

A photograph of a large-scale water treatment facility. In the foreground, a wide, multi-lane spillway is shown with water cascading over its edge, creating a misty spray. Above the spillway is a complex metal structure with railings and walkways, likely for maintenance or monitoring. The background shows a clear blue sky and some greenery on the right side. The overall scene is bright and industrial.

Rubicon Water

Overview

November 2014

Content

- 1 Introduction to Rubicon Water**
- 2 Product offering**
- 3 Rubicon solution – Total Channel Control®**
- 4 Case studies**

Introduction to Rubicon Water

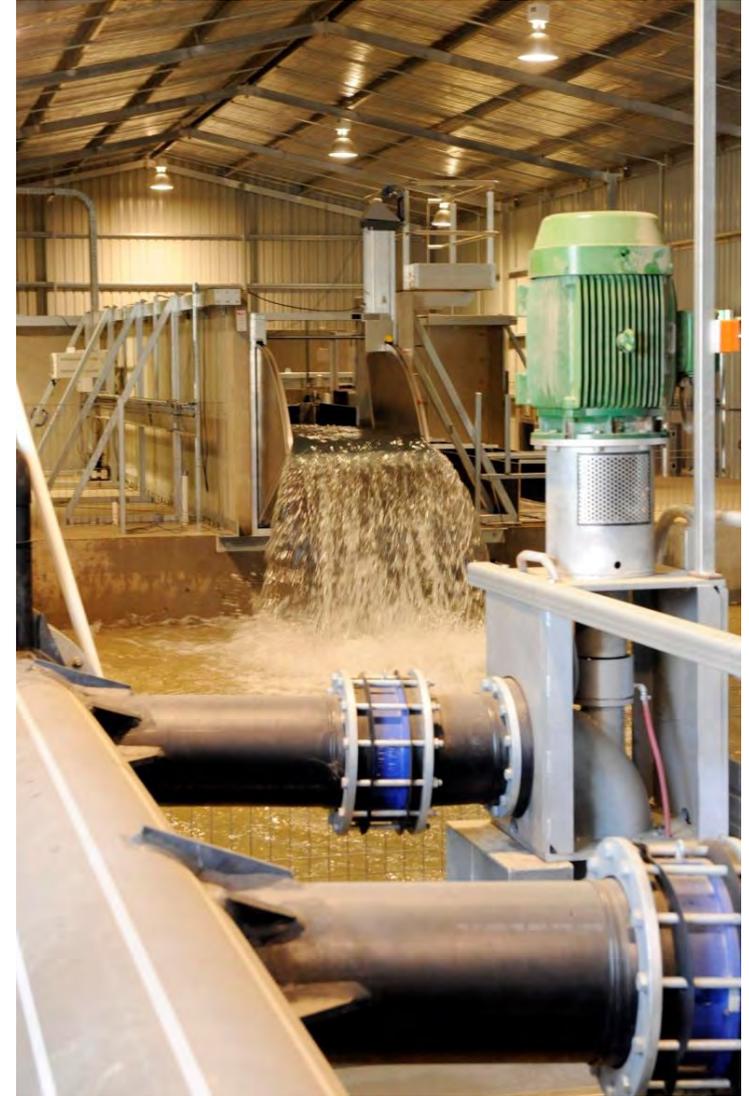
- ▶ Established in 1995 in Victoria, Australia
- ▶ Collaboration with Universities on research
 - University of Melbourne (Australia)
 - Colorado State University
- ▶ Globally ~200 Employees (including factory)
 - Mechanical Engineers
 - Software Developers
 - Instrumentation and Control Engineers
 - Field Technicians
- ▶ Offices in Australia, the US and China
- ▶ Hydraulic flow lab on-site for R&D
- ▶ More than 11,000 Rubicon gates sold worldwide
- ▶ ISO9001 certified quality system

Factory: Victoria, Australia

Currently producing more than 3,000 gates p.a.



Rubicon Hydraulic Flow Laboratory



Rubicon US Footprint (Offices, Staff and Customers)

Rubicon Water America

- 3 Offices
- 16 Staff
- 30+ Customers

Central Valley, CA

- Darrel Evensen PE
- Shane Elliott – Field Technician
- Jason Andrade-Field Technician

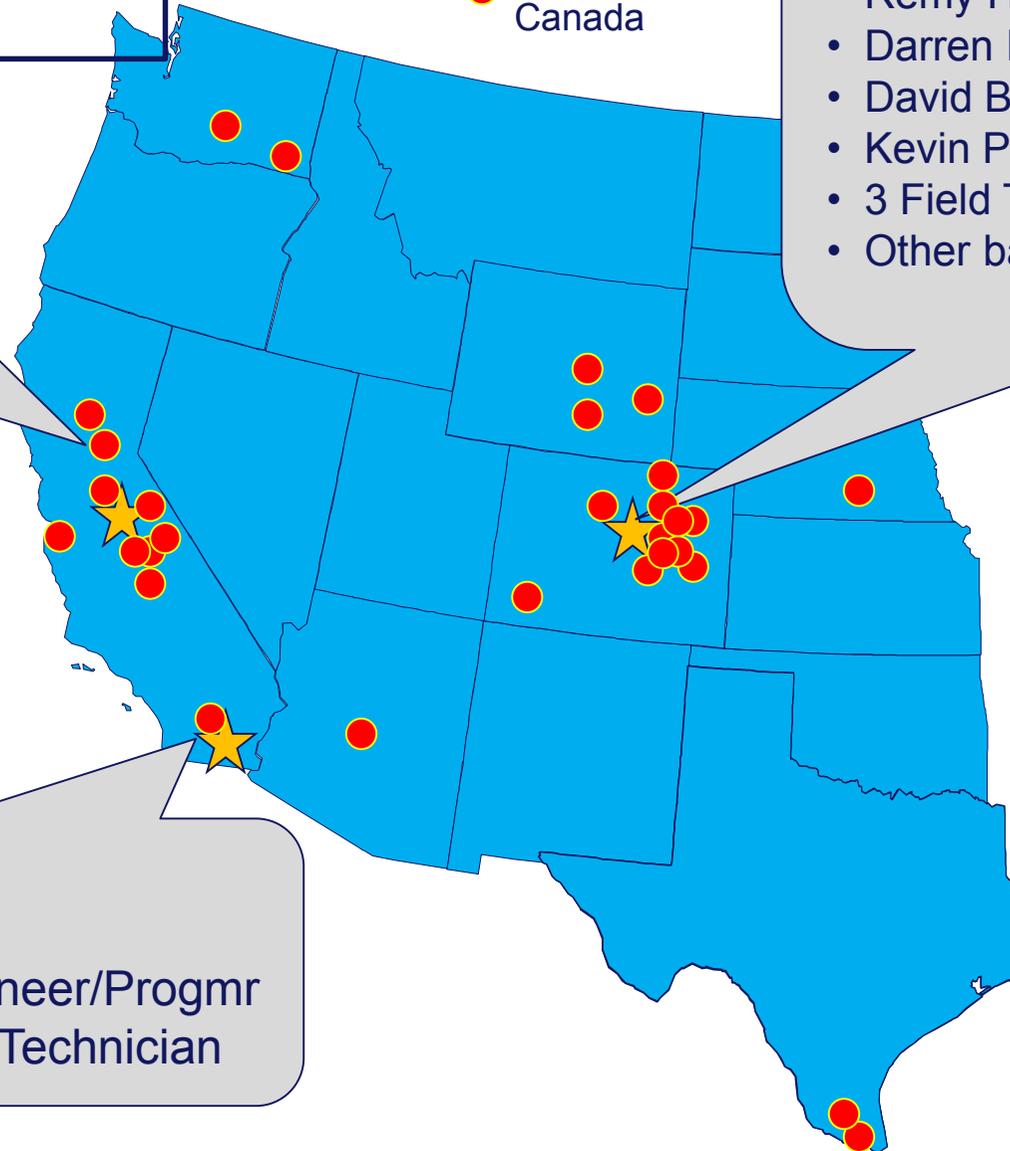
Imperial, CA

- Alan Jackson PE
- Andrew Galbraith-Engineer/Progmr
- Anthony Hamel– Field Technician

Fort Collins, CO – Head Office

- Damien Pearson– GM US
- Remy Halm PE –Director
- Darren McGregor– Engineer
- David Bridge
- Kevin Prokop
- 3 Field Technicians
- Other back office support

● Alberta, Canada



Key

- ★ Rubicon Office
- Customer

Our objective is to reduce the 65% of water lost/uncontrolled throughout the irrigation distribution system

Dam/River



Canal



Farm



Plant



Typical efficiency levels through an irrigation system

30%

70%

50%

20%

15%

35%

Dam to farm gate

- operating spills
- poor measurement
- leaks
- seepage
- evaporation

Farm gate to crop

- poor service
- slow delivery
- varying flows
- poor control

Use by plant

- imprecise timing
- no measurement of crop needs



RUBICON

What Sets Rubicon Apart?

- ▶ **Fully integrated, proven solution to measure and control water from the source to the plant root – *a true full automated, integrated canal solution***
- ▶ **Unique technology and control algorithms to match supply and demand resulting in:**
 - reduction of consumptive use of plants due to improved service levels and control to farmers/irrigators (on demand irrigation)
 - conservation of “lost” water from evaporated spills, seepage or deep percolation (unmanaged, unmeasured and uncontrolled)
- ▶ **Cost effective**
 - Lower cost option than putting all the pieces together and hoping that it works
 - Fraction of the cost of pipelines or lining
- ▶ **Local presence**
 - Gates and equipment assembled in Colorado – 15,000 sq ft office and factory
 - New assembly office planned for Central Valley for later this year
 - Team of Engineers and Field Technicians based in Central Valley
- ▶ **Operate our own hydraulic flow lab for R&D; continuing innovation**
- ▶ **Customer oriented, consultative approach – Experienced P.E.’s and technicians there to support you and provide insight**

Rubicon Systems: Rocky Mountain Region

▶ **Colorado customers include:**

- New Cache La Poudre (Don Magnuson)
- Larimer & Weld (Bill Johnson)
- Church Ditch Company
- Central Colorado Water Conservancy District (Randy Ray)
- St. Vrain Left Hand Water Conservancy District (Les Williams)
- Bessemer Irrigating Ditch Company
- Montezuma Valley Irrigation Company (Jim Siscoe)

▶ **Wyoming customers include:**

- Wheatland Irrigation District (Don Britton)
- Midvale Irrigation District (Dick Johnson)
- Goshen Irrigation

▶ **Nebraska customers include:**

- Farwell Irrigation District
- Frenchman-Cambridge Irrigation Districts

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For irrigation and ditch companies, we provide end-to-end product offering and support



Actuated Gates

- Control gates: FlumeGate™ and SlipGate®
- Advanced gate technology: flow measurement, positioning features and precision control, advanced water level sensors



Meters

- SlipMeter™, Sonaray™ Flume Meters, Sonaray™ Pipe Meters
- Accurate measurement, real time data communication
- Precision control



SCADA (remote control)

- SCADA software: SCADAConnect®
- Advanced telemetry and wireless networks



Software

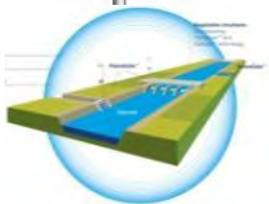
- Demand Management: Rubicon DMS
- Irrigation scheduling
- Billing software
- Control software: NeuroFlo®

FarmConnect® on-farm irrigation automation

- Soil moisture probes
- iFée™ (Zigbee) communication network
- Web based access to network for ordering, planning and scheduling water requirements

Total Channel Control®

- Integrates all Rubicon products together to manage an entire irrigation system



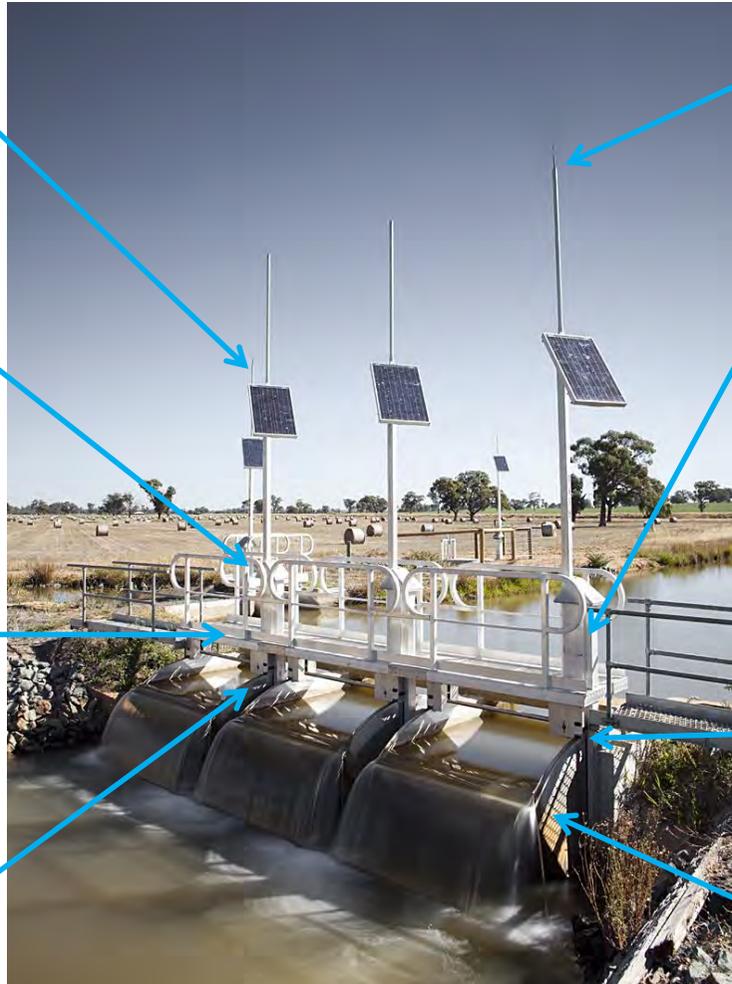
FlumeGate™ - developed in 2001 with more than 8,000 installed

Solar powered – fully self powered with battery backup (12 volt system)

Flow calculation and control computed in each pedestal (user screen display)

Aluminum walkway for safety (optional)

Water tight seals (exceed AWWA leakage standards)



Can be connected to most other SCADA/PLC networks.

Highly accurate gate control $\pm 1/16$ of an inch (positive actuation in both directions)

Can run in following modes:

- Manual mode
- Remote mode (Web based/SCADA)
- Upstream/downstream water level mode
- Flow rate mode

Highly accurate ultrasonic water level sensors $\pm 1/16$ of an inch

High grade aluminum construction – 40 year design life

Available in sizes from 2'-10' width and depth

SlipGate[®]-developed in 2005 with more than 4,000 installed

Masts and solar panel supports designed to withstand hurricane strength winds

Solar powered – fully self powered with battery backup (12 volt system)

Stand alone pedestal (wired to SlipGate)

- Can provide local control (with password)
- Able to view flow rates



Highly accurate gate control $\pm 1/16$ of an inch (positive actuation in both directions)

Can run in following modes:

- Manual mode
- Remote mode (Web based/SCADA)
- Upstream/downstream water level mode
- Flow rate mode

Unique CableDrive™ system – “no screw mechanism” that would wear down

Can seal on all four sides

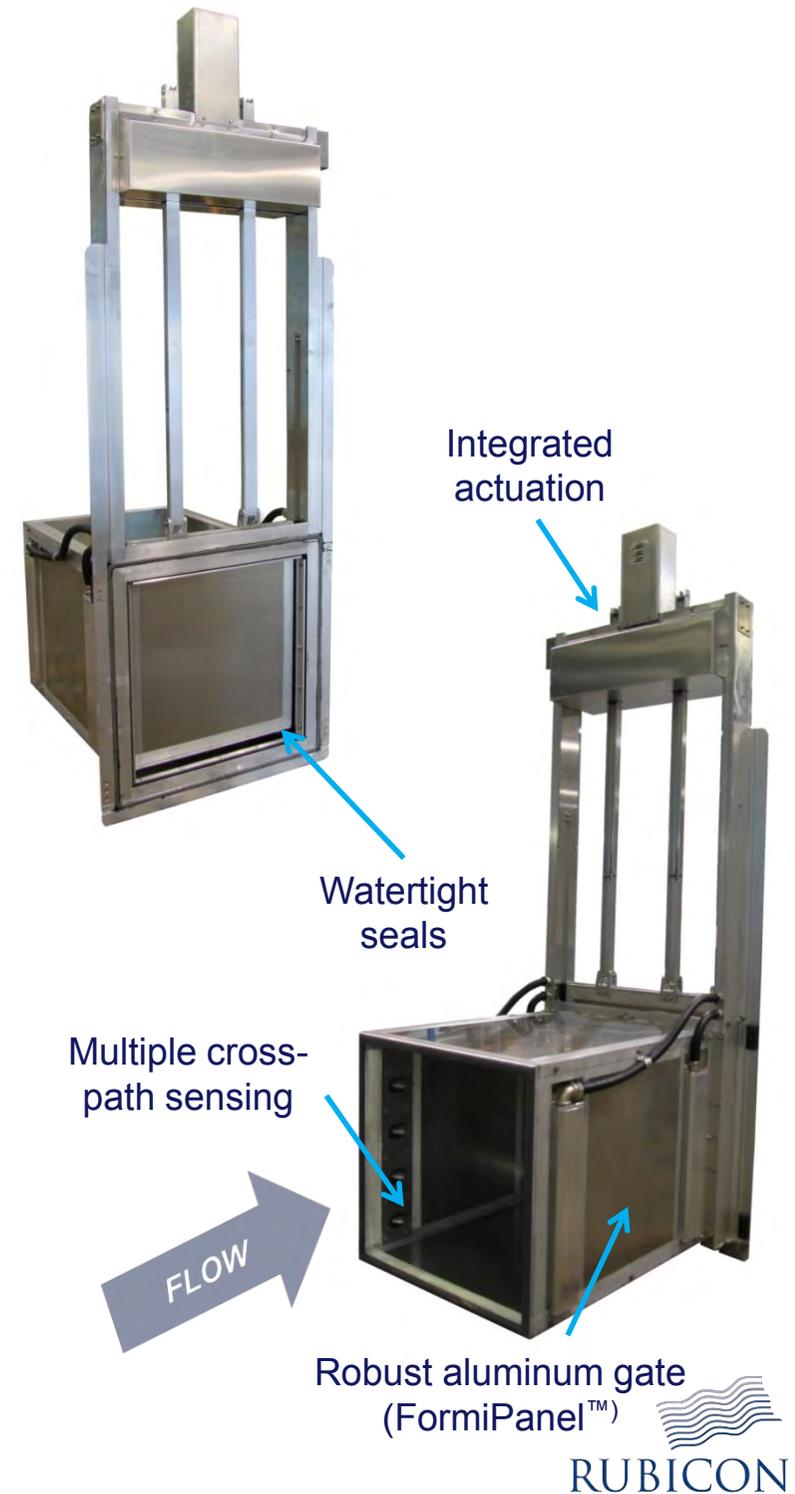
Minimal maintenance required

Available in sizes from 2'-10' width and depth

SlipMeter™

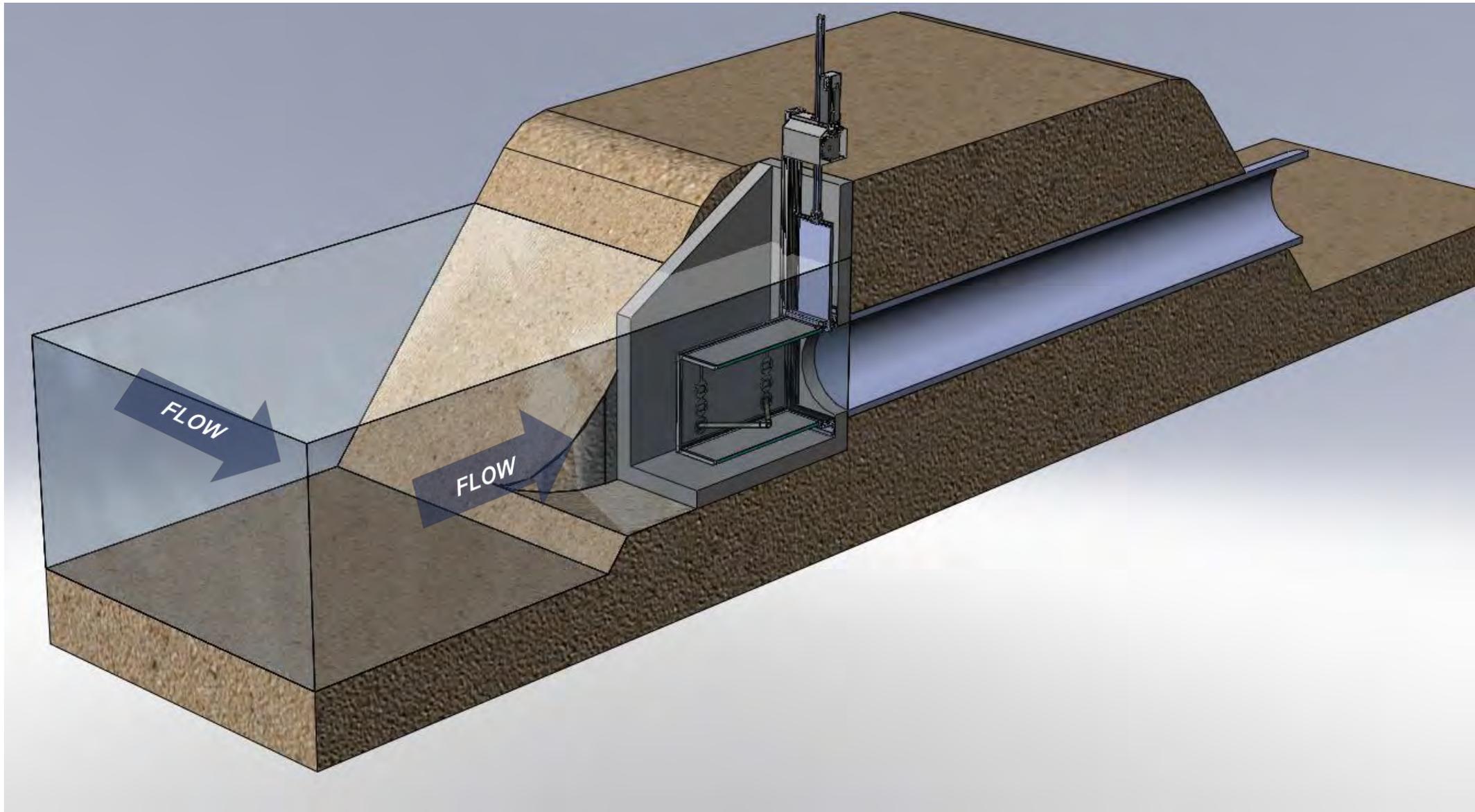
Integrated control gate and flow meter

- ▶ Accurate ultrasonic transit-time flow measurement
- ▶ Uniquely capable of high accuracy down to low flow rates
- ▶ Designed to be mounted to a headwall structure on the canal that feeds a conduit
- ▶ Location on the upstream side of a conduit:
 - avoids costly structures on the farmer's side of supply boundary
 - avoids conduit remaining continuously full when not in use
 - avoids silt build-up when not in use
- ▶ Large opening ensures minimal headloss
- ▶ Ideal as a farm turnout control gate/meter solution



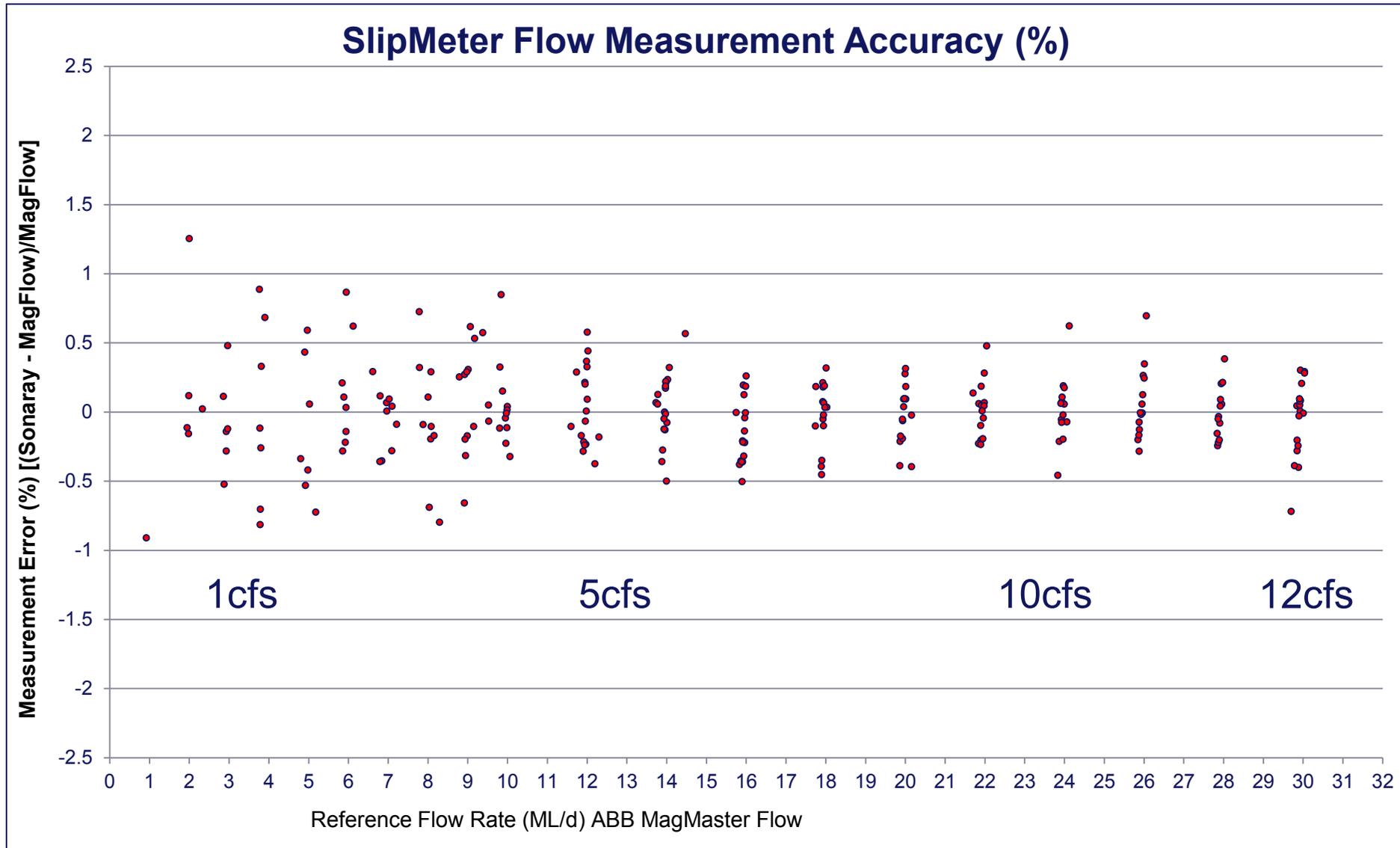
SlipMeter™

Integrated control gate and flow meter

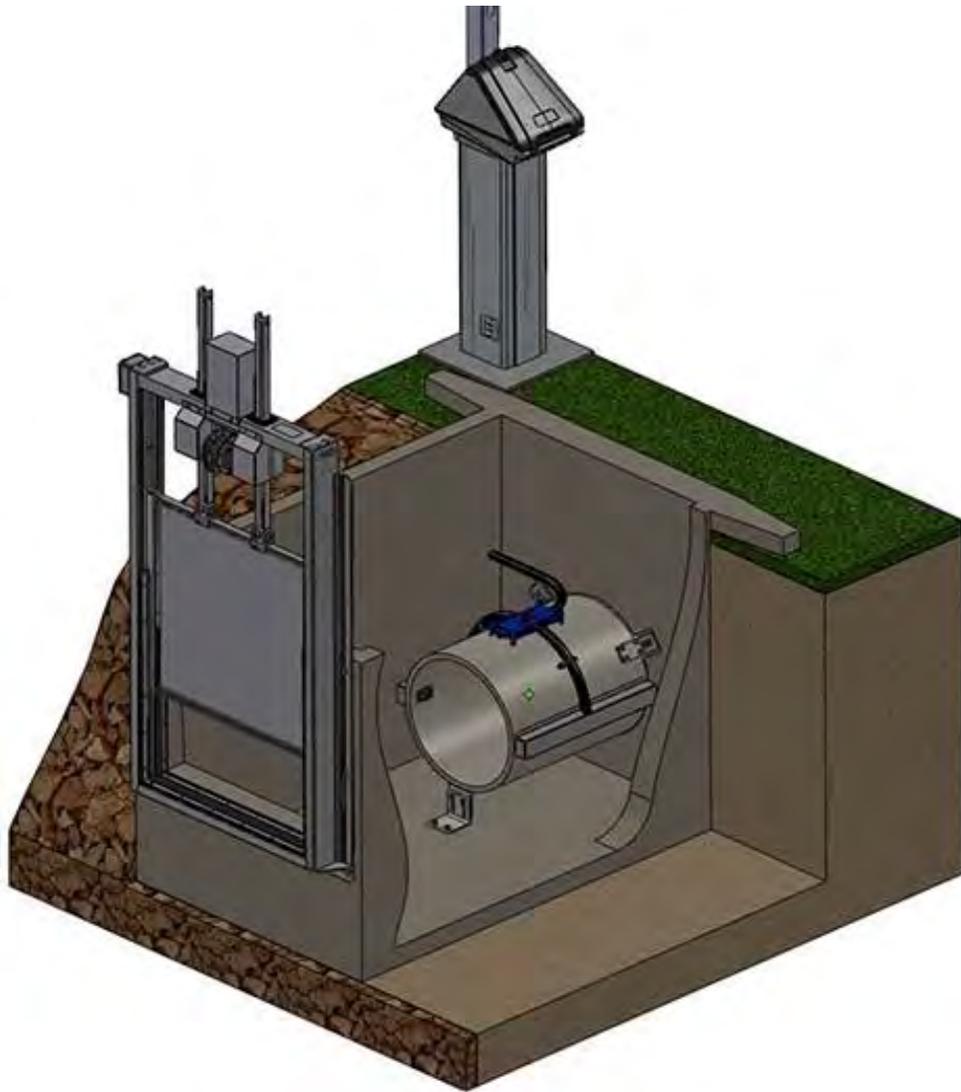


The SlipMeter is a precision flow meter

Accuracy $\pm 1\%$ (flow laboratory) from ~ 1 cfs up to 12cfs (tested)



Sonaray™ Pipe Flow Meters



Sonaray™ Pipe Flow Meter Features

- ▶ Offers a range of standard diameter pipes (e.g. 12", 18", 24", 40") with standard pipe couplings or flange interfaces (custom sizes are available)
- ▶ Can be connected to most other SCADA/PLC networks
- ▶ Can be combined with Rubicon gate for control
- ▶ Includes Rubicon Pedestal for flow measurement calculation, power, and communication

All Rubicon gates and meters feature standard pedestal

Powers, calculates and communicates



Pedestal features

- ▶ Robust die-cast aluminum controller housing ideal for harsh environments
- ▶ Weather proof and insect resistant
- ▶ Flexible mounting position
- ▶ User interface
 - Monitor set-points, flow rates
 - Set control modes and to set positions
 - Lockable (key)
 - Password protected screens
- ▶ Integrated mast and cabling (can be lowered easily)
- ▶ Lockable
- ▶ Houses batteries, PLC and radio

Gates are easy to install

Installation in the dry or wet

Bolt and seal aluminum frame to wall



FlumeGate™ arrives



FlumeGate™ positioned above frame



FlumeGate™ slides into frame – next step is commissioning and then it is ready to pass water



Example: Stanford University

FarmConnect®

On-farm irrigation automation

iBee™ (Zigbee) communications network

Wireless monitoring and control of a wide range of field devices including:

- soil moisture sensors
- weather stations
- gates
- valves
- pumps



On-farm high flow bay gates

User screenshot of field



Displays for users level of moisture (parameters set by grower and agronomist)

Soil moisture probes

GIS mapping

Rubicon Software and SCADA

Water Ordering for Growers (Web Based)

The screenshot shows the Rubicon WaterPortal interface. At the top, there are navigation tabs for Home, Orders, Usage, and User Options. Below this, a table lists various water orders with columns for order type, order number, and entitlement details. A 'Did you know?' box provides information about the overview screen.

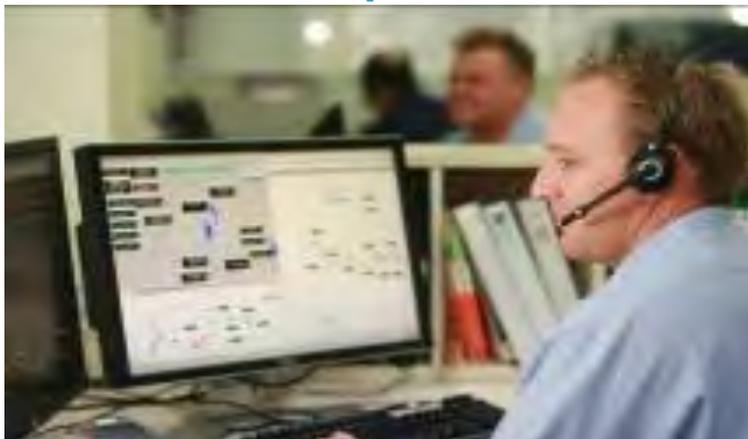
Order Type	Order Number	Entitlement Remaining	Total Entitlement
Operating	3201	12.68 ML	218.66 ML
Pending	9090	45.45 ML	45.45 ML
Pending	13462	1.51 ML	23.63 ML
Pending	ABA020286	15.57 ML	90.47 ML
Pending	ABA019685	11.38 ML	35.95 ML
Pending	ABA024402	42.05 ML	42.05 ML
Pending	ABA022285	66.69 ML	66.69 ML
Pending	ABA024753	58.82 ML	-

Did you know?
The overview screen displays summary information of your operating and pending orders, usage details and recent messages.

Rural water users can easily track use against their allocation

Water orders lodged by the irrigator

Water Operations



SCADA Interface for Control

The screenshot shows a SCADA interface for a 'REGULATOR 123B MAIN HWY'. It features a central video feed of the regulator, a control panel with buttons for 'Open', 'Close', 'Stop', and 'Start', and a graph showing flow rate and levels over time. The interface is designed for remote control and monitoring.

Remote Control of site from SCADA Connect Graphical User Interface

Alarm management tracking

Real time monitoring of flow rate and levels

Network Control Schematic



Schematic representation of irrigation channel network

Demand for water lodged by the irrigator

Different types of meters (old and new)

Live network data from Rubicon FlumeGates

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Total Channel Control[®] is an integrated system solution combining hardware, software and communication



1. Breakthroughs in modeling and control of channel dynamics (University partnership)
 - can work in the vast majority of topographies/slopes
2. Actuated gates with accurate measurement
 - highly accurate ultrasonic sensors ($\pm 2\%$)
 - conversion of manually operated structures
3. On-farm sensing and automation
4. Planning and scheduling software
 - online ordering
 - planning software for manual operation
 - enterprise software for system management
5. SCADA – Supervisory Control & Data Acquisition
6. Peer-to-peer communication

Total Channel Control[®] solution has been proven to benefit all stakeholders

Irrigation districts

- ▶ Provides global control of channel systems
- ▶ Conserves water
 - Eliminates operational spills
 - Pinpoints leakage, seepage and theft losses
- ▶ Provides real-time data / measurement for operators for better supervision
- ▶ Reduces costs
 - Eliminates manual planning, scheduling and operation of gates
 - Reduces risks from injury/accident
- ▶ Provide potential revenue stream

Farmers

- ▶ Near “on demand” supply of water (within 1 hour of the order) – when it is best for the crops
- ▶ Accurate measurement – the right amount ordered
- ▶ Conserved water could be used to expand irrigated acreage or to augment supply in water short years
- ▶ Provides constant high flows to support efficient flood irrigation

Buyers of Water (Municipals/ Irrigation Districts)

- ▶ Augments existing municipal water supply in a cost efficient method
- ▶ Reduces need for buying and drying/ improve relations with agricultural community

Environmental

- ▶ Improved water quality (reduce water runoff – less fertilizer, salinity)
- ▶ Keeps water in the river for greater in-stream flows
- ▶ Potential source of “conserved” water for wetland support

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Case Study 1: Oakdale Irrigation District (CA)

Oakdale Irrigation District

55,000 acres

- ▶ 35 Rubicon gates installed since 2006 – part of modernization strategy
- ▶ Conducted TCC[®] Assessment to develop cost benefit analysis (40-year business case)
- ▶ GM and Principal Engineer conducted due diligence trip to Victoria, Australia (Feb 2010)
- ▶ Have completed full automation demonstration pilot on two key laterals for 2012 irrigation season:
 - 31 FlumeGates[™]
 - 7 SlipMeters[™] at farmer turnouts
 - SCADAConnect
 - Telemetry (Peer to Peer communication)
 - Online water ordering
 - Scheduling software



Photos: Oakdale Irrigation District



Case Study 2: Reclamation District 108 (CA)

► Situation

- In 1997 Reclamation District 108 undertook a large modernization project to build a pumping facility on the Sacramento River and link that to an automated canal system

► Results

- During a one month testing period, TCC control resulted in a performance level of 97% - 99% to maintain the water level within +/-3 inches of set point.
- Reduced return spills to the river from ~20cfs to 1cfs – Kept more water in the river!
- Reduced energy use – e.g. less pumping required as a result of reduced spills.
- Now generates accurately monthly volumetric usage reports.

FlumeGate™ at RD108



Case Study 2: RD 108 Test Results

Manual (14" variation) vs. automated control (4" variation) over 7 weeks

SCADAConnect screenshot



Case Study 3: Victoria's "FoodBowl"

Agricultural region

Key facts:

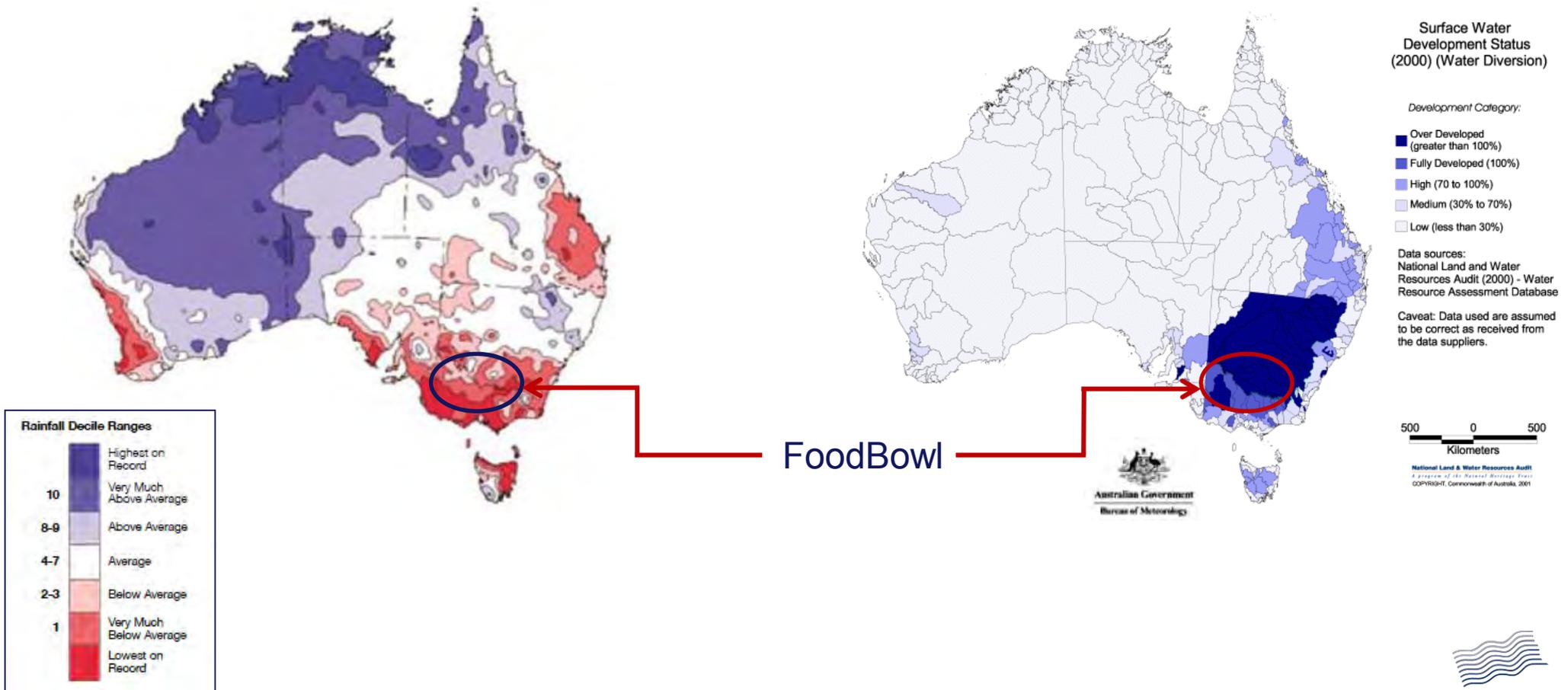
- ▶ 1,250,000 acres of irrigated land
- ▶ 70-80% of water use in Victoria
- ▶ 14,000 irrigators
- ▶ Output of irrigated agriculture about \$1.2B at the farmgate
- ▶ ~5,000 miles of open channel irrigation
- ▶ Loses about 30% of inflows



In the past 18 years, Victoria has faced the driest years on record along with an over allocation of supply

Rainfall deciles: October 1996 to May 2009

Over allocation of surface water



Source: Australian Bureau of Meteorology, 2009

Victoria's irrigation systems were antiquated, inefficient and manually intensive

Antiquated infrastructure

Manually operated gates

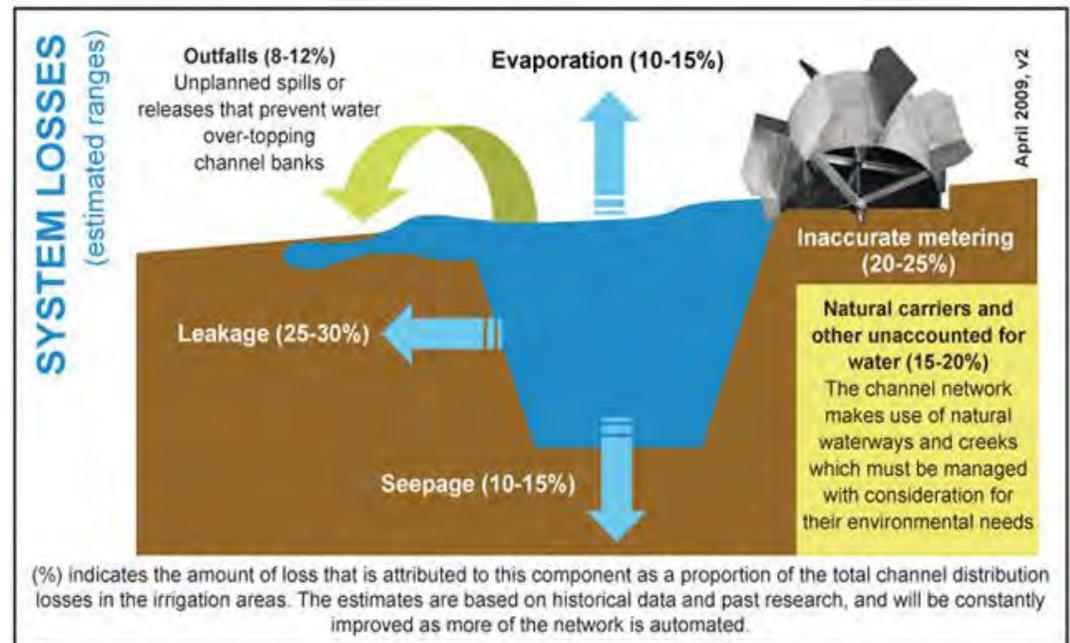


Dethridge meter



Losses in irrigation canal systems

System loss source (% of water lost)



A strategy was developed to save the FoodBowl by improving irrigation efficiency through modernization

Northern Victoria Irrigation Renewal Project

- ▶ Formed in 2007 with the aim to recapture 360k acre feet in total savings from:
 - improved service delivery
 - renovation
 - rationalisation
- ▶ The cornerstone of the FoodBowl modernization is Rubicon's Total Channel Control® - the integration of nearly 20,000 control gates, one of the world's largest SCADA systems, communication systems and management software (planning, scheduling and billing)

Modernized automated system



The FoodBowl is now completed its transformation to a modern, highly automated system

Inefficient antiquated infrastructure and practices.....



TCC®

...transformed using Rubicon's Total Channel Control® technology



*Project completion estimated in 2013

Independently documented FoodBowl results (1/2)

System Efficiency Gains

- In the Shepparton Irrigation Area, operational spills were reduced by 79% from 7,150 af in 2007/08 to 1,470 af in 2008/09
- TCC automation combined with targeted channel lining of the CG2/2 canal has increased efficiency from 78.9% in 2007/08 to 91.6% in 2008/09
- Individual pool efficiency in the CG9 channel in the Central Goulburn Irrigation Area has reached 96%

Source: Goulburn-Murray Water 2008-09 modernisation case studies, August 2009

Long-term System Cost Savings

- An independently reviewed report by Goulburn-Murray Water found that the cost of operating and maintaining a network modernized by TCC was substantially lower over a 50 year period, with 35% less revenue required to run a fully modernized system compared to an un-modernized system.

Source: Impact of Modernisation: Whole of Life Cost Analysis, Goulburn-Murray Water, August 2009

Independently documented FoodBowl results(2/2)

▶ Reduced On-farm Water Use

▶ Higher and more consistent flow rates have already resulted in anecdotal evidence of significantly reduced on-farm water use:

- *“We’ve just done our second watering since the installation of our new meter, and it’s absolutely marvelous. The canals had manual wooden structures, and the levels would fluctuate 8” to 12”. Now the new FlumeGates in the canal mean the water is the same all the time. I am very happy”.*
- *“The flow rate through our (meter) didn’t vary for the first time in 14 years. It can only be put down to the FlumeGates installed in the canal.”*

Source: The Benefits of Irrigation Modernisation – Beyond Water Savings. Peter Walsh (Alliance Manager, FutureFlow) and Kevin Preece, (Manager Water Services, Goulburn-Murray Water)

▶ Unique Technology

▶ A report on Rubicon’s systems by consulting firm Westin Engineering concluded:

- *“The TCC system is a sophisticated, state of the industry system. In the specialized market of irrigation flow control systems, the TCC system has no equals. It is clearly an industry leader and benchmark for those types of systems”.*

*Source: SCADA and Total Channel Control Technology and Product Review,
Westin Engineering Inc (USA)*

A Solution for the Carbondale Weaver Canal?



What Would be Needed:

▀ Rubicon to Provide and Install:

- New Check Gates: 15x FlumeGates, model FGB-0626-0674 (29.9x28.1, max 18 cfs)
- New Level Monitoring Stations: 3x FlumeLinks
- Wireless Network: Master Station plus 18 remote radio sites
- Central Server System: Server, Internet connection, PC Workstation
- Network Control Solution Software: NeuroFlo, SCADAConnect, Oracle DBMS

▀ Civil Works to build or modify existing gate structures by others.

FlumeGate™ - Maximum Flow Discharge

FGA-0626-0674

Gate Model	FGA-0626-0674
Updated Last	7/18/11
Gate Radius	26.5 in
Fully Open Gate Elevation(OE)	4.9 in
Fully Closed Gate Elevation (CE)	28.1 in
Internal Gate Width (F)	22.6 in
External Gate Width (B)	29.9 in



RUBICON

Maximum Flow Discharge Q (cf/s)

Upstream Water Level HU (In)	Downstream Water Level HD (in)								
	0	3	6	9	12	15	18	21	24
0	0								
3	0	0							
6	0	0	0						
9	1	1	1	0					
12	3	3	3	3	0				
15	6	6	6	5	5	0			
18	8	8	8	8	7	7	0		
21	11	11	11	11	11	10	9	0	
24	14	14	14	14	14	13	12	11	0
27	18	18	18	18	17	17	16	15	13



Thank you