK

The proposed North, Central, and South management areas were presented at the May 2017 Advisory Committee meeting. The management areas delineate generalized areas within the Subbasin taking into account multiple factors affecting the Subbasin, including differences in water use sector, water source type, geology, and aquifer characteristics. Management areas may have different minimum thresholds and measurable objectives than the basin at large but must provide descriptions of why those differences are appropriate.

Sustainability Indicators were previously defined and discussed in the November 2017 AC meeting. In the Subbasin, the three significant indicators are lowering groundwater levels, reduction in storage, and degraded water quality. In many cases, but not all, the three indicators could be evaluated by way of tracking groundwater elevations.

Critical terms previously discussed will be further discussed herein. Specific definitions of these terms in the context of SGMA are defined by the California Department of Water Resources in the draft Best Management Practices for the Sustainable Management of Groundwater, Sustainable Management Criteria BMP, dated November 2017.

## Sustainability Criteria

### Representative Monitoring Sites

#### Approach to selecting Representative Monitoring Sites:

- Each Management Area will be represented by one or more monitoring sites (wells)
- Selection of prospective Representative Monitoring Sites will consider:
  - Volume of historical data
  - Condition of the well (e.g., anticipated life span)
  - Representativeness of significant units within Management Area (e.g., Upper Aquifer of NMA)
- Analyses of prospective Representative Monitoring Sites will be performed to determine preliminary Measurable Objectives and Minimum Thresholds
- Final Representative Monitoring Sites will be based on interpreted representativeness of each management area

DUDEK

Representative monitoring sites are a subset of a basin's complete monitoring network, where minimum thresholds, measurable objectives, and interim milestones are set.

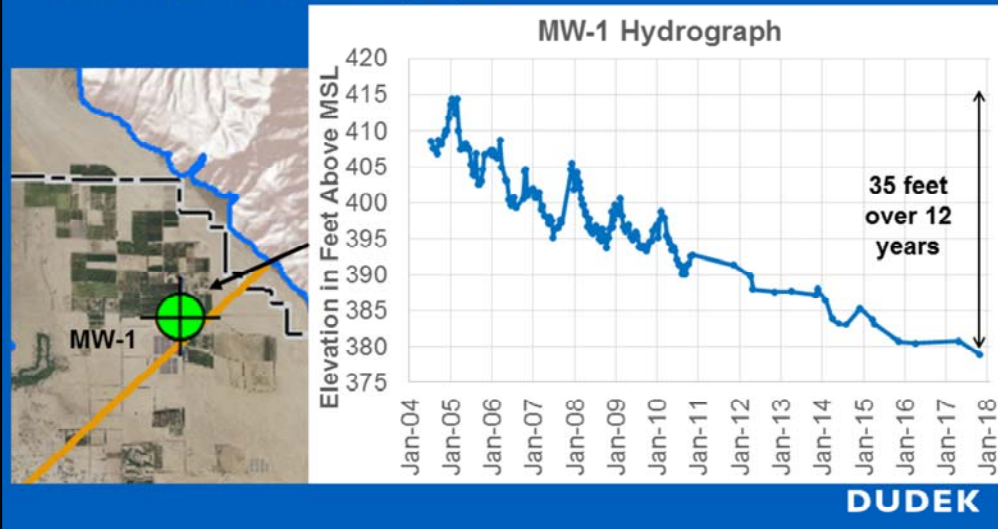
There will likely be more than one Representative Monitoring Site in each management area for each sustainability indicator. Representative monitoring sites can be used for one sustainability indicator or multiple sustainability indicators.

In general, the approach will be to perform the analysis described herein for each existing monitoring point that meets general qualifications, such as the quality and duration of the historical data set, existing condition of the well and representativeness of aquifer groundwater quality. After the preliminary analysis, the monitoring points will be further screened to identify an optimal monitoring network that represents each of the management areas and addresses identified undesirable results.

## Sustainability Criteria

### Example Prospective Representative Monitoring Site – MW-1

In the NMA, monitoring well (MW-1) shows average groundwater level decline at a rate of ~3 feet per year.



Monitoring well (MW-1) in the North Management Area is located near an area of high groundwater production and is a good representation of groundwater levels over time. As illustrated in the hydrograph, the groundwater elevation has decline about 35 feet over 12 years or about 3 feet per year.

We will utilize the preliminary analysis of MW-1 as a prospective Representative Monitoring Site as a demonstration of our planned approach to defining Measurable Objectives and Minimum Thresholds.

## Sustainability Criteria

Example Prospective Representative Monitoring Site – MW-1

### Sustainability Indicators to Evaluate in MW-1:

#### Chronic Lowering of Groundwater Levels

- Linear reduction to be applied

#### Reduction of Groundwater Storage

- Reduction in storage is limited to Upper Aquifer

#### Degraded Water Quality

- Based on screened interval into lower aquifer, water quality impacts are not observed or expected

Based on these conditions, a specific groundwater elevation (ft MSL) would be an appropriate metric for the pertinent sustainability indicators.

Water quality will be tracked and assigned independent Measurable Objectives and Minimum Thresholds.

DUDEK

DWR allows for groundwater elevations to be used for any (potentially all) sustainability metrics as long as a sufficient correlation is presented.

Water quality evaluation will follow a similar but separate analysis process not presented herewith.

## Sustainability Criteria

### Chronic Lowering of Groundwater Levels:

#### Approach to Determine Measurable Objective

- Define Sustainability Goal: No average groundwater level decline
- Groundwater model has estimated a sustainable yield that requires a 3% per year pumping reduction over 20 years to balance overdraft conditions
- Apply linear reduction rate (3% per year) to historical trend of water level decline (3 ft per year) to attain sustainability goal in 20 years
- Apply linear reduction rate to historical trends in 5 year increments to establish Interim Milestones (5, 10, and 15 year increments)

DUDEK

The approach to defining the Measurable Objectives will make use of the existing groundwater model and the calculated sustainable yield estimate. At current conditions, assuming a linear reduction schedule, this would require approximately 3% reduction in pumping per year to achieve sustainable conditions within the SGMA-specified 20-year implementation period.

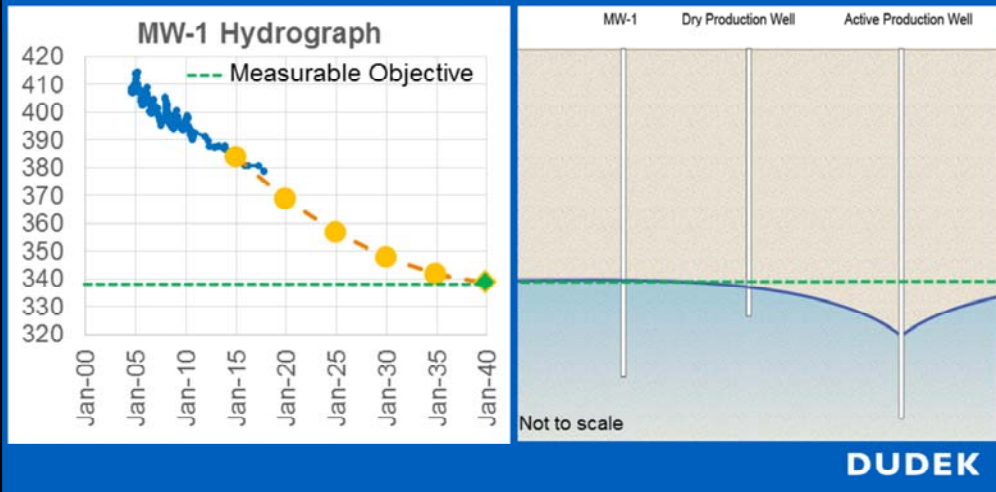
If the same reduction rate (3%/year) is applied to the ongoing decline in groundwater levels observed on a per-well basis over a 20-year trend, then the resulting groundwater elevations will represent balanced conditions and the Measurable Objective value (as an elevation).

These calculated values must be higher (elevation) than Minimum Thresholds to prevent new Undesirable Results. If this is the case, more aggressive localized Measurable Objectives may be required.

## Sustainability Criteria

### Example: Measurable Objective

The **Measurable Objective** is specifically assigned to MW-1, but should be protective of other wells for which it represents.



The Measurable Objective value for each monitoring well will also be determined for 5-year increments to represent the Interim Milestones for each Representative Monitoring Point.

Representative Monitoring Points will be selected to represent portions of the subbasin with similar conditions, but will consider variability such as differing screened intervals in wells.

In the hypothetical example above, although water level in Active Production Well depicted in the aquifer illustration on the right is below the Measurable Objective set for MW-1, the Measurable Objective is still protective of the Active Production Well.

## Sustainability Criteria

### Chronic Lowering of Groundwater Levels:

#### Approach to Determine Minimum Threshold

- Qualitative Undesirable Results must be correlated with quantitative minimum thresholds with clear metrics (i.e., Feet above MSL)
- Identify nearby production well screen lengths that would be represented by MW-1
- Determine elevation at which represented wells would realize undesirable results
  - Dry or significantly reduced yields
  - Dewatering of Upper Aquifer
  - Other

DUDEK

Minimum Thresholds will be based on anticipated Undesirable Results. However, the identified Undesirable Results (a qualitative factor) must be converted into a quantitative value (i.e., a specific elevation).

Each prospective representative monitoring site will be evaluated for anticipated undesirable results using the available data, including, but not limited to, nearby well screen intervals, nearby well uses (potable, irrigation, etc.), saturated aquifer units, etc.

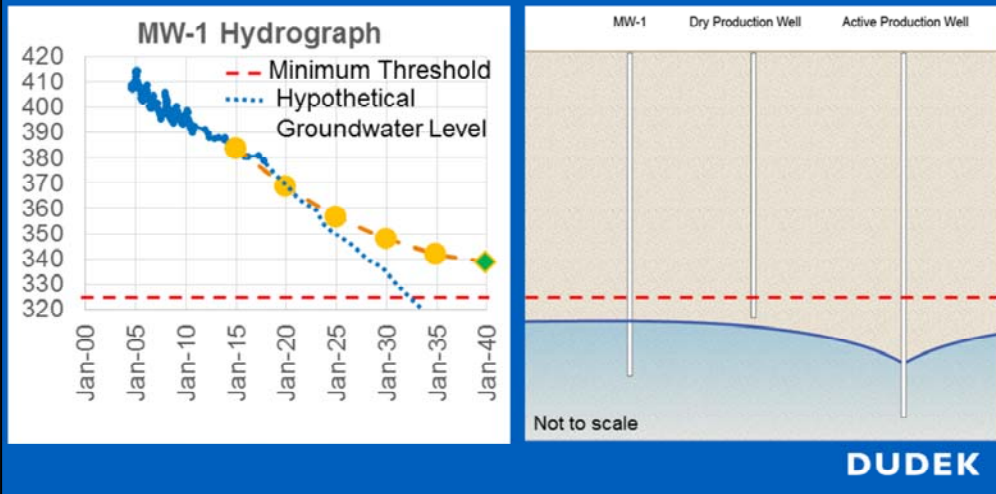
Based on the evaluation, the highest groundwater elevation at which new undesirable effects would be expected to be realized by a well represented by that particular representative monitoring site would be defined.



## Sustainability Criteria

### Example: Minimum Threshold

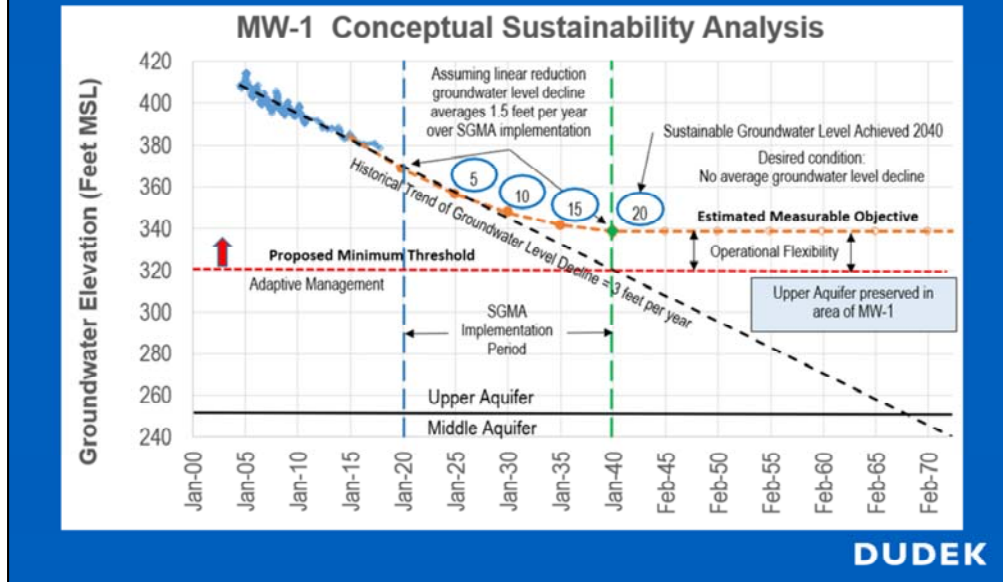
An **Undesirable Result** could occur if the groundwater level does not exceed the **Minimum Threshold**.



For this example, the Minimum Threshold is set below the lowest projected groundwater level set by the Interim Milestones and Sustainability Goal. If groundwater levels decrease below the Minimum Threshold, the Subbasin will not be on track to reach the sustainability goal.

## Sustainability Criteria

### Evaluating Sustainability Criteria



This slide represents the actual preliminary analysis for MW-1 using a linear trend.

The historical trend has been fairly consistent at 3 feet decline per year, and the 3% reduction rate per year has been applied to deflect the trend to be asymptotic (i.e. the curve approaches zero or no decline) by year 20 as the Measurable Objective.

Key undesirable results considered in this analysis of Monitoring Well 1 were preservation of saturated conditions in the Upper Aquifer, and prevention of nearby dry well screens.

The difference between the Measurable Objective and the Minimum Threshold represents the operational flexibility of the system, and reduces the likelihood for temporary drought conditions or other similar effects to lead to Undesirable Results.

## Sustainability Criteria

### Degradation of Water Quality:

Similar process will be performed for water quality metrics.

#### Considerations for determination of Measurable Objectives

- Drinking water standards
- Intended use of well water (i.e., ag wells vs. potable)
- Feasibility of mitigation

#### Considerations for determination of Minimum Thresholds

- Drinking water maximum contaminant levels
- Agricultural tolerance (e.g., TDS concentration)
- Logistical capability for treatment (e.g., blending)

DUDEK

Currently, there is not sufficient data to forecast when a drinking water exceedance will potentially occur based on groundwater level decline trends.

In absence of a direct causal relationship, the probability of an occurrence and the cost impacts of an occurrence require evaluation. The actions to control the potential for drinking water exceedance is unclear. Also the water quality trigger for action is currently unclear.

Water quality trends will be monitored over time to determine if a statistically significant forecast can be made in regards to degradation of water quality. This will require an adaptive management approach.