"I should think this a gull, but that the white-bearded fellow speaks it; knavery cannot, sure, hide himself in such reverence."
— William Shakespeare, Much Ado About Nothing
Outline

• Water supple and Conjunctive Use
• Surface Water Project
• Prep For Delivery of Surface Water
• Current Water Quality
• Wastewater Treatment Plant

"He hath indeed better bettered expectation than you must expect of me to tell you how."
- William Shakespeare, *Much Ado About Nothing*
Potable Water Supply

Issues/Concerns

“Pause awhile, And let my counsel sway you.”
— William Shakespeare, Much Ado About Nothing
Potable Water Supply

• Solution
  – Diversification of water supplies (surface + GW)
  – Regional water supply
  – Centralized water treatment = more consistent water quality
  – Lower cost
Water Source Supply Portfolio

Supplemental Supply Options

Municipal Groundwater (limited by water quality considerations)

CPG Surface Water Contract Purchase (limited by contract terms)

WDCWA Appropriative Surface Water Right Permit (limited by Sacramento/San Joaquin Delta inflows)

Water Conservation
(Ongoing)

Demand Management
(Dry Years)
Project Goals & Objectives

**Quantity & Quality**
- Improve water supply quantity and quality

**Regulations**
- Comply with drinking water & wastewater discharge regulatory requirements

**Environmental**
- Provide environmental benefits and minimize impacts

**Diversify**
- Diversify supply portfolio to improve supply reliability

**Sustainable GW**
- Allow sustainable groundwater pumping integrated with ASR wells

**Conservation**
- Integrate water conservation elements
Source of Supply

NOW

100%
Groundwater

FUTURE

5 – 15%
Groundwater

85 – 95%
Treated Surface Water
"He is a very valiant trencher-man."
- William Shakespeare, Much Ado About Nothing
There was a star danced, and under that was I born.
— William Shakespeare, Much Ado About Nothing
Joint Surface Water Intake & Fish Screen Facility Site

- Replaces the largest unscreened surface water diversion on the Sacramento River
- Provides water for agriculture and municipal uses
- State-of-the-art fish screens, the facility protects threatened fish populations, specifically juvenile Chinook Salmon, Steelhead Trout, and Green Sturgeon fisheries.
Preparation for Surface Water Introduction

• Studied other cities that converted to surface water
• Anti-corrosion
  – pH control
  – Zinc orthophosphate
• Water distribution system flushing
• Water quality testing
Preparation for Surface Water Introduction

Water Distribution System Flushing
Preparation for Surface Water Introduction
Water Quality Testing

- pH
- Hardness
- Alkalinity
- Turbidity
- Color
- Free Chlorine
- Het. bacteria plate count
- Lead
- Manganese
- Total chromium
- Zinc orthophosphate
- Aluminum
- Asbestos
Timing of Surface Water Delivery
Surface Water Delivery

- June 2016 – initial delivery, 3 MGD
- Increase by 1 MGD every few days during water plant acceptance testing
- Maximum delivery of 6 MGD through August 2016
- Surface water fully integrated December 2016
“One foot in sea and one on shore,
To one thing constant never.”
- William Shakespeare, Much Ado About Nothing
Water Quality

- Hardness
  - Water softener use
- Lead
- Hexavalent chromium
- Turbidity and/or discolored water
- Special concerns
  - Medical concerns
  - Aquatic species

“For it falls out that what we have we prize not to the worth whiles we enjoy it, but being lacked and lost, why, then we rack the value, then we find the virtue that possession would not show us while it was ours.”
— William Shakespeare, Much Ado About Nothing
## Distribution System Water Quality

### JUNE 1, 2016

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---

SS-005 5th and Rowe Streets (Central)
SS-008 Wake Forest and Guava (West Central)
SS-012 Whaleback Park (West)
SS-017 Mockingbird Place (North Central)
SS-022 Wintun Place (South)
SS-037 Rockwell Drive (North East)

(1) Measured in the field
Water Softeners

• Typical water hardness below 7 grains
• Personal preference for level of hardness
• Suggest bypassing for short period of time to assess need
• Lower grain setting on softener to appropriate level
• Individual determination to use water softener or not

“Sigh no more, ladies, sigh no more”
- William Shakespeare, Much Ado About Nothing
How to Report Water Quality Concerns

• Do not report water quality concerns via City website
• During normal business hrs (8-5 M-F) - call Public Works at 757-5686
• After normal business hrs contact Davis PD at 747-5400
• For general questions – email PWWWeb@cityofdavis.org
Compliance with Current and Anticipated Wastewater Discharge Requirements

- 40-year history of tightening regulatory standards
- Maximum of 10 years to implement new regulatory requirements
- Major constituents of concern:
  - Selenium
  - Salinity
  - BOD/TSS Removal
  - Tertiary (filtering) treatment

“I can see he's not in your good books,' said the messenger. 'No, and if he were I would burn my library.”
― William Shakespeare, Much Ado About Nothing
“I am gone, though I am here. There is no love in you. Nay, I pray you let me go.”
— William Shakespeare, Much Ado About Nothing
New WWTP Footprint

Willow Slough Bypass

Restoration Wetlands
WWTP Construction
“What need the bridge much broader than the flood? The fairest grant is the necessity.”
— William Shakespeare, Much Ado About Nothing
New Opportunities With Upgraded WWTP

• Opportunities for Davis Restoration Wetlands
• Long-term management of the overland flow area
• Recycled water opportunities

“What need the bridge much broader than the flood? The fairest grant is the necessity.”
— William Shakespeare, Much Ado About Nothing
The Davis Restoration Wetlands Provide a Valuable Community Asset

- ~80 Acres of Permanent Wetlands
- ~190 Acres of Seasonal Wetlands
- ~30 Acres of Riparian Woodlands
- ~100 Acres of Upland Habitat
- Seeded With All Native Species
Biological Resources Near the Project Site

- Seasonal Wetlands
- Giant Garter Snakes
- Swainson’s Hawk & other raptors
Project Purpose: Restoration Wetlands Enhancement

Issue: The Restoration Wetlands will no longer be included as part of the wastewater treatment process. Identify opportunities for expanding habitat or public recreation involving the wetlands.

• Wetlands no longer governed by treatment processes
• High quality effluent delivered to wetlands allows for increased public access
Wetland Improvement Options

1) Expand permanent wetland habitat
2) Increase public access to wetlands
3) Increase educational opportunities at wetlands
Project Purpose:
Long-Term Management of the Overland Flow (OLF) Site

Issue: Existing 170-acre OLF site will require long-term maintenance and care. Need to determine if there are synergistic opportunities that results in the highest and best use of this land.

- Existing site has existing infrastructure that needs to be considered
- The facility provides waterfowl nesting and raptor foraging habitat
- The area is potentially subject to flooding (outside of flood protection levee)
Overland Flow Site Options

1) Convert to irrigated agricultural lands
2) Grow forest for carbon sequestration
3) Convert to habitat
4) Expand solar power facility
5) Organic processing facility
6) Public recreation
7) Biosolids disposal
8) Stormwater treatment system
9) Sell/Lease land to third party
10) Do nothing/Maintain as part of treatment plant
Project Purpose: Increased Use of Recycled Water

Issue: With new treatment facilities coming online, the treated effluent can be used for a wide-range of reuse options that were not previously available.

- Many agricultural users in the area
- Wetland or habitat uses near the WWTP
- Urban use is another opportunity

"Pause awhile, And let my counsel sway you."
— William Shakespeare, Much Ado About Nothing
Potential Recycled Water Use Areas

- Yolo County Landfill (agricultural use)
- Overland Flow (habitat/agricultural use)
- Municipal (landscape/habitat use)
- Conaway Ranch (habitat/agricultural use)
- City Owned Lands (habitat/agricultural use)
Potential Recycled Water Use Options

1) Overland flow site
2) Buy portion of Conaway Ranch for farming or habitat
3) Agricultural irrigation at Yolo County Landfill
4) Agricultural irrigation on City-owned lands south of the WWTP
5) Supply to agricultural users in the area
6) City municipal uses
7) Commercial filling station
8) Groundwater recharge
9) Industrial uses
10) Establish a local water market
11) Create additional City-owned wetlands
12) Do Nothing

― William Shakespeare, Much Ado About Nothing
Questions?

Woodland Davis Clean Water Agency
WDCWA.com

City of Davis Wastewater Treatment Plant Upgrade
DavisWWTP.org

Water Quality
CityofDavis.org

Water Conservation
SaveDavisWater.org

“For man is a giddy thing, and this is my conclusion.”
— William Shakespeare, Much Ado About Nothing

Stan Gryczko
Assistant Director
City of Davis Public Works Department
SGryczko@CityofDavis.org
CITY OF DAVIS WELL FIELD & TRANSMISSION LINE
Construction Sequence Timing

CITY OF DAVIS SURFACE WATER PIPELINES PROJECT

LEGEND

- SOUTH AND WEST PIPELINES START-UP (JUNE 2016)
- SOUTH PIPELINE START-UP (SEPTEMBER 2016)
- SOUTH AND WEST PIPELINES START-UP (DECEMBER 2016)
- NEW CITY 16" WATER MAIN START-UP (DECEMBER 2016)
- UCD PIPELINE START-UP (MAR 2017)
- EXISTING TANK / BOOSTER PUMP STATION
- EXISTING DEEP WELL
- EXISTING ELEVATED TANK
- SURFACE/BLENDED WATER TURNOUT
Preparation for Surface Water Introduction
Water Distribution System Flushing
Example Level of Pre-Design Detail
Benchmark Treatment Process

Silt/Turbidity Removal

Silt Removal → Clarification → Ozone → GAC Filter → Chloramines

SOC and DBP Minimization

Silt/Turbidity Removal

Clarification

Ozone

GAC Filter

Chloramines
Regional Project Capacity Share

City of Davis 44.4%
UC Davis 3.5%
City of Woodland 52.1%
Regional project components addressed by Procurement Documents

Woodland Local Facilities
Storage & distribution pipelines

Davis Local Facilities
Storage & distribution pipelines

Woodland TW Transmission Pipelines
Length: 3 miles
Diameter: 30 and 36 inches

Davis Treated Water Transmission Pipeline
Length: 7 miles
Diameter: 36 inches

Water Treatment Plant
Capacity: 40 mgd

Raw Water Transmission Pipeline
Length: 4.5 miles
Diameter: 2 @ 36 inches

Intake/Pump Station
Location: River mile 70.8
Maximum combined diversion: 400 cfs

Regional Facilities
- Treated Water Transmission Pipeline
- Raw Water Transmission Pipeline
- Intake/Pumping Station
- Local Facilities
  - Water Transmission/Distribution Pipeline
Changing Demand Challenges

2010 projections are roughly 30% lower than 2005 projections.
Anticipated 2040 Water Supply Portfolio (assumes Term 91 is in effect for 3 months)
Project Implementation Schedule, 2010-2016

2010
- Facilities Permitting
- Facilities Pre-Design
- Water Right Permits Issued
- DBO Contract Procurement
- Project Financing

2011
- Facilities Permitting
- Facilities Pre-Design
- Water Right Permits Issued
- DBO Contract Procurement
- Project Financing

2012
- Facilities Design/Permitting
- Project Financing
- Award of DBO Contract

2013
- Intake/Pipelines/Water Treatment Facility
- Local Facilities Construction
- Project Financing

2014
- Facilities Design/Permitting
- Intake/Pipelines/Water Treatment Facility
- Water Treatment Facility Construction

2015
- Intake/Pipelines/Water Treatment Facility and Local Facilities Construction

2016
- Completion of Construction
- Project Start-up and Operation
Project Goals

- Preserve flexibility for long-term uses of recycled water
- Preserve/enhance habitat
- Continue meeting treatment plant effluent water quality standards
- Identify and achieve highest and best use of City’s water and lands
- Maximize the use of available financial resources
- Maintain existing stormwater discharge quality (minimum goal); improve stormwater discharge quality (stretch goal)
- Provide opportunities for public education
- Provide opportunities for enhancing WWTP energy self-sufficiency and/or resource recovery
## Anticipated Project Implementation Timeline

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<td>Work with City staff and commissions to identify preferred alternatives for detailed Feasibility Study</td>
<td>July 2016 – January 2017</td>
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<tr>
<td>Present recommendations to City Council and request authorization to complete detailed Feasibility Study</td>
<td>February 2017</td>
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<tr>
<td>Complete Feasibility Study/Select Preferred Alternative</td>
<td>December 2017</td>
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<tr>
<td>Complete design and environmental assessments</td>
<td>December 2018</td>
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<tr>
<td>Construct preferred project(s)</td>
<td>March 2019 – December 2020</td>
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Existing Public Access to Wetlands

- Wetlands open to public from 7 am-1 pm, seven days a week
  - Gate to wetlands to keep visitors out when WWTP operators are not around for safety
  - Visitors must sign in at kiosk by gate
  - Only open on Mondays between September 1 and February 14
- Popular with bird enthusiasts
- Some signage
- Limited, identified tour route
- Picnic area and portable toilet available
- Some outreach to the community about this resource
- Once a month docent-led tours
- PG&E and Conaway staff currently use existing access gates
Wetland Option 1: Expand Permanent Wetland Habitat

- **Opportunities**
  - Reduced constraints for water quality objectives since wetlands no longer part of treatment process
  - Increased flexibility

- **Constraints**
  - Expansion of wetlands would reduce amount of recycled water that could be available for other purposes
  - Need to work with Army Corps for changes in operation

Wetland Option 2: Increase Public Access to Wetlands

- **Opportunities**
  - Unrestricted recreational waterbody from regulatory standpoint
  - Access could be similar to other open space or park owned by City

- **Constraints**
  - City property and liability associated with that
  - Proximity to Conaway Ranch and Yolo Bypass
  - Distance from City limits ease of access for public and for City maintenance
  - Increasing access could require more maintenance
Wetland Option 3: Increase Educational Opportunities at Wetlands

• Opportunities
  – Manipulation of wetlands or access not restricted by treatment needs
  – UC Davis and other entities may be interested in using this site for research

• Constraints
  – Similar constraints as public access issues
  – If habitat manipulation is desired, Army Corps would also need to approve
Wetland Improvement Options

**Brainstorming**

1) Expand permanent wetland habitat
2) Increase public access to wetlands
3) Increase educational opportunities at wetlands
4) Others??
Overland Flow Site Alternatives
Existing Overland Flow Operations

Solar Panels
OLF Option 1: Convert to Agricultural Reuse

• Opportunities
  – Potential for application of recycled water
  – Potential source of revenue
  – Could be an inexpensive, better, and higher use of some biosolids

• Constraints
  – Some reconfiguration would be needed
  – Permit required if biosolids or recycled water applied
  – Potential concerns with soil quality

OLF Option 2: Grow forest for carbon sequestration

**Opportunities**
- Potential for application of recycled water
- Helps City meet carbon footprint goals
- Could be an inexpensive, better, and higher use of some biosolids
- Provide research opportunities related to carbon offsets

**Constraints**
- Some reconfiguration would be needed
- Permit potentially required (if biosolids or recycled water applied)
- Reduce opportunity for revenue compared to agriculture
- Maintenance of site would be a City staff responsibility
- Potential concerns with soil quality
OLF Option 3: Convert to Habitat Area

• **Opportunities**
  – Potential for application of reclaimed water/discharge point for wetlands operations
  – Could be a source of revenue (habitat easement)
  – Could be incorporated into overall habitat viewing area open to the public
  – Fields would not (necessarily) need to be reconfigured
  – Habitat mitigation bank: City could sell mitigation credits for this area

• **Constraints**
  – Permit would need to be modified to allow for irrigation reuse
  – Could restrict long-term use of the land for other purposes
  – Habitat uses would likely restrict biosolids application potential
OLF Option 4: Expand Solar Power Generation Facility

• Opportunities
  – Site is more than adequate to provide solar to offset the WWTP’s power needs
  – Could fit into Community Choice Energy Program
    • Existing electrical infrastructure to City
    • Site could provide ~15% of Davis’ energy

• Constraints
  – No recycled water use opportunity
  – No biosolids application opportunity
  – Potentially limits habitat potential
  – Area is within the floodplain and could be subject to flooding
OLF Option 5: Organic Processing/Energy Generating Facility

- **Opportunities**
  - Organic waste management is becoming a major issue in the state and technologies are emerging that are for beneficial reuse or power generation
  - Could also be an opportunity to beneficially reuse biosolids
  - Could be synergies with existing plant cogeneration system/biogas capture
  - Recycled water would be available to support operations
  - Synergy with City’s solid waste program

- **Constraints**
  - Would need to operate facility or develop third party agreement (like solar facility)
  - Unless third party involved, City would need to do all marketing, permitting, etc.
OLF Option 6: Active Recreation Site

• Opportunities
  – Soccer fields, golf fields
  – Go-kart/Paintball
  – Community Gardens
  – Community Park
  – Use recycled water to support operations

• Constraints
  – Distance from Community
  – Proximity to WWTP

Image credit: https://www.groupon.com/deals/davis-paintball-center
OLF Option 7: Biosolids Disposal

• Opportunities
  – Potentially a low cost option for biosolids disposal
  – Reduces or eliminates dependence on landfill

• Constraints
  – Significant regulatory hurdles to permit site for disposal
  – Potential to impacts to groundwater over the long term
  – Beneficial reuse of biosolids on agricultural land and beneficial use of treated human waste
OLF Option 8: Stormwater Treatment System

• Opportunities
  – Overland flow treatment system available for other purposes
  – City conveys stormwater to area for wetland treatment

• Constraints
  – Additional infrastructure needed
  – Benefits of additional treatment are unclear
OLF Option 9: Sell/Lease Land to Third Party

• Opportunities
  – Revenue source to offset cost of treatment plant
  – Reduce/eliminate maintenance costs

• Constraints
  – City would no longer have control over land adjacent to treatment plant
  – Economic value uncertain
  – Buffer between treatment facilities and adjacent facilities would be lost
OLF Option 10: Do Nothing

• Opportunities
  – Continue to provide buffer for the WWTP
  – Very low cost

• Constraints
  – Some continued maintenance would likely be needed to avoid fire hazards
  – Even with maintenance, habitat would likely be created
  – Does not provide opportunity for reuse or biosolids applications
Overland Flow Site Options

Brainstorming

1) Convert to irrigated agricultural lands
2) Grow forest for carbon sequestration
3) Convert to habitat
4) Expand solar power facility
5) Organic processing facility
6) Public recreation
7) Biosolids disposal
8) Stormwater treatment system
9) Sell/Lease land to third party
10) Do nothing/Keep as part of treatment plant
11) Others??
Recycled Water Alternatives
Reuse Option 1: Overland Flow Site
Reuse Option 2: Buy Portion of Conaway Ranch and Irrigate with Recycled Water
Reuse Option 3: Potential Landfill Irrigation Areas
Reuse Option 4: City Owned Ag Lands
Reuse Option 5: Provide Tertiary Effluent to other Ag Users
Reuse Option 6: Municipal Uses
Reuse Option 7: Commercial Water Truck Filling Stations at Treatment Plant Site

• Opportunities
  – Potential uses are: median landscaping, construction water, sewer flushing, dust control

• Constraints
  – Low demand
  – Limited revenue
Reuse Option 8: Groundwater Recharge

• **Opportunities**
  - Offset urban groundwater use
  - Help mitigate groundwater depletion associated with agricultural uses near the WWTP

• **Constraints**
  - Soil type not porous
  - Requires 50/50 blend with stormwater, unless advanced treatment is provided
Reuse Option 9: Industrial Uses

• Opportunities
  – Solar panels or biomass plant (if implemented at overland flow site) could require a water supply
  – Other industries within City limits could use water
  – Industrial users typically require recycled water supplies year round

• Constraints
  – Current industrial users are not identified
  – Infrastructure required to bring water to users may be cost prohibitive
Reuse Option 10: Establish a Local Water Market

- **Opportunities**
  - City could potentially be compensated for increased discharges to Willow Slough Bypass
  - No additional infrastructure required
  - City of Modesto and Regional San have set precedent

- **Constraints**
  - Limits flexibility for City to use recycled water in future
  - Viability of market is unclear
Reuse Option 11: Create/Expand Wetlands

• Opportunities
  – Yolo Bypass and surrounding areas are premier habitat for birds and other species
  – City owned ag lands could be converted to wetlands
  – Potential for mitigation banking revenue
  – Expand connectivity and open space/public use potential of existing wetlands

• Constraints
  – Major modifications of landscape required to create wetland ponds
  – Permitting requirements are uncertain
  – Ongoing maintenance would be required
Reuse Option 12: Do Nothing

• Opportunities
  – Discharging additional flows year round could potentially increase habitat potential of Willow Slough Bypass and other downstream waters
  – No additional infrastructure or permitting requirements

• Constraints
  – Potentially lose water rights to downstream users, resulting in loss of future revenue and/or opportunities
Recycled Water Use Options

Brainstorming

1) Overland flow site
2) Buy portion of Conaway Ranch for farming or habitat
3) Agricultural irrigation at Yolo County Landfill
4) Agricultural irrigation on City-owned lands south of the WWTP
5) Supply to agricultural users in the area
6) City municipal uses
7) Commercial filling station
8) Groundwater recharge
9) Industrial uses
10) Establish a local water market
11) Create additional City-owned wetlands
12) Do Nothing
13) Others??
Reuse Option 1: Overland Flow Site

• Opportunities
  – Could be used for farming or habitat space (or both)
  – Farming the area could be a source of revenue (farmer lease)
  – Takes advantage of existing infrastructure

• Constraints
  – Some reconfiguration may be needed to support ag
Reuse Option 2: Buy Portion of Conaway Ranch and Irrigate with Recycled Water

- **Opportunities**
  - Creates bridge between overland flow site and wetlands (for now)
  - Could be used for farming or habitat space (or both)
  - Potential to create City recreational space in conjunction with Overland Flow and Wetlands

- **Constraints**
  - Unclear whether land is available.
Reuse Option 3: Agricultural Irrigation at Landfill

- **Opportunities**
  - Landfill needs water supply for farming in summer
  - Recycled water delivery to landfill potential revenue source

- **Constraints**
  - Infrastructure needs at landfill uncertain
  - Require agreement between landfill and City
Reuse Option 4: Use Tertiary Effluent as Irrigation on City-owned Lands South of the WWTP

**Opportunities**
- Can reduce amount of irrigation water purchased or pumped by City
- Increase farming (revenue) potential
- If farmed, could be a biosolids applications site
- Gets recycled water closer to town

**Issues/constraints**
- Water availability may only supplement current needs
- Some areas flood, and therefore are less desirable for agriculture. May not be highest and best use of water supplies
Reuse Option 5: Provide Tertiary Effluent to other Agricultural Users

- **Opportunities**
  - Potential revenue from sale of water

- **Constraints**
  - Requires User Agreement with Land Owner
  - Value of water is unclear
Reuse Option 6: Municipal Uses

• Opportunities
  – Effluent water quality adequate for unrestricted irrigation
  – Use recycled water for habitat ponds within City Limits
  – Residential/commercial recycled water filling station within City Limits

• Constraints
  – Limited available supply of recycled water