

# Streamlining Reporting, Compliance, and Mitigating Against Human Factors

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Trinity River Authority of Texas  
*Enriching the Trinity basin as a resource for Texans*

# Overview

- ▶ Background
- ▶ Introduction
- ▶ Old Paradigm
- ▶ New Paradigm
- ▶ Conclusion



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# Background – Who Am I?

Experience in military aircraft maintenance operations management is applied to optimize water information systems implementation



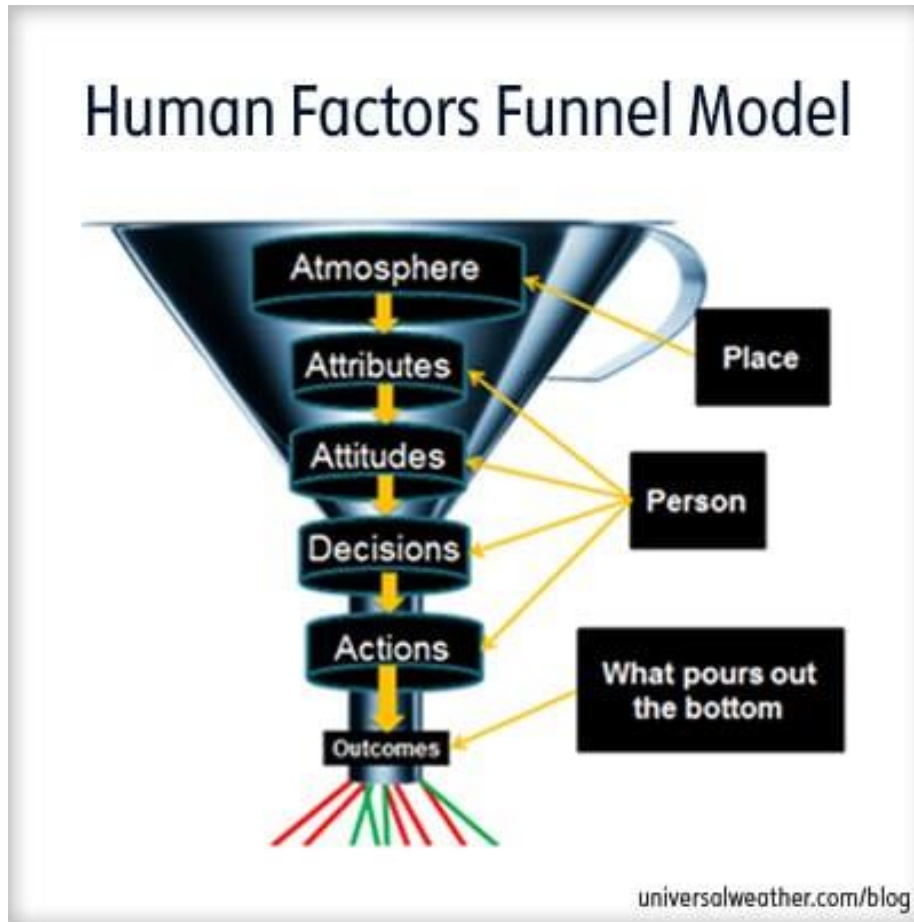
(Boiling, 2019)



Liquids Operations Control Room



# Introduction – The Reason



Human factors can play a considerable role in the success and failures of a wastewater or water facility

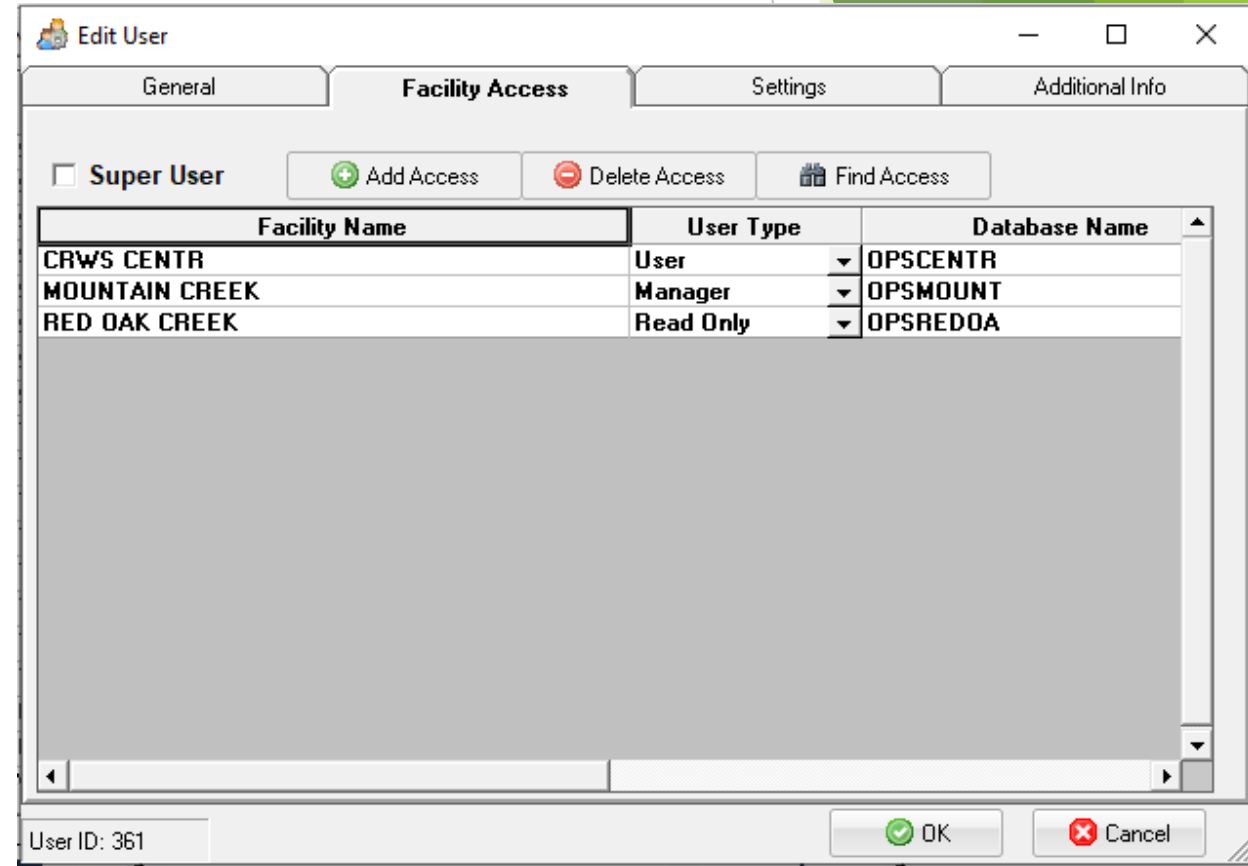
(Baron, 2012)



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# Old Paradigm – The Opportunities

Ad-Hoc security presents a challenge with securing data from manipulation or access by those who should not have permission



The image shows a screenshot of the 'Edit User' dialog box in the WIMS Ad-Hoc User Setup application. The dialog has four tabs: 'General', 'Facility Access' (which is selected), 'Settings', and 'Additional Info'. In the 'Facility Access' tab, there is a checkbox for 'Super User' which is unchecked. To the right of this checkbox are three buttons: 'Add Access' (with a green plus icon), 'Delete Access' (with a red minus icon), and 'Find Access' (with a magnifying glass icon). Below these buttons is a table with three columns: 'Facility Name', 'User Type', and 'Database Name'. The table contains three rows of data. At the bottom of the dialog, there is a 'User ID' field containing the value '361', and two buttons: 'OK' (with a green checkmark icon) and 'Cancel' (with a red X icon).

| Facility Name  | User Type | Database Name |
|----------------|-----------|---------------|
| CRWS CENTR     | User      | OPSCENTR      |
| MOUNTAIN CREEK | Manager   | OPSMOUNT      |
| RED OAK CREEK  | Read Only | OPSREDOA      |

WIMS Ad-Hoc User Setup



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# Old Paradigm – The Opportunities



(Lawrence, 2018)

Manual water data collection using pen and paper can be lost, damaged, destroyed, or illegible



# Old Paradigm – The Opportunities

Performing calculations manually may differ between operators that may not produce a result with higher precision or may be inaccurate

Handwritten calculation for Mass Balance for Sludge:

$$Qc_{1,in} + Qc_{2,in} = Qc_{out} + M_{sludge}$$
$$M_{sludge} = Q (C_{1,in} + C_{2,in} - C_{out})$$
$$M_{sludge} = 0.5 \frac{m^3}{s} (23 + 37 - 12) \frac{mg}{L}$$
$$= 24 \frac{m^3}{s} \cdot \frac{mg}{L} \left( \frac{1000 L}{m^3} \right) \left( \frac{86,400 s}{d} \right)$$
$$= 2,073,600,000 \frac{mg}{d} \left( \frac{g}{1000 mg} \cdot \frac{kg}{1000 g} \right)$$

(Mass Balance for Sludge Calculation in Water Treatment Plant, 2017)



# Old Paradigm – The Opportunities

|    | A | B                   | C | D |
|----|---|---------------------|---|---|
| 1  |   | Daily Total         |   |   |
| 2  |   | 34                  |   |   |
| 3  |   | 54                  |   |   |
| 4  |   | 23                  |   |   |
| 5  |   | 51                  |   |   |
| 6  |   | =SUM(B12,,B3,B4,B5) |   |   |
| 7  |   |                     |   |   |
| 8  |   |                     |   |   |
| 9  |   |                     |   |   |
| 10 |   |                     |   |   |
| 11 |   |                     |   |   |
| 12 |   |                     |   |   |
| 13 |   |                     |   |   |

Accidental Excel Formula Change

Excel spreadsheet formulas can be easily manipulated and do not provide a means of validating the data or provide an audit trail



# Old Paradigm – The Opportunities

Entering data manually into WIMS after operator rounds have been accomplished and generating reports - is redundant and costs valuable time

| TRINITY RIVER AUTHORITY                   |           |                 |              |        |          |                    |                      |             |
|---|-----------|-----------------|--------------|--------|----------|--------------------|----------------------|-------------|
| ROCRWS                                    |           |                 |              |        |          |                    |                      |             |
| PH VALUE                                  |           |                 |              |        |          |                    |                      |             |
| MONTH OF <u>FEBRUARY</u> YEAR <u>2017</u> |           |                 |              |        |          |                    |                      |             |
| DATE                                      | COLLECTOR | TIME OF COLLECT | TIME OF TEST | INF PH | INF TEMP | EFFLUENT DUPLICATE | EFFLUENT TEMPERATURE | EFFLUENT PH |
| 1   | Jh.       | 12:47 PM        | 12:52 PM     | 7.49   | 23°C     | 7.57               | 22°C                 | 7.47        |
| 2   | Jh.       | 10:26 AM        | 10:30 AM     | 7.17   | 19°C     | 7.36               | 20°C                 | 7.35        |
| 3   | Jh.       | 2:06 PM         | 2:12 PM      | 7.27   | 20°C     | 7.34               | 20°C                 | 7.33        |
| 4   |           |                 |              |        |          |                    |                      |             |
| 5   | DAVID     | 1:25 PM         | 2:05 PM      |        |          | 7.11               | 21                   | 7.04        |
| 6   | DAVID     | 2:25 PM         | 2:30 PM      | 7.36   | 21       | 7.14               | 23                   | 7.24        |
| 7   | DAVID     | 1:20 PM         | 1:30 PM      |        |          | 7.53               | 23                   | 7.32        |
| 8   | Jh.       | 1:52 PM         | 1:58 PM      | 7.28   | 20°C     | 7.35               | 21°C                 | 7.23        |
| 9   | Jh.       | 3:42 PM         | 3:57 PM      | 7.24   | 21°C     | 7.24               | 21°C                 | 7.22        |

Manual Data Collection



|       | Daily Com | 3291                    | 3273   | 3481        |
|-------|-----------|-------------------------|--------|-------------|
|       |           | Eff pH Lab at Peak Flow | Eff DO | Eff E. coli |
|       |           | mg/L                    | mg/L   | ColV100ML   |
| 1 Wed |           | 7.41                    | 7.9    | 1           |
| 2 Thu |           | 7.35                    | 8.0    | 1           |
| 3 Fri |           | 7.33                    | 8.0    | 1           |
| 4 Sat |           |                         |        |             |
| 5 Sun |           | 7.06                    | 7.5    |             |
| 6 Mon |           | 7.24                    | 7.4    | 1           |
| 7 Tue |           | 7.32                    | 7.4    | 1           |
| 8 Wed |           | 7.23                    | 7.4    | 1           |
| 9 Thu |           | 7.22                    | 7.7    | 1           |

Manual Data Entry

# Old Paradigm – The Opportunities

Lagging indicators include: privilege creep, intentional or unintentional data manipulation, data inconsistency, delayed reporting erroneous or averaged calculations, and unnecessary expenditures; opportunities to improve, all of which do not support informed decision making and increases the risk of failures



(Del Buono, 2017)



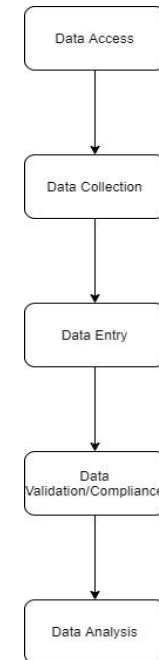
# New Paradigm – The Strategic Plan

Strategic planning on WIMS implementation identifies strategic objectives that address the opportunities presented by the Old Paradigm

## Objectives

|  |  |
|--|--|
| <b>Objective #1: Collect and enter accurate water data as close to the source as possible.</b> In order to improve our data collection and entry efforts we need to replace the old manual paradigm. Implementing modern techniques to performing operator rounds using technology will aid in reducing human error. Earlier use of WIMS allowed the creation of data points Ad Hoc to the specific needs of the user that created them at that current time. Over the years this has created a uniformed way of entering and storing data within WIMS. Standardizing the data points and normalizing the data Authority-wide can reduce ambiguity and place all users in the same language. |  |
| Action plans to achieve objectives   | <ul style="list-style-type: none"><li>- Maximo to WIMS operator round solution</li><li>- Variable naming convention</li><li>- Variable audit</li><li>- WIMS Data Entry Forms</li><li>- WIMS Lab Cal</li><li>- WIMS BOD Manager</li><li>- WIMS Plant Automation</li></ul> |
| Person / Group responsible   | WIMS Power User Group  |

TRA Strategic Plan Objectives



- Data Access
  - WIMS User Profiles (RBAC)
- Data Collection
  - Maximo to WIMS Operator Round Solution
  - WIMS Plant Automation
- Data Entry
  - Variable Audit
  - Variable naming convention
  - WIMS Data Entry Forms (Ad Hoc)
- Data Validation/Compliance
  - WIMS Data Approval
  - WIMS Compliance Engine
  - WIMS Sampling Requirements
- Data Analysis
  - WIMS Modeling
  - WIMS BOD Manager
  - Strategic Power BI
  - Operational Power BI
  - Standardized WIMS Dashboards
  - WIMS Reports (Ad Hoc)
  - WIMS Graphs (Ad Hoc)
  - DMR Reports

WIMS Data Lifecycle

# New Paradigm – The Strategic Plan

Using security, validation, auditing, and calculation tools increase data integrity

|             | ROLES                    | ENTRY GROUPS - USE |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|-------------|--------------------------|--------------------|--|--------------------|---|----------------------------|---|---|---|---|--|--|---|------------------------|---|---------------|---------------------------------------|----------------|---|
|             |                          | Solids Data Entry  | Solids Data Entry / Retired Liquids Data Entry | Liquids Data Entry | Liquids Data Entry / Retired Liquids Data Entry | Administrati on Data Entry | Administrati on Data Entry/Liquid s Manager | Administrati on Data Entry/Solids Manager | Administrati on Data Entry/Engin eering Manager | Administrati on Data Entry / Retired Administrati on Data Entry | Administrati on Data Entry / Retired Administrati on Data Entry/Liquid | Administrati on Data Entry / Retired Administrati on Data Entry/Solids | Administrati on Data Entry / Retired Administrati on Data Entry/Engin | Engineering Data Entry | Engineering Data Entry / Retired Engineering Data Entry | QA Data Entry | QA Data Entry / Retired QA Data Entry | Lab Data Entry | Lab Data Entry / Retired Lab Data Entry |
| Liquids     | Liquids Division         |                    |  | X                  | X   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|             | Liquids Chief            |                    |  | X                  | X   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|             | Liquids Senior           |                    |  | X                  | X   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|             | Liquids Operator         |                    |  | X                  | X   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
| Solids      | Solids Division          | X                  | X  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|             | Solids Chief Operator    | X                  | X  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|             | Solids Senior            | X                  | X  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
|             | Solids Operator          | X                  | X  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
| Engineering | PCSA Engineer PCS        |                    |  |                    |   |                            |   |   |   |   |  |  | X   | X                      |   |               |                                       |                |   |
|             | Administrat PCSA Analyst |                    |  |                    |   |                            |   |   |   |   |  |  | X   | X                      |   |               |                                       |                |   |
|             | Plant Engineer           |                    |  |                    |   |                            |   |   |   |   |  |  | X   | X                      |   |               |                                       |                |   |
|             |                          |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       |                |   |
| Lab         | Lab Division             |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |
|             | Lab Supervisor           |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |
|             | Lab Senior Chemist       |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |
|             | Lab Senior Biologist     |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |
|             | Lab Chemist              |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |
|             | Lab Biologist            |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |
|             | Lab Technician           |                    |  |                    |   |                            |   |   |   |   |  |  |   |                        |   |               |                                       | X              | X                                       |

Role-Based Access Control Matrix

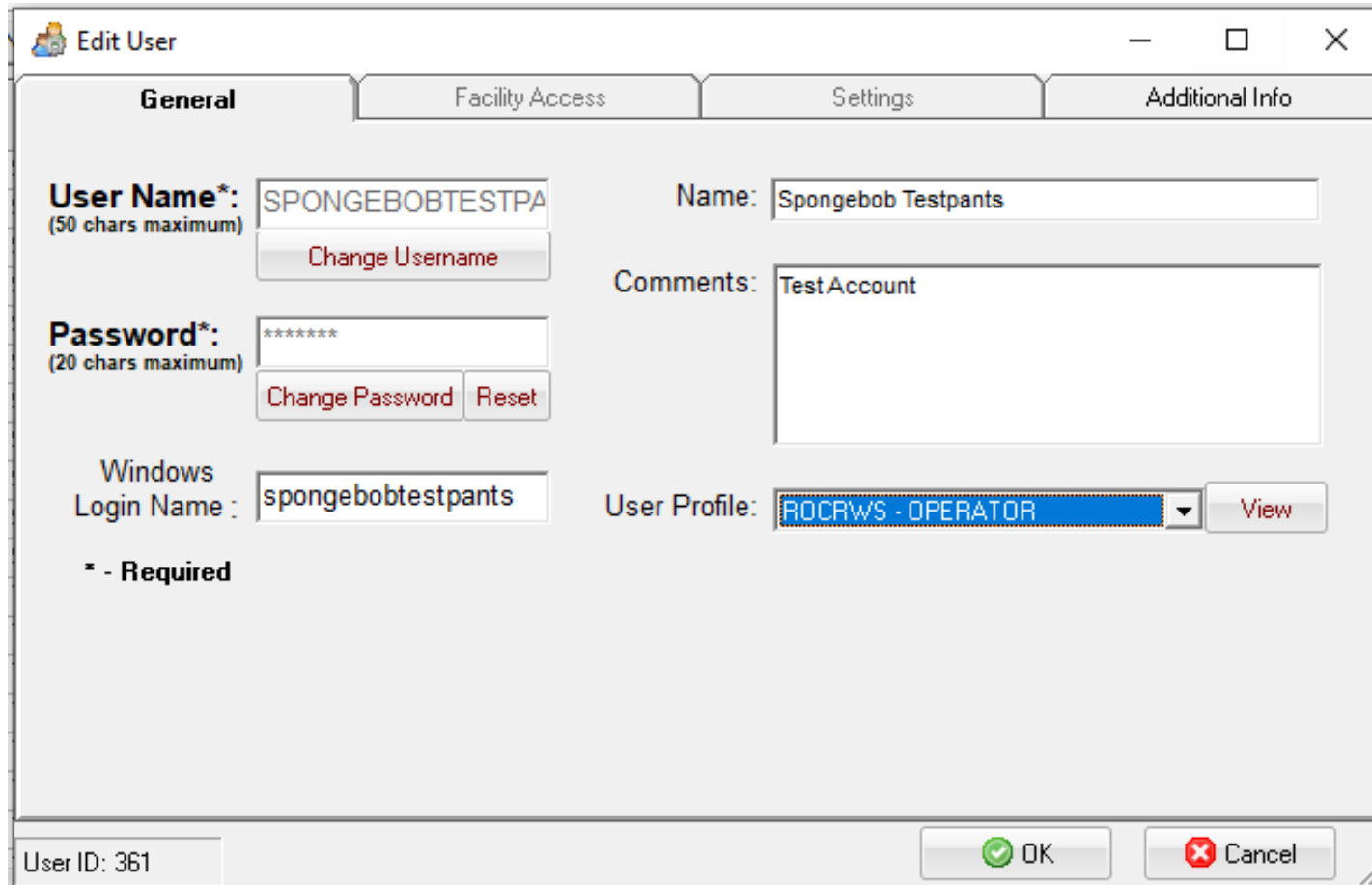
The screenshot shows the 'User Profile Setup' window for the 'CRWS/LQDS OPERATOR' profile. The 'Entry Groups' tab is selected, displaying a list of 27 entry groups with checkboxes for 'Use' and 'Design' permissions. The 'Use' column is checked for groups 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and 27. The 'Design' column is checked for groups 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and 27.

| Facility | Group                             | Use                                 | Design                   |
|----------|-----------------------------------|-------------------------------------|--------------------------|
| 13       | Liquids Data Entry                | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 14       | Liquids Manager                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| 15       | Liquids Manager                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| 16       | Manual Daily Total Effluent Entry | <input type="checkbox"/>            | <input type="checkbox"/> |
| 17       | Monthly Data Entry                | <input type="checkbox"/>            | <input type="checkbox"/> |
| 18       | QA Data Entry                     | <input type="checkbox"/>            | <input type="checkbox"/> |
| 19       | Retired Administration Data Entry | <input type="checkbox"/>            | <input type="checkbox"/> |
| 20       | Retired Engineering Data Entry    | <input type="checkbox"/>            | <input type="checkbox"/> |
| 21       | Retired Lab Data Entry            | <input type="checkbox"/>            | <input type="checkbox"/> |
| 22       | Retired Liquids Data Entry        | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 23       | Retired QA Data Entry             | <input type="checkbox"/>            | <input type="checkbox"/> |
| 24       | Retired Solids Data Entry         | <input type="checkbox"/>            | <input type="checkbox"/> |
| 25       | Solids Data Entry                 | <input type="checkbox"/>            | <input type="checkbox"/> |
| 26       | Solids Manager                    | <input type="checkbox"/>            | <input type="checkbox"/> |
| 27       | Solids Manager                    | <input type="checkbox"/>            | <input type="checkbox"/> |

WIMS User Profile Setup



# New Paradigm – The Strategic Plan



The image shows a screenshot of a software window titled "Edit User". The window has four tabs: "General", "Facility Access", "Settings", and "Additional Info". The "General" tab is selected. It contains several input fields and buttons. The "User Name\*" field is labeled "(50 chars maximum)" and contains the text "SPONGEBOBTESTPA". Below it is a "Change Username" button. The "Password\*" field is labeled "(20 chars maximum)" and contains seven asterisks. Below it are "Change Password" and "Reset" buttons. The "Name:" field contains "Spongebob Testpants". The "Comments:" field contains "Test Account". The "Windows Login Name:" field contains "spongebobtestpants". The "User Profile:" dropdown menu is set to "ROCRWS - OPERATOR" and has a "View" button next to it. At the bottom left, it says "User ID: 361". At the bottom right, there are "OK" and "Cancel" buttons. A note at the bottom left of the form area says "\* - Required".

**Edit User**

**General** | Facility Access | Settings | Additional Info

**User Name\*:** (50 chars maximum) SPONGEBOBTESTPA  
Change Username

**Password\*:** (20 chars maximum) \*\*\*\*\*  
Change Password Reset

**Name:** Spongebob Testpants

**Comments:** Test Account

**Windows Login Name:** spongebobtestpants

**User Profile:** ROCRWS - OPERATOR View

\* - Required

User ID: 361

OK Cancel

Assigning a User Profile to a user



# New Paradigm – The Strategic Plan

|    |      | Limit Name | Start Date | End Date  | Description         | Current Limit | Grouping |
|----|------|------------|------------|-----------|---------------------|---------------|----------|
| 2  | Edit | DAVG       | 5/1/2024   | 9/30/2024 | Daily Average Limit | > 100         | M        |
| 3  | Edit | DAVG       | 10/1/2023  | 4/30/2024 | Daily Average Limit | > 200         | M        |
| 4  | Edit | DAVG       | 5/1/2023   | 9/30/2023 | Daily Average Limit | > 100         | M        |
| 5  | Edit | DAVG       | 10/1/2022  | 4/30/2023 | Daily Average Limit | > 200         | M        |
| 6  | Edit | DAVG       | 5/1/2022   | 9/30/2022 | Daily Average Limit | > 100         | M        |
| 7  | Edit | DAVG       | 10/1/2021  | 4/30/2022 | Daily Average Limit | > 200         | M        |
| 8  | Edit | DAVG       | 5/1/2021   | 9/30/2021 | Daily Average Limit | > 100         | M        |
| 9  | Edit | DAVG       | 10/1/2020  | 4/30/2021 | Daily Average Limit | > 200         | M        |
| 10 | Edit | DAVG       | 5/1/2020   | 9/30/2020 | Daily Average Limit | > 100         | M        |
| 11 | Edit | DAVG       | 10/1/2019  | 4/30/2020 | Daily Average Limit | > 200         | M        |

## WIMS Compliance Engine

Edit/View Variables

First Prev Next Last ... Browse New Del Ins Info Copy

VarNum 12 Edit VarNum

Location Influent

Name Inf BOD Load Units lbs/day

Track every Day Type Calculated ☐ Data Read-Only ☐ Definition Read-Only

User Defined Symbols List Additional Info Global Ids Entry Limits Sampling Req

Description Reg Limits Name Attributes Quality Control Equation Interface Options

+ - \* / ( ) Check Equation

V12 = V3201 \* V11 \* 8.34

[Eff Total Flow [MGD]] \* [Inf BOD [mg/L]] \* 8.34

NARANJODL (2/11/2021 10:14:13 AM) VARID : 7

## Vetted WIMS Calculated Variables

Data Approval

Settings

Date range Start Date 9/1/2021 End Date 9/30/2021 < Sep 2021 >

Show Records

Datasource: 0 Daily Data 1 Hourly Data 2 15 Min Data 3 30 Min Data 4 5 Min Data 5 4 Hourly Data 6 Minutely Data

Select All Select Filter Save Filter

Data Approval Levels: 0 FINAL APPROVAL 1024 ENTERED

Select All Unapproved

Action Select All Select None Print Approve Selected

Available records (171 found)

| Type | VarNum | Location | Var Name    | Date/Time | Value | Approval |
|------|--------|----------|-------------|-----------|-------|----------|
| P    | 3481   | Effluent | Eff E. coli | 9/26/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/19/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/21/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/18/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/22/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/1/2021  | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/17/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/29/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/23/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/16/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/24/2021 | 1     | ENTERED  |
| P    | 3481   | Effluent | Eff E. coli | 9/2/2021  | 1     | ENTERED  |

## WIMS Data Approval

### RED OAK CREEK Updated and Deleted Records

Report Date Range: 9/1/2021 - 9/30/2021

| VarNum | Variable                | Audit Date & Time     | Audit User | Data Date |
|--------|-------------------------|-----------------------|------------|-----------|
| 11     | Inf BOD                 | 9/13/2021 10:36:09 AM | MORGANT    | 8/29/2021 |
| 1202   | AerBasin MLSS Lab (6AM) | 9/6/2021 8:10:11 AM   | DENNIER    | 9/6/2021  |
| 1403   | AerBasin MLSS Lab (6pm) | 9/5/2021 8:08:29 PM   | DENNIER    | 9/4/2021  |

## WIMS Updated and Deleted Records Report



Trinity River Authority of Texas  
*Enriching the Trinity basin as a resource for Texans*

# New Paradigm – The Strategic Plan



**SCADA  
Interface**



**LIMS  
Interface**



**Maximo  
Interface**

Collecting and entering accurate water data as close to the sources as possible streamlines capture and mitigate against human factors



# New Paradigm – The Strategic Plan

| Sequence | Location | Asset | Asset/Location Description | Job Plan                    | Inspection Form | Name                  |
|----------|----------|-------|----------------------------|-----------------------------|-----------------|-----------------------|
| 1        | 122-91A  | >     | >                          | Laboratory Building         | 1048            | Rainfall, Temps - 6-2 |
| 5        | 122-21A  | >     | >                          | Plant Influent Pump Station | 1021            | NH3 - 6-2             |
| 6        | 122-40B  | >     | >                          | Aeration Basin #1           | 1021            | NH3 - 6-2             |
| 7        | 122-40C  | >     | >                          | Aeration Basin #2           | 1021            | NH3 - 6-2             |
| 8        | 122-58A  | >     | >                          | Effluent Structure          | 1021            | NH3 - 6-2             |

AllIncompleteCompleted

▼ Rainfall, Temps - 6-2

1. What is the barometric reading?

2. What is the rainfall reading?

3. What is the high temperature?

4. What is the low temperature?

1. What is the barometric reading?

Rainfall, Temps, 6-2, Barometric Pressure  
*Unspecified*



Mountain Creek Regional Wastewater System  
pH Calibration and Analysis Process Control  
September 2021

| Date      | 10PM to 6AM Shift                |                                   |                                    |                                   |                            |  | 6AM to 2PM Shift                 |                                   |                                    |                                   |                            |  | 2PM to 10PM Shift                |                                   |                                    |                                   |                            |  |
|-----------|----------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------|--|----------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------|--|----------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------|--|
|           | pH Meter Calibration Temperature | pH Meter Calibration 7.0 Standard | pH Meter Calibration 10.0 Standard | pH Meter Calibration 4.0 Standard | pH Meter Calibration Slope | pH Meter Calibration Quality Control Check | pH Meter Calibration Temperature | pH Meter Calibration 7.0 Standard | pH Meter Calibration 10.0 Standard | pH Meter Calibration 4.0 Standard | pH Meter Calibration Slope | pH Meter Calibration Quality Control Check | pH Meter Calibration Temperature | pH Meter Calibration 7.0 Standard | pH Meter Calibration 10.0 Standard | pH Meter Calibration 4.0 Standard | pH Meter Calibration Slope | pH Meter Calibration Quality Control Check |
| 9/1/2021  | Deg C                            | SU                                | SU                                 | SU                                |                            | SU   | Deg C                            | SU                                | SU                                 | SU                                |                            | SU   | Deg C                            | SU                                | SU                                 | SU                                |                            | SU   |
| 9/2/2021  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 22.40                            | 7.01                              | 10.04                              | 4.01                              | 58.60                      | 9.97                                       |
| 9/3/2021  |                                  |                                   |                                    |                                   |                            |  | 22.30                            | 7.01                              | 10.04                              | 4.01                              | 58.50                      | 9.98                                       |                                  |                                   |                                    |                                   |                            |  |
| 9/4/2021  |                                  |                                   |                                    |                                   |                            |  | 22.50                            | 7.01                              | 10.04                              | 4.01                              | 58.50                      | 9.97                                       |                                  |                                   |                                    |                                   |                            |  |
| 9/5/2021  |                                  |                                   |                                    |                                   |                            |  | 23.10                            | 7.01                              | 10.03                              | 4.01                              | 58.40                      | 9.95                                       | 23.80                            | 7.00                              |                                    |                                   |                            |  |
| 9/6/2021  |                                  |                                   |                                    |                                   |                            |  | 21.70                            | 7.01                              | 10.04                              | 4.01                              | 58.60                      | 10.00                                      | 23.60                            | 7.00                              |                                    |                                   |                            |  |
| 9/7/2021  |                                  |                                   |                                    |                                   |                            |  | 21.20                            | 7.01                              | 10.04                              | 4.00                              | 58.70                      | 10.02                                      | 22.40                            | 6.99                              |                                    |                                   |                            |  |
| 9/8/2021  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 22.60                            | 7.01                              |                                    |                                   |                            |  |
| 9/9/2021  |                                  |                                   |                                    |                                   |                            |  | 21.90                            | 7.01                              | 10.04                              | 4.00                              | 58.70                      | 9.99                                       | 22.90                            | 7.01                              |                                    |                                   |                            |  |
| 9/10/2021 |                                  |                                   |                                    |                                   |                            |  | 22.00                            | 7.01                              | 10.04                              | 4.01                              | 58.60                      | 9.98                                       |                                  |                                   |                                    |                                   |                            |  |
| 9/11/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |
| 9/12/2021 |                                  |                                   |                                    |                                   |                            |  | 21.70                            | 7.01                              | 10.04                              | 4.00                              | 58.60                      | 9.99                                       | 22.80                            | 6.99                              |                                    |                                   |                            |  |
| 9/13/2021 | 23.10                            | 7.07                              |                                    |                                   |                            |  | 22.70                            | 7.01                              | 10.03                              | 4.01                              | 58.50                      | 9.97                                       | 23.00                            | 7.00                              |                                    |                                   |                            |  |
| 9/14/2021 | 22.90                            | 7.00                              |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 22.80                            | 7.00                              |                                    |                                   |                            |  |
| 9/15/2021 |                                  |                                   |                                    |                                   |                            |  | 22.60                            | 7.01                              | 10.04                              | 4.01                              | 58.30                      | 9.99                                       | 23.00                            | 7.02                              |                                    |                                   |                            |  |
| 9/16/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 23.30                            | 7.01                              |                                    |                                   |                            |  |
| 9/17/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |
| 9/18/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |
| 9/19/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |
| 9/20/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 585.00                           | 7.01                              |                                    |                                   |                            |  |
| 9/21/2021 |                                  |                                   |                                    |                                   |                            |  | 22.40                            | 7.01                              | 10.04                              | 4.01                              | 58.80                      | 9.99                                       | 22.70                            | 7.01                              |                                    |                                   |                            |  |
| 9/22/2021 | 22.90                            | 7.00                              |                                    |                                   |                            |  | 22.20                            | 7.01                              | 10.04                              | 4.01                              | 58.70                      | 10.02                                      | 23.20                            | 7.03                              |                                    |                                   |                            |  |
| 9/23/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 23.00                            | 7.01                              |                                    |                                   |                            |  |
| 9/24/2021 | 22.20                            |                                   |                                    |                                   |                            |  | 21.90                            | 7.01                              | 10.04                              | 4.01                              | 58.70                      | 9.98                                       |                                  |                                   |                                    |                                   |                            |  |
| 9/25/2021 | 21.80                            | 7.01                              |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  |
| 9/26/2021 |                                  |                                   |                                    |                                   |                            |  | 22.80                            | 7.01                              | 10.05                              | 4.01                              | 58.70                      | 9.99                                       | 22.20                            | 7.04                              |                                    |                                   |                            |  |
| 9/27/2021 |                                  |                                   |                                    |                                   |                            |  |                                  |                                   |                                    |                                   |                            |  | 22.20                            | 7.00                              |                                    |                                   |                            |  |
| 9/28/2021 |                                  |                                   |                                    |                                   |                            |  | 22.20                            | 7.01                              | 10.04                              | 4.01                              | 58.70                      | 9.98                                       | 23.30                            | 7.00                              |                                    |                                   |                            |  |
| 9/29/2021 | 21.70                            | 7.00                              |                                    |                                   |                            |  | 21.00                            | 7.00                              | 10.05                              | 4.00                              | 58.90                      | 9.96                                       | 23.10                            | 6.99                              |                                    |                                   |                            |  |
| 9/30/2021 | 22.10                            | 6.99                              |                                    |                                   |                            |  | 21.20                            | 7.01                              | 10.05                              | 4.00                              | 58.60                      | 9.98                                       | 22.50                            |                                   |                                    |                                   |                            |  |
| Minimum   | 21.70                            | 6.99                              |                                    |                                   |                            |  | 21.00                            | 7.00                              | 10.03                              | 4.00                              | 58.70                      | 9.96                                       | 22.10                            | 6.99                              | 10.04                              | 4.01                              | 58.60                      | 9.97                                       |
| Maximum   | 23.10                            | 7.07                              |                                    |                                   |                            |  | 23.10                            | 7.01                              | 10.05                              | 4.01                              | 58.80                      | 10.02                                      | 585.00                           | 7.04                              | 10.04                              | 4.01                              | 58.60                      | 9.97                                       |
| Total     | 156.60                           | 42.07                             |                                    |                                   |                            |  | 375.40                           | 119.16                            | 170.69                             | 68.12                             | 703.20                     | 169.75                                     | 998.90                           | 133.13                            | 10.04                              | 4.01                              | 58.60                      | 9.97                                       |
| Average   | 22.37                            | 7.01                              |                                    |                                   |                            |  | 22.08                            | 7.01                              | 10.04                              | 4.01                              | 43.95                      | 9.99                                       | 49.95                            | 7.01                              | 10.04                              | 4.01                              | 58.60                      | 9.97                                       |

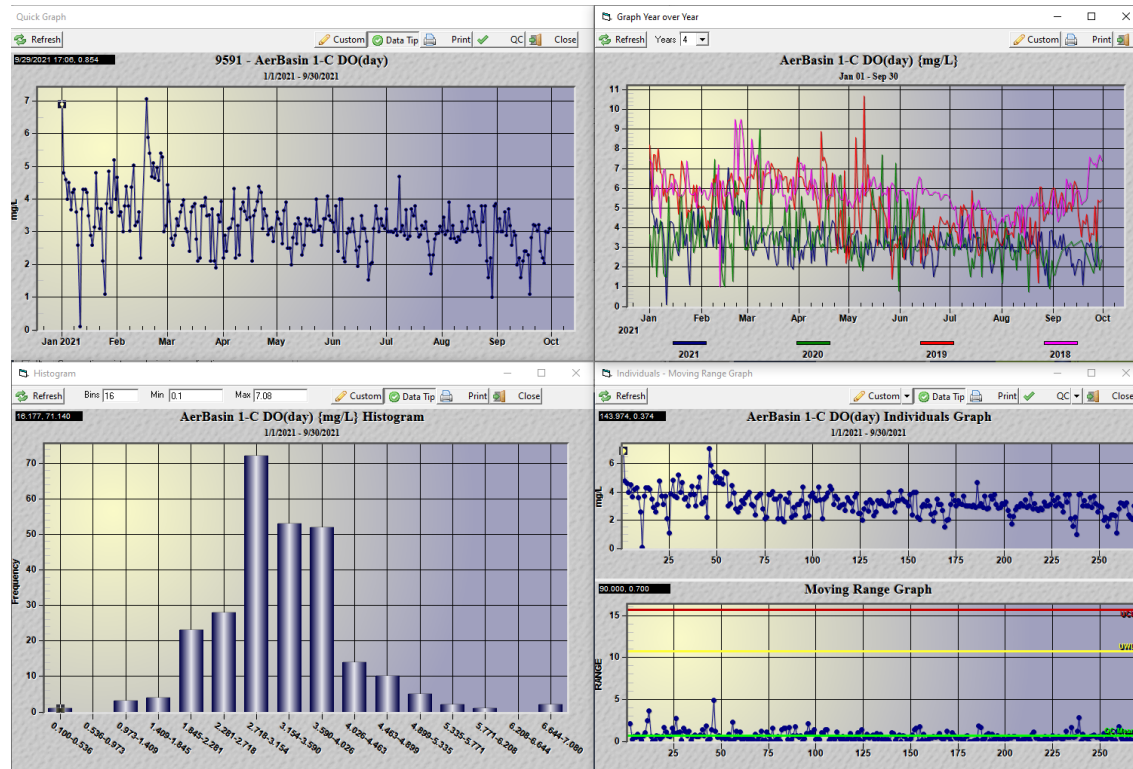
Operator rounds data captured in Maximo inspection form

Operator rounds data from Maximo transferred into WIMS via interface

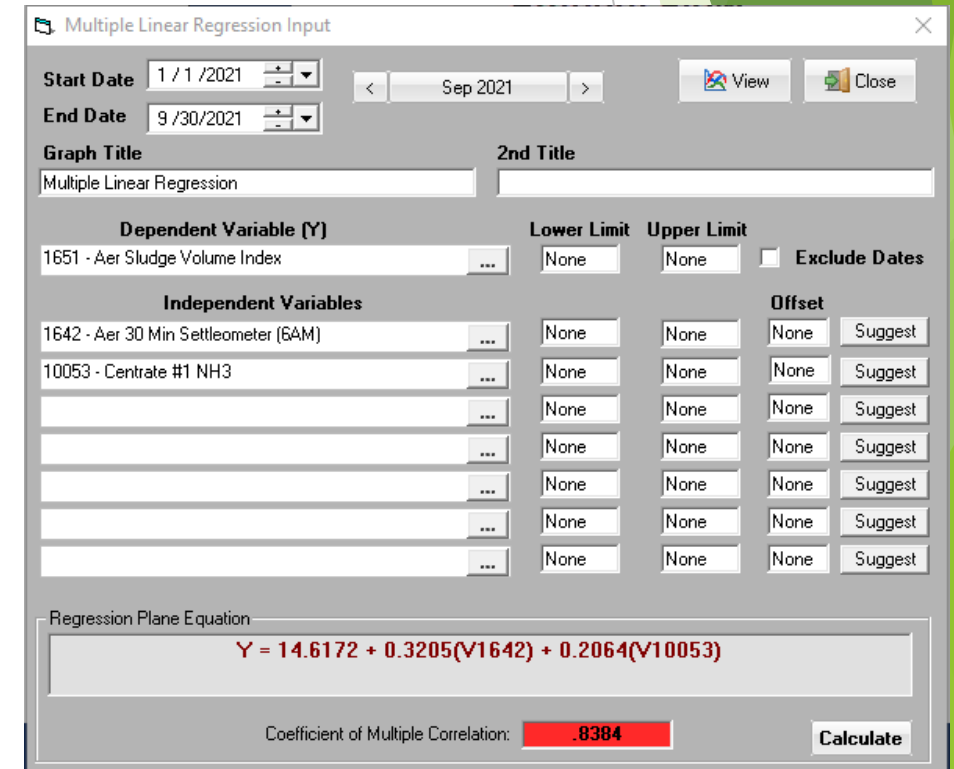


# New Paradigm – The Strategic Plan

Data visualization and analytics give managers insights, provide answers, and enable informed process control adjustments



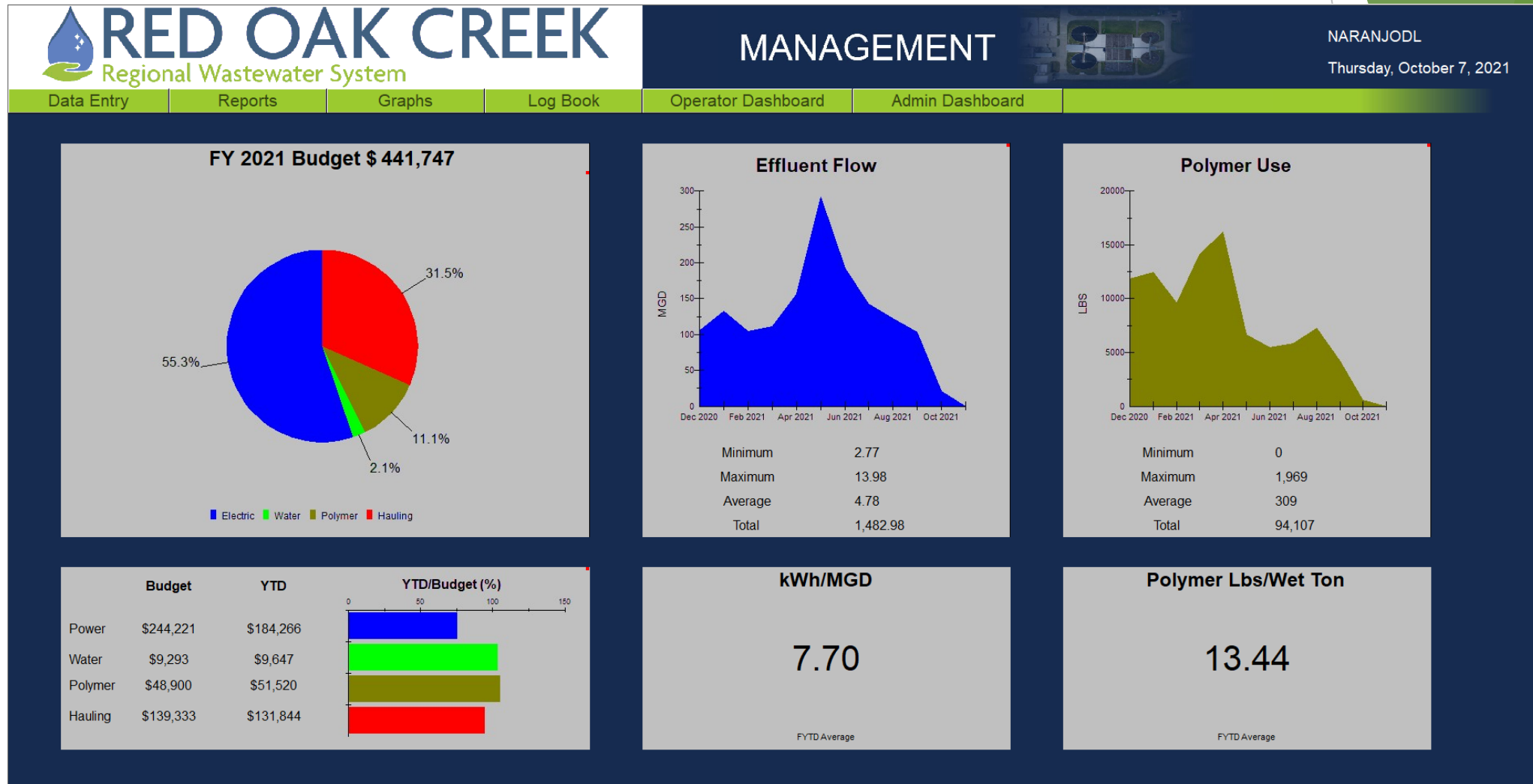
WIMS Variable Analysis Graph



Predictive Model Example



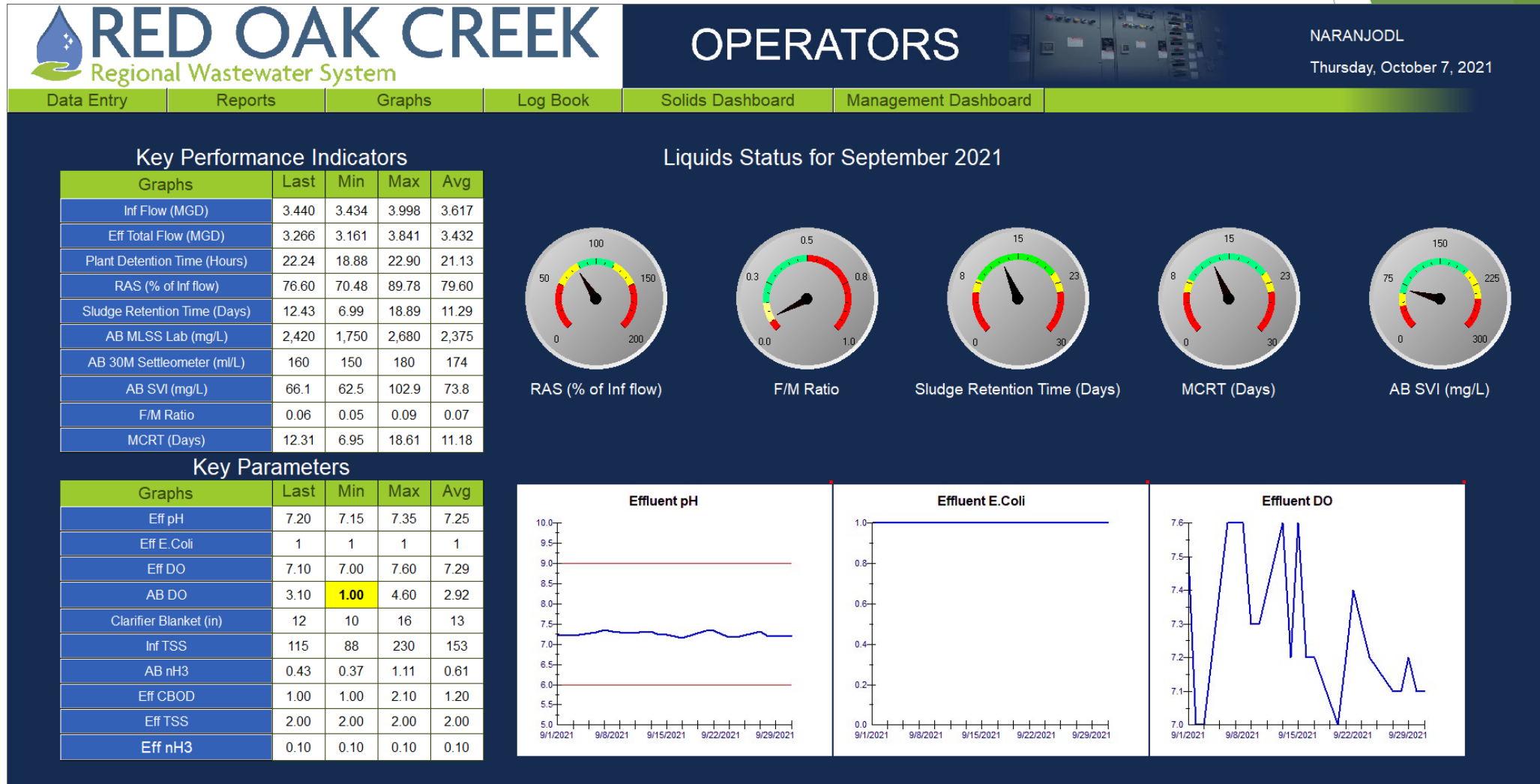
# New Paradigm – The Strategic Plan



Plant Management Dashboard



# New Paradigm – The Strategic Plan





# New Paradigm – The Strategic Plan



## RED OAK CREEK Regional Wastewater System

### OPERATORS

NARANJODL

Thursday, October 7, 2021

Data Entry

Reports

Graphs

Log Book

Liquids Dashboard

Management Dashboard

#### Key Performance Indicators

| Graphs                      | Last  | Min   | Max   | Avg   | Total   |
|-----------------------------|-------|-------|-------|-------|---------|
| Cake Total Solids (%)       | 17    | 17    | 21    | 19    | 266     |
| Centrifuge Total Runtime    | 10.0  | 10.0  | 19.0  | 14.7  | 206     |
| Wet Tons Hauled             | 23.50 | 16.72 | 23.50 | 19.87 | 218.58  |
| WAS Flow (X1000)            | 129.6 | 78.8  | 204.9 | 130.3 | 3,908   |
| Sludge Feed (X1000)         | 45.6  | 0.0   | 94.7  | 55.0  | 1,650   |
| Decant Total (X1000)        | 84.0  | 30.2  | 181.6 | 75.3  | 2,257.8 |
| Holding Tank Start Level    | 8.9   | 5.5   | 9.5   | 7.5   | 226     |
| Holding Tank End Level      | 3.4   | 3.2   | 4.3   | 3.4   | 103     |
| Polymer Use                 | 100   | 40    | 389   | 140   | 4,204   |
| Polymer lbs/tons Dry Solids | 8.6   | 7.8   | 17.1  | 12.1  | 170     |

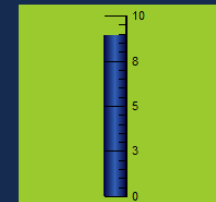
#### Solids Status for September 2021



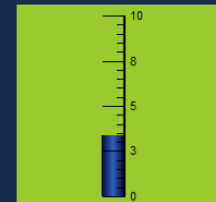
Cake Total Solids (%)



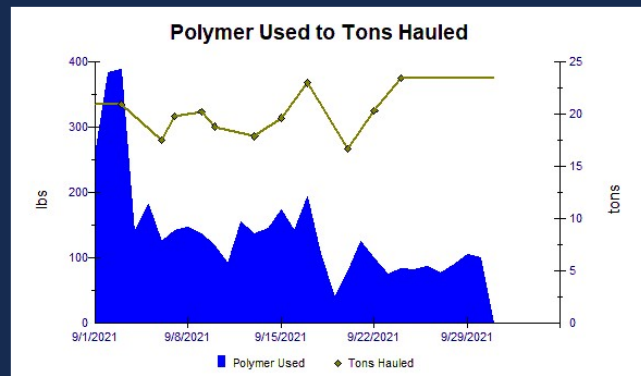
Centrifuge Total Runtime



Holding Tank Start Level



Holding Tank End Level



Sludge Feed  
to Centrifuge

45,585

gal

Decant Total

84,015

gal

Target WAS

129,949

gal

Previous WAS

129,600

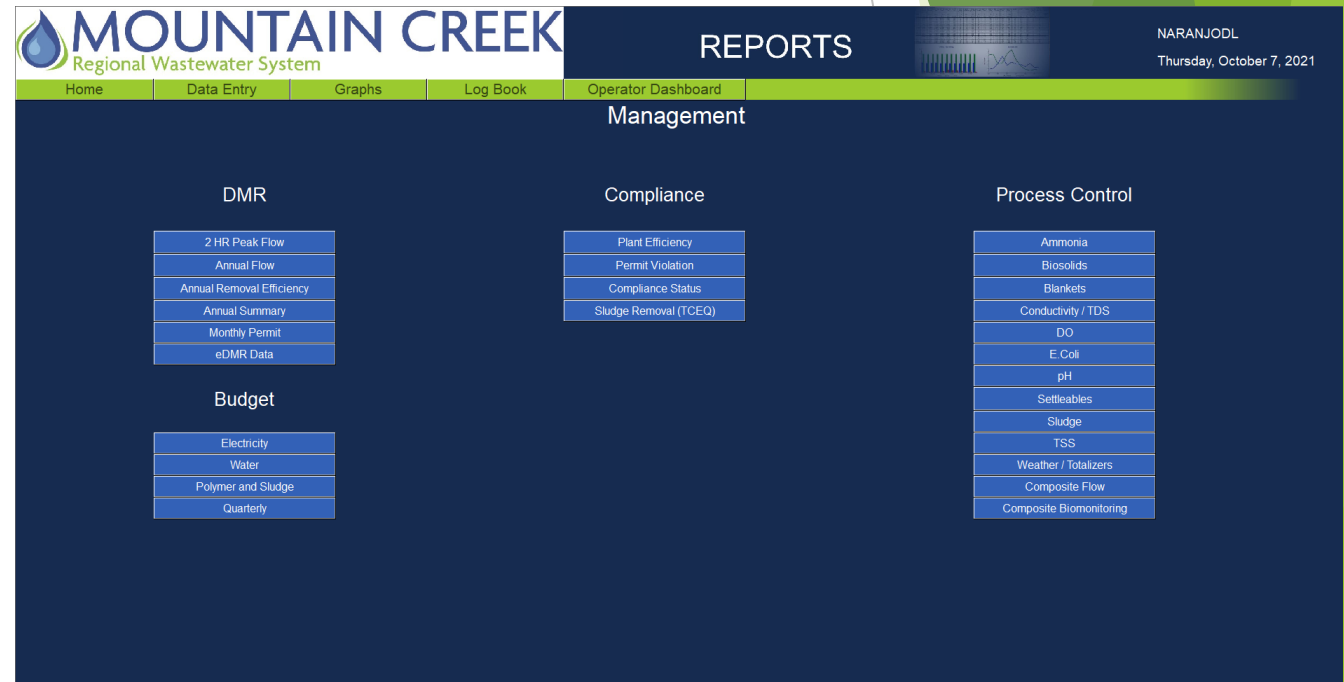
gal



Trinity River Authority of Texas  
Enriching the Trinity basin as a resource for Texans

# New Paradigm – The Strategic Plan

Limits monitoring, automated reporting, and alerting provide data transparency and informs operators of events enabling rapid corrective actions and reporting; and informed decision making



Dashboard provides buttons for report generation

# New Paradigm – The Strategic Plan

By using the WIMS compliance engine, limits monitoring aid in regulatory reporting and process control management

| Scheduled Tasks for OPSREDOA   |                                     |   |            |                         |
|--|-------------------------------------|---|------------|-------------------------|
| <div>  New            Del            Find           <input type="text" value="Quick Filter"/> <input type="button" value="Run Task Now !"/>  Exit         </div> |                                     |   |            |                         |
|  | Enabled                             | Task Description  | Sched Type | Schedule Times          |
| Edit   | <input checked="" type="checkbox"/> | RUN PERMIT VIOLATION TRIGGER REPORT<br>RUN REPORT TRIGGER<br>"Permit Violation Trigger Report"<br>Dates : LAST HOUR | HOURLY     | At 5 minutes after hour |
| Edit   | <input checked="" type="checkbox"/> | SCAN FOR EVENTS<br>SCAN FOR EVENTS<br>Dates : LAST 30 DAYS  | HOURLY     | At 1 minutes after hour |

WIMS Scheduled Tasks

| RED OAK CREEK<br>Compliance Status Report<br>Report Date Range: 10/1/2021 - 10/31/2021 |                                       |            |                      |        |
|--|---------------------------------------|------------|----------------------|--------|
| Varnum   | Variable                              | Violations | Limit Description    | Limit  |
| 3204   | Effl 2hr Interval Average {MGD}       | 0          | Daily Maximum Limit  | >15    |
| 3205   | Effl 2hr Interval Average {GPM} {gpm} | 0          | Daily Maximum Limit  | >10417 |
| 3208   | Eff Annual Average Flow {MGD}         | 0          | Annual Average Limit | >6     |
| 3221   | Eff CBOD {mg/L}                       | 0          | Daily Maximum Limit  | >25    |
|  |                                       | 0          | Daily Average Limit  | >10    |
|  |                                       | 0          | Single Grab Limit    | >35    |
| 3222   | Eff CBOD Load {Lbs}                   | 0          | Daily Average Limit  | >500   |
| 3223   | Eff CBOD 7-Day Avg {mg/L}             | 0          | 7-Day Average        | >15    |
| 3241   | Eff TSS {mg/L}                        | 0          | Single Grab Limit    | >60    |
|  |                                       | 0          | Daily Average Limit  | >15    |
|  |                                       | 0          | Daily Maximum Limit  | >40    |
| 3242   | Eff TSS Load {Lbs}                    | 0          | Daily Average Limit  | >751   |
| 3243   | Eff TSS 7-Day Avg {mg/L}              | 0          | 7-Day Average Limit  | >25    |
| 3273   | Eff DO {mg/L}                         | 0          | Daily Minimum Limit  | <6     |
| 3291   | Eff pH Lab at Peak Flow {mg/L}        | 0          | Daily Maximum Limit  | >9     |
|  |                                       | 0          | Daily Minimum Limit  | <6     |
| 3321   | Eff Ammonia {mg/L}                    | 0          | Daily Maximum Limit  | >8     |
|  |                                       | 0          | Daily Average Limit  | >4     |
|  |                                       | 0          | Single Grab Limit    | >11    |
| 3322   | Eff Ammonia Load {Lbs}                | 0          | Daily Average Limit  | >200   |
| 3324   | Eff Ammonia 7-Day Avg {mg/L}          | 0          | 7-Day Average Limit  | >6     |
| 3481   | Eff E. coli {Col/100ML}               | 0          | Daily Average Limit  | >126   |
|  |                                       | 0          | Daily Maximum Limit  | >399   |
|  |                                       | Total      | 0                    |        |

WIMS Built In Compliance Report



# New Paradigm – The Strategic Plan

Automated trigger reports send an SMS message and emails to individuals when an event has occurred



## Permit Violation

| Event | Date | Location | VarNum | Variable Name | Notes |
|-------|------|----------|--------|---------------|-------|
|-------|------|----------|--------|---------------|-------|

Please be advised that the Railport Lift Station Wet Well Level has exceeded 10 ft.

Please be advised that the Railport Lift Station Wet Well Level has now dropped below 10ft.

Alerts managers of a permit violation

Alerts managers of a wet well level exceeding and returning to acceptable limits

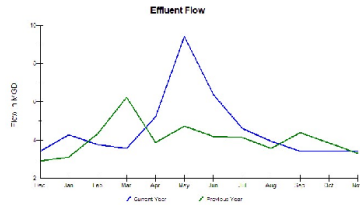
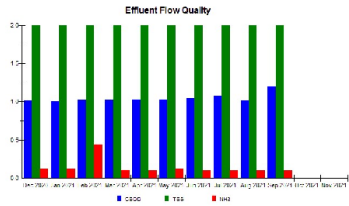


Trinity River Authority of Texas  
Enriching the Trinity basin as a resource for Texans

# New Paradigm – The Strategic Plan

Regulatory reports are created in WIMS, eliminating the need for manual monthly creation

|             | Flow    | Flow  | Flow   | Flow      | Flow   | Rainfall | CBOOD | CBOOD | CBOOD | TSS   | TSS   | TSS   | NH3   | NH3   | NH3   | DO  | pH   | pH   | E. Coli | Collection |
|-------------|---------|-------|--------|-----------|--------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|------|------|---------|------------|
| Limit       | Average | Max   | Post   | Pre       | Pre    | Total    | Daily | Daily | Daily | Daily | Daily | Daily | Daily | Daily | Daily | Min | Max  | Min  | Daily   | System     |
| Permit      | MGD     | MGD   | MGD    | MGD       | MGD    | MGD      | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD | MGD  | MGD  | MGD     | MGD        |
| Month       | MGD     | MGD   | MGD    | MGD       | MGD    | MGD      | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD   | MGD | MGD  | MGD  | MGD     | MGD        |
| Dec 2020    | 4,002   | 3,410 | 6,077  | 7,027.75  | 19,476 | 4,004    | 1.0   | 1.3   | 29.3  | 2.0   | 2.0   | 27.8  | 0.12  | 0.43  | 3.30  | 7.9 | 7.33 | 6.86 | 1       | 105        |
| Jan 2021    | 4,151   | 4,298 | 7,795  | 9,033.37  | 11,387 | 1,105    | 1.0   | 1.3   | 35.2  | 2.0   | 2.0   | 32.4  | 0.12  | 0.38  | 4.11  | 8.1 | 7.53 | 7.28 | 1       | 9          |
| Feb 2021    | 4,106   | 3,748 | 4,887  | 5,653.47  | 5,621  | 1,186    | 1.0   | 1.3   | 31.7  | 2.0   | 2.0   | 62.9  | 0.48  | 5.96  | 13.55 | 7.9 | 7.38 | 7.25 | 1       | 3          |
| Mar 2021    | 3,660   | 3,579 | 4,144  | 4,556.33  | 6,980  | 2,237    | 1.0   | 1.3   | 30.3  | 2.0   | 2.0   | 58.5  | 0.11  | 0.18  | 3.18  | 8.1 | 7.48 | 7.17 | 1       | 13         |
| Apr 2021    | 3,991   | 5,214 | 12,963 | 16,011.25 | 14,301 | 6,301    | 1.0   | 1.3   | 41.3  | 2.0   | 2.0   | 60.4  | 0.10  | 0.10  | 4.02  | 7.5 | 7.48 | 7.18 | 2       | 35         |
| May 2021    | 4,388   | 6,411 | 13,977 | 18,955.07 | 14,379 | 12,880   | 1.0   | 1.3   | 66.1  | 2.0   | 2.0   | 107.7 | 0.12  | 0.44  | 9.89  | 7.5 | 7.81 | 7.28 | 1       | 185        |
| Jun 2021    | 4,589   | 6,353 | 13,935 | 18,926.97 | 14,379 | 2,200    | 1.0   | 1.4   | 22.3  | 2.0   | 2.0   | 106.3 | 0.10  | 0.10  | 5.87  | 7.4 | 7.62 | 7.25 | 2       | 8          |
| Jul 2021    | 4,604   | 6,807 | 8,738  | 10,521.84 | 10,438 | 7,104    | 1.1   | 1.5   | 41.9  | 2.0   | 2.0   | 78.2  | 0.10  | 0.10  | 3.91  | 7.4 | 7.52 | 7.38 | 2       | 68         |
| Aug 2021    | 4,661   | 3,660 | 6,117  | 6,587.15  | 9,999  | 4,200    | 1.0   | 1.3   | 38.7  | 2.0   | 2.0   | 66.6  | 0.10  | 0.10  | 3.33  | 7.5 | 7.67 | 7.48 | 2       | 2,600      |
| Sep 2021    | 4,564   | 4,433 | 3,941  | 4,465.26  | 4,996  | 6,301    | 1.2   | 2.1   | 36.3  | 2.0   | 2.0   | 60.5  | 0.10  | 0.10  | 3.00  | 7.5 | 7.35 | 7.15 | 1       | 1          |
| Oct 2021    |         |       |        |           |        |          |       |       |       |       |       |       |       |       |       |     |      |      |         |            |
| Nov 2021    |         |       |        |           |        |          |       |       |       |       |       |       |       |       |       |     |      |      |         |            |
| Minimum     | 3,580   | 3,410 | 3,581  | 4,465.26  | 4,996  | 6,301    | 1.0   | 1.0   | 29    | 2.0   | 2.0   | 38    | 0.10  | 0.10  | 3.00  | 7.5 | 7.33 | 6.86 | 1       | 1          |
| Maximum     | 4,661   | 6,411 | 13,977 | 18,955.07 | 14,379 | 12,880   | 1.3   | 2.1   | 66    | 2.0   | 2.0   | 108   | 0.48  | 5.96  | 13.55 | 8.1 | 7.81 | 7.31 | 3       | 2,420      |
| Range       | 4,106   | 4,106 | 4,106  | 4,106     | 4,106  | 4,106    | 0.3   | 0.8   | 37    | 0.0   | 0.0   | 70    | 0.36  | 5.84  | 10.55 | 0.6 | 0.48 | 0.42 | 2       | 2,419      |
| Average     | 4,265   | 4,800 | 8,143  | 12,221.19 | 10,400 | 4,233    | 1.0   | 1.4   | 42    | 2.0   | 2.0   | 81    | 0.14  | 0.79  | 6.35  | 7.8 | 7.49 | 7.21 | 2       | 201        |
| Grand Total | 4,288   | 4,551 | 7,387  | 10,736.89 | 9,999  | 2,394    | 1.0   | 1.3   | 40    | 2.0   | 2.0   | 77    | 0.12  | 0.24  | 4.88  | 7.6 | 7.49 | 7.21 | 2       | 27         |



## Red Oak Creek Regional Wastewater System Sludge Removal TCEQ Reporting Period 2021

| VENDOR                | DATE       | WET TONS | TOTAL    | MONTH        | WET TONS        | TOTAL               | DRY TONS      | METRIC DRY TONS |
|-----------------------|------------|----------|----------|--------------|-----------------|---------------------|---------------|-----------------|
| Protect Environmental | 09-01-2020 | 15.65    | \$637.74 | September    | 288.56          | \$11,758.84         |               |                 |
| Protect Environmental | 09-03-2020 | 16.18    | \$659.34 | October      | 275.37          | \$11,221.34         |               |                 |
| Protect Environmental | 09-04-2020 | 16.41    | \$668.71 | November     | 340.24          | \$13,864.78         |               |                 |
| Protect Environmental | 09-07-2020 | 19.29    | \$786.07 | December     | 412.78          | \$16,820.85         |               |                 |
| Protect Environmental | 09-08-2020 | 16.32    | \$665.04 | January      | 341.02          | \$13,896.60         |               |                 |
| Protect Environmental | 09-09-2020 | 16.92    | \$689.49 | February     | 250.08          | \$10,190.79         |               |                 |
| Protect Environmental | 09-10-2020 | 13.06    | \$532.20 | March        | 305.03          | \$12,430.00         |               |                 |
| Protect Environmental | 09-12-2020 | 19.49    | \$794.22 | April        | 348.55          | \$14,203.44         | 74.52         |                 |
| Protect Environmental | 09-14-2020 | 17.52    | \$713.94 | May          | 317.34          | \$12,931.61         | 67.37         |                 |
| Protect Environmental | 09-15-2020 | 17.25    | \$702.94 | June         | 268.46          | \$10,939.76         | 57.31         |                 |
| Protect Environmental | 09-17-2020 | 17.12    | \$697.64 | July         | 345.04          | \$16,389.45         | 73.06         |                 |
| Protect Environmental | 09-18-2020 | 13.73    | \$559.50 | August       | 310.28          | \$14,738.35         | 63.82         |                 |
| Protect Environmental | 09-21-2020 | 17.2     | \$700.90 | <b>TOTAL</b> | <b>3,802.75</b> | <b>\$159,385.61</b> | <b>336.07</b> | <b>304.89</b>   |
| Protect Environmental | 09-24-2020 | 16.08    | \$736.76 |              |                 |                     |               |                 |
| Protect Environmental | 09-25-2020 | 19.79    | \$806.44 |              |                 |                     |               |                 |
| Protect Environmental | 09-28-2020 | 18.31    | \$746.13 |              |                 |                     |               |                 |
| Protect Environmental | 09-30-2020 | 16.24    | \$661.78 |              |                 |                     |               |                 |
| Protect Environmental | 10-02-2020 | 13.45    | \$548.09 |              |                 |                     |               |                 |
| Protect Environmental | 10-03-2020 | 15.37    | \$626.33 |              |                 |                     |               |                 |
| Protect Environmental | 10-05-2020 | 17.26    | \$703.35 |              |                 |                     |               |                 |
| Protect Environmental | 10-07-2020 | 17.46    | \$711.50 |              |                 |                     |               |                 |
| Protect Environmental | 10-08-2020 | 10.71    | \$436.43 |              |                 |                     |               |                 |
| Protect Environmental | 10-09-2020 | 15.25    | \$621.44 |              |                 |                     |               |                 |

| CODE  | PARAMETER                                     |                    | QUANTITY OR LOADING |                   |         | QUALITY OR CONCENTRATION |         |               | NO. EX     | FREQUENCY OF ANALYSIS | SAMPLE TYPE   |        |
|-------|---|--------------------|---------------------|-------------------|---------|--------------------------|---------|---------------|------------|-----------------------|---------------|--------|
|       |   |                    | AVERAGE             | MAXIMUM           | UNITS   | MINIMUM                  | AVERAGE | MAXIMUM       |            |                       |               |        |
| 00300 | Monitoring Location<br>Oxygen, dissolved [DO] | SAMPLE MEASUREMENT |                     |                   |         | 7.0                      |         |               | mg/L       | 0                     | Five Per Week | Grab   |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT |                     |                   |         | 6 MO MIN                 |         |               |            |                       |               |        |
| 00400 | pH  | SAMPLE MEASUREMENT |                     |                   |         | 7.15                     |         | 7.35          | S.U.       | 0                     | Five Per Week | Grab   |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT |                     |                   |         | 6 MINIMUM                |         | 9 MAXIMUM     |            |                       |               |        |
| 00530 | Solids, total suspended                       | SAMPLE MEASUREMENT | 60.0                |                   | lb/d    |                          | 2.0     | 2.0           | mg/L       | 0                     | Five Per Week | COMP12 |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT | DAILY AVG           |                   |         | 15 DAILY AVG             |         | 40 DAILY MAX  |            |                       |               |        |
| 00610 | Nitrogen, ammonia total [as N]                | SAMPLE MEASUREMENT | 3.00                |                   | lb/d    |                          | 0.10    | 0.10          | mg/L       | 0                     | Five Per Week | COMP12 |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT | DAILY AVG           |                   |         | 2 DAILY AVG              |         | 10 DAILY MAX  |            |                       |               |        |
| 50050 | Flow, in conduit or thru treatment plant      | SAMPLE MEASUREMENT | 3.432               | 3.841             | MGD     |                          |         |               |            | Continuous            | TOTALZ        |        |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT | DAILY AVG           | Req Mon DAILY MAX |         |                          |         |               |            |                       |               |        |
| 50050 | Flow, in conduit or thru treatment plant      | SAMPLE MEASUREMENT |                     | 3465              | gal/min |                          |         |               | 0          | Continuous            | TOTALZ        |        |
|       | P - See Comments                              | PERMIT REQUIREMENT |                     | 10417 2HR PEAK    |         |                          |         |               |            |                       |               |        |
| 50050 | Flow, in conduit or thru treatment plant      | SAMPLE MEASUREMENT | 4.564               |                   | MGD     |                          |         |               | 0          | Continuous            | TOTALZ        |        |
|       | Gross (Supplementary)                         | PERMIT REQUIREMENT | 6 ANNL AVG          |                   |         |                          |         |               |            |                       |               |        |
| 51040 | E. coli                                       | SAMPLE MEASUREMENT |                     |                   |         |                          | 1       | 1.0           | CFU/100 mL | 0                     | Daily         | Grab   |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT |                     |                   |         | 126 DAILY AVG            |         | 399 DAILY MAX |            |                       |               |        |
| 80082 | BOD, carbonaceous [5 day, 20 C]               | SAMPLE MEASUREMENT | 36.0                |                   | lb/d    |                          | 1.2     | 2.1           | mg/L       | 0                     | Five Per Week | COMP12 |
|       | 1 - Effluent Gross                            | PERMIT REQUIREMENT | DAILY AVG           |                   |         | 10 DAILY AVG             |         | 25 DAILY MAX  |            |                       |               |        |



# New Paradigm – The Strategic Plan

Plant efficiency report gives a snapshot of plant health by looking at regulatory, process control, and budgeting variables

## Red Oak Creek Regional Wastewater System Plant Efficiency Report

**Absolute Plant Efficiency (%):** 95.32

### Process Control (40% Weight)

| Last Entered | Variable                         | Value | Units   | Control Limits | Relative Efficiency (%) | Reason for Inefficiency |
|--------------|----------------------------------|-------|---------|----------------|-------------------------|-------------------------|
| 9/30/2021    | RAS                              | 76.60 | %       | 50 - 120       | 100.00                  |                         |
| 9/30/2021    | Sludge Retention Time            | 7.97  | Days    | 9 - 21         | 88.53                   | Lower Limit Exceeded    |
| 9/30/2021    | Mean Cell Residence Time         | 7.92  | Days    | 9 - 24         | 88.00                   | Lower Limit Exceeded    |
| 10/1/2021    | F/M Ratio                        | 0.06  | Ratio   | 0.08 - 0.5     | 78.97                   | Lower Limit Exceeded    |
| 10/1/2021    | Aer Sludge Volume Index          | 65.04 | ml/g    | 60 - 200       | 100.00                  |                         |
| 9/29/2021    | Centrifuge Cake Total Solids     | 17.40 | %       | >=19           | 91.59                   | Lower Limit Exceeded    |
| 9/27/2021    | Polymer Usage lbs/ton dry solids | 7.79  | lbs/ton | <=15           | 100.00                  |                         |

**Absolute Efficiency (%):** 92.44

### Regulatory Compliance (50% Weight)

| Last Entered         | Variable                        | Value    | Units     | Permit Limits | Relative Efficiency (%) | Reason for Inefficiency |
|----------------------|---------------------------------|----------|-----------|---------------|-------------------------|-------------------------|
| 10/1/2021 6:00:00 AM | Effl 2hr Interval Average (GPM) | 2,226.74 | gpm       | <=10417       | 100.00                  |                         |
| 10/1/2021            | Eff Daily Peak 2hr Flow         | 4.29     | MGD       | <=15          | 100.00                  |                         |
| 10/1/2021            | Eff Annual Average Flow         | 4.67     | MGD       | <=6           | 100.00                  |                         |
| 9/30/2021            | Eff pH Lab at Peak Flow         | 7.20     | mg/L      | 6 - 9         | 100.00                  |                         |
| 9/30/2021            | Eff DO                          | 7.10     | mg/L      | >=6           | 100.00                  |                         |
| 9/29/2021            | Eff E. coli                     | 1.00     | Col/100ML | <=399         | 100.00                  |                         |

**Absolute Efficiency (%):** 100.00

### Cost-of-Operations (10% Weight)

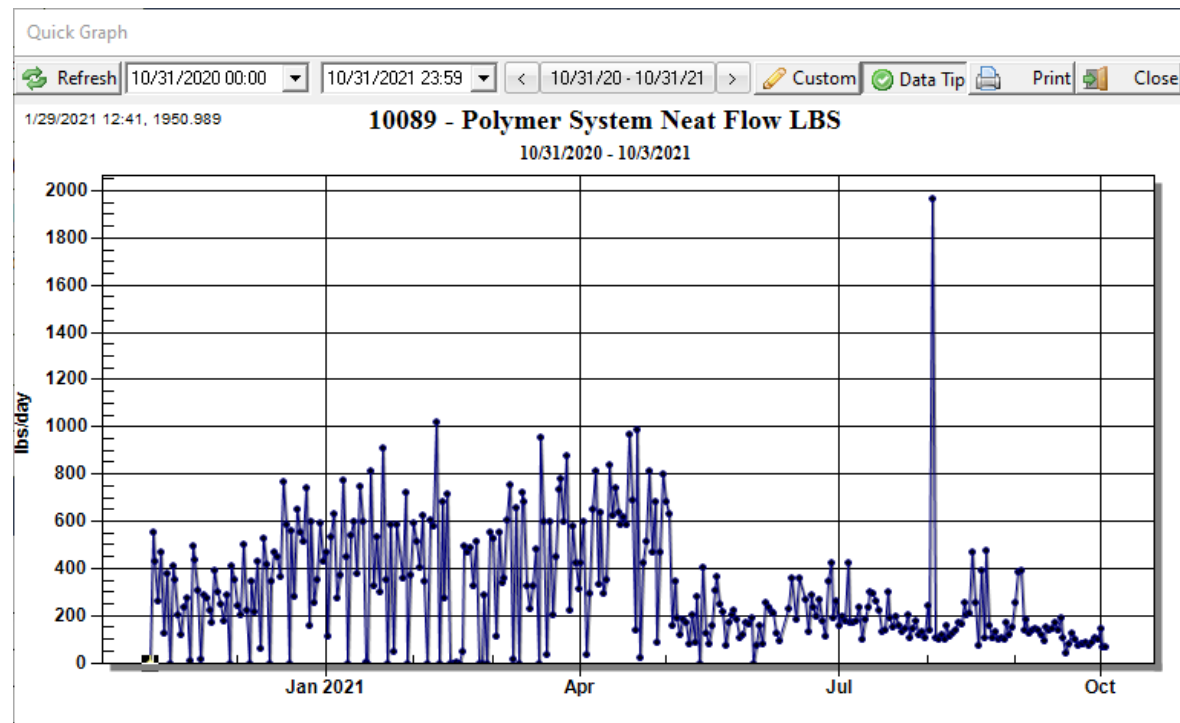
| Expense Type | Budget       | FYTD Spent   | Current Monthly Average | Target Monthly Average | Relative Efficiency (%) | Reason for Inefficiency         |
|--------------|--------------|--------------|-------------------------|------------------------|-------------------------|---------------------------------|
| Power        | \$244,220.69 | \$166,884.69 | \$16,688.47             | \$20,351.72            | 100.00                  |                                 |
| Water        | \$9,293.00   | \$9,646.56   | \$964.66                | \$774.42               | 46.20                   | Annual Budget exceeded          |
| Polymer      | \$48,900.00  | \$41,216.00  | \$4,121.60              | \$4,075.00             | 98.86                   | Target Monthly Average Exceeded |
| Hauling      | \$139,333.00 | \$129,265.75 | \$12,926.58             | \$11,611.08            | 88.67                   | Target Monthly Average Exceeded |

**Absolute Efficiency (%):** 83.43



# Conclusion – The Results

Human factors mitigation is improved; short-term results are starting to surface; improved chances for long-term future success



Reduced noise and downward trend



Trinity River Authority of Texas  
*Enriching the Trinity basin as a resource for Texans*

# Summary

- ▶ Background
- ▶ Introduction
- ▶ Old Paradigm
- ▶ New Paradigm
- ▶ Conclusion



Trinity River Authority of Texas  
*Enriching the Trinity basin as a resource for Texans*

# Questions

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