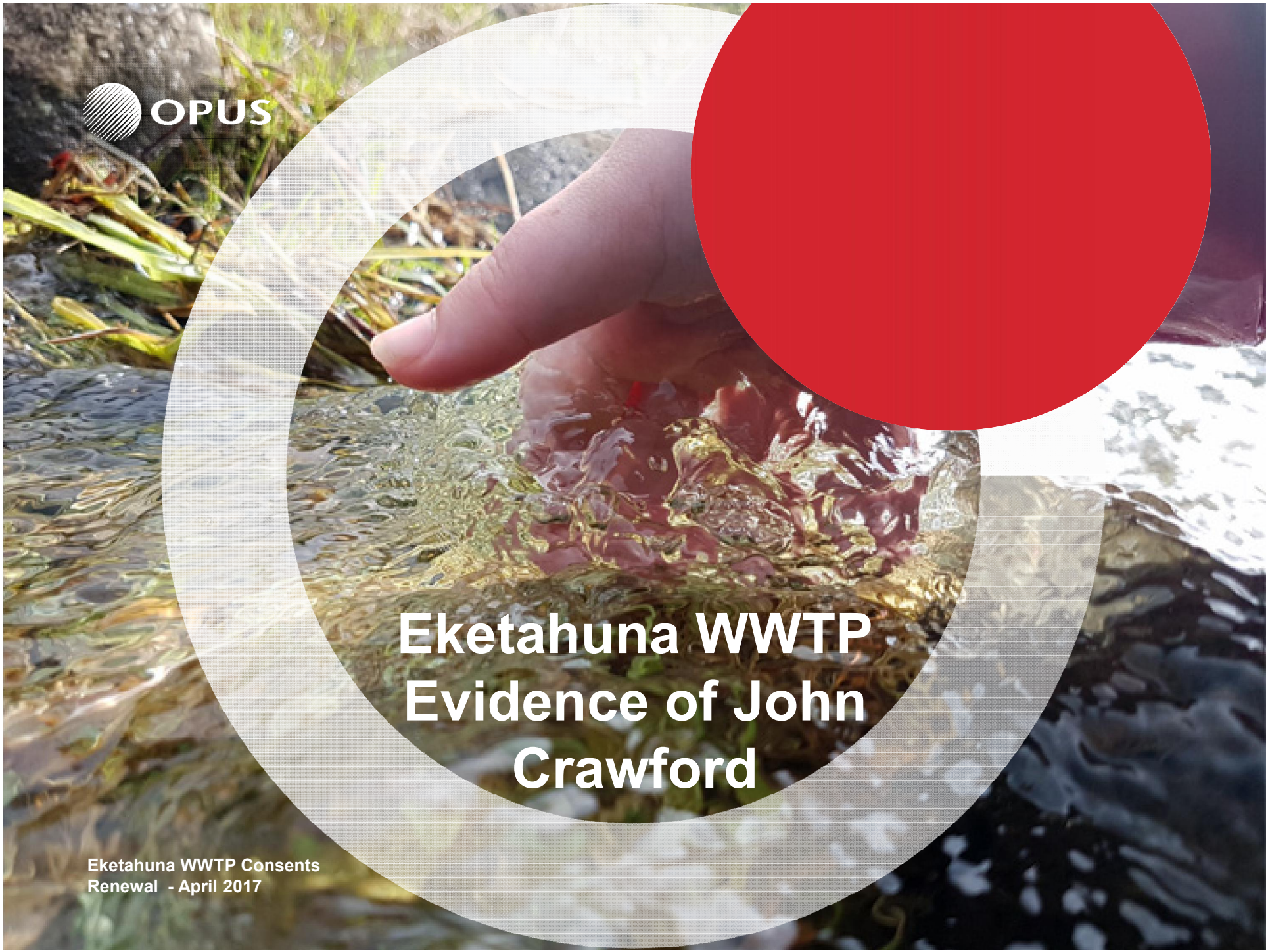


Eketahuna WWTP Evidence of John Crawford

Eketahuna WWTP Consents Renewal - April 2017

Overview of Presentation

- Description of Ponds and what they do
- EWWTP Loading
- EWWTP Performance
- Proposed Effluent Quality
- Proposed Upgrades
- Post install commissioning and optimisation requirements

Eketahuna WWTP – Make Up

- Influent fine screen
- 0.33 ha Facultative Pond
- 3kW mechanical aerator
- 0.12 ha Maturation pond
- Sandwiched between river & golf course

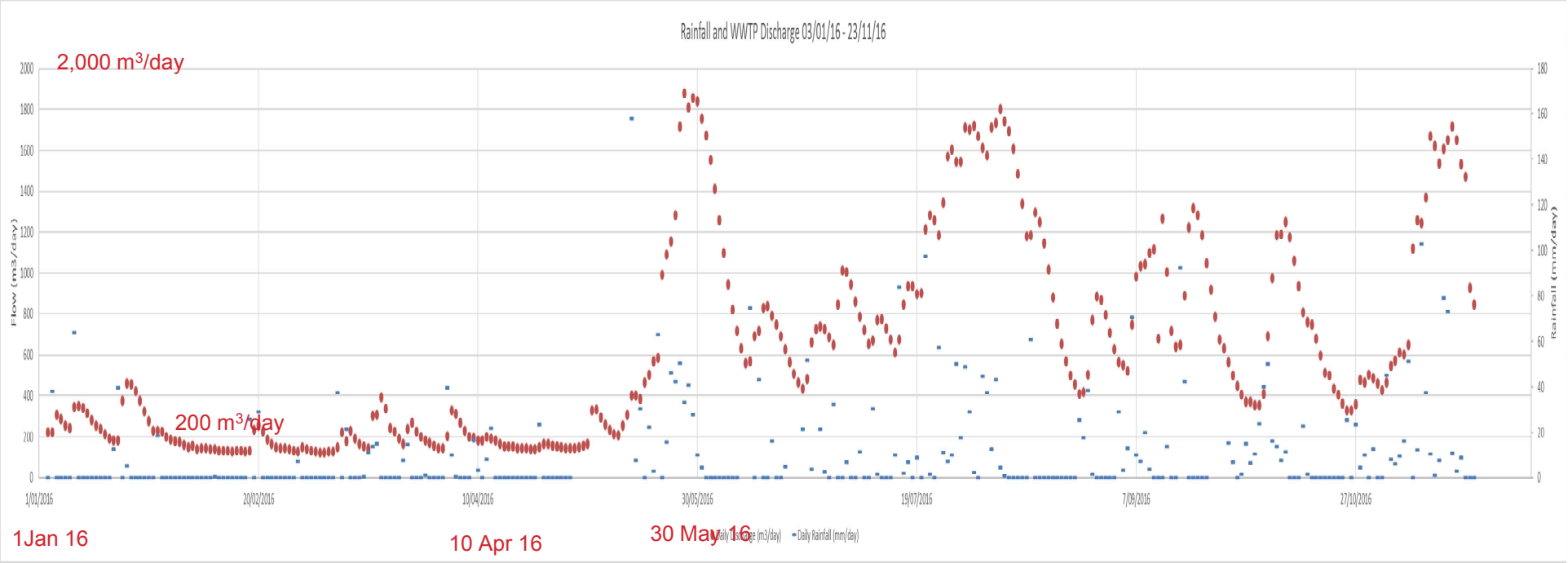
Oxidation Ponds - What they do

- Principally target 80 – 90% reduction of BOD and TSS 40:40 mg/l
- 2 – 3 $\log_{10}$ disinfection through predation & solar UV
- Some N & P removed in cell synthesis
- Some N lost as volatile ammonia
- Some N may be lost through nitrification & denitrification

EWWTP - Loading

- 441 persons
- ADWF = 144 m^3/d = 326 l/person/day (High)
- AADF = 256 m^3/d
- ADF = 638 m^3/d (very high)
- PWWF = 1,900 m^3/d (from only 1 year of data)
- 41 kg BOD_5 /d
- 124 kg BOD_5/ha/d cf 84 kg/ha/day
- Processing capacity approx. 67 kg BOD_5/day
- Limited flow data. Industry load data.

EWWTP - One Year Out-Flow Profile



Low flows through & Post Summer

High flows through & Post Winter

EWWTP - 2016 Performance

Table 3: Year 2016 Daily Effluent Flows and Concentrations

	Flow	e.coli	TSS	NH4	SIN	TN	DRP	scBOD$_5$
	m^3/d	MPN/100ml	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3	g/m^3
Annual								
Mean	704	946	17	5.5	5.9	9.5	0.9	3.8
90%ile	1268	3240	29	13.0	13.1	19.4	1.8	7.4
Summer								
Mean	161	1743	19	9.2	9.4	14.9	1.8	5.5
90%ile	195	3150	29	13.9	14.0	21.7	2.4	7.1
Winter								
Mean	1014	593	16	3.9	4.4	7.2	0.5	3.1
90%ile	1376	1292	31	6.2	6.2	9.7	0.9	4.8

EWWTP - 2016 Performance

Table 5: Pollutant Removal Performance 2016

	TSS	NH4	SIN	TN	DRP	$scBOD_5$
	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d
Influent	40	3.9	3.9	6.8	1.1*	41
Annual						
Effluent	7	2.3	2.8	4.4	0.3	2
% Removal	82.5%	41%	28%	35%		95%
Summer						
Effluent	3	1.5	1.5	2.3	0.3	1
% Removal	92.5%	62%	62%	34%		98%
Winter						
Effluent	9	2.8	3.5	5.5	0.3	2
% Removal	78%	28%	10%	19%	73%	95%

* TP

EWWTP - 2016 Performance

Table 4: Year 2016 Daily Effluent Flows and Loads

	Flow	e.coli	TSS	NH4	SIN	TN	DRP	$scBOD_5$
	m^3/d	MPN/d	kg/d	kg/d	kg/d	kg/d	kg/d	kg/d
Annual		x 10^9						
Mean	704	3.1	7	2.3	2.8	4.4	0.3	2
90%ile	1268	8.7	15	3.4	4.1	5.9	0.4	3
Summer								
Mean	161	2.6	3	1.5	1.5	2.3	0.3	1
90%ile	195	4.3	4	2.5	2.5	3.3	0.4	1
Winter								
Mean	1014	3.4	9	2.8	3.5	5.5	0.3	2
90%ile	1376	8.7	17	4.0	4.6	6.8	0.5	3

Proposed Effluent Quality

Table 6: Proposed Effluent Quality Standards

	Following implementation of proposed upgrades	
	Mean	90th %ile[1*]
$scBOD_5$ *(g/m³)*[2]	≤5	≤8
Total suspended solids *(g/m³)*	≤15	≤30
Ammoniacal nitrogen *(g/m³)*	≤10	≤15
DRP (g/m³)	≤0.5	≤1.0
	Median	90th%ile.
E.coli (MPN/100*ml*)	260	1,000

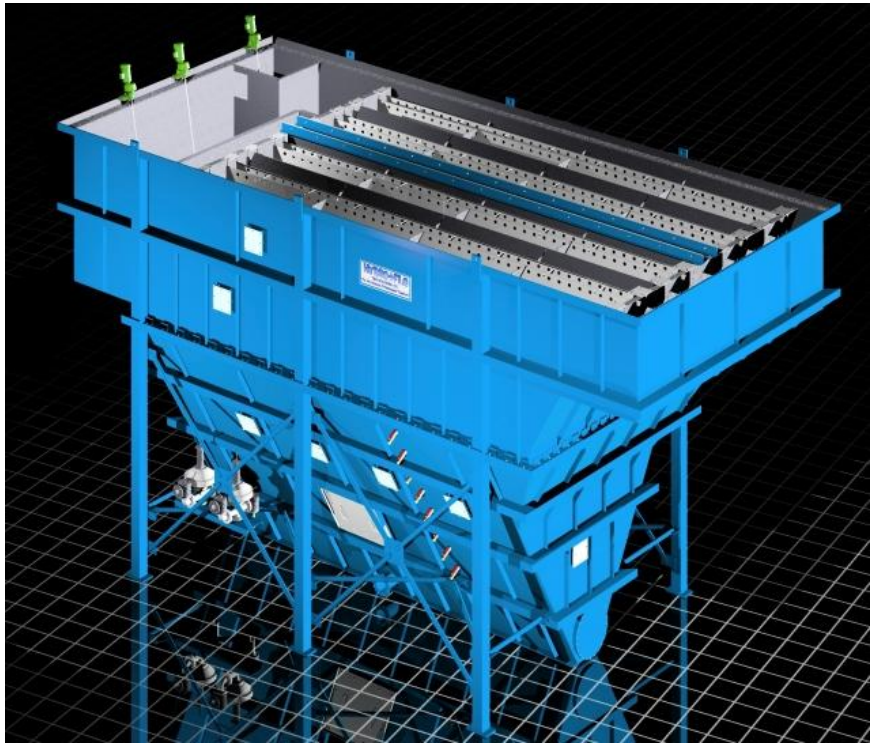
Proposed Upgrades
Lamella Clarifier

- Target: TSS, DRP, Disinfection pre-cursor
- Incidental (Bonus): $cBOD_5$, organic N, pathogens direct removal
- Currently used:
  - Taihape, Hunterville, Woodville, Pahiatua &
  - In Actiflo configuration: Warkworth, Ngaruawahia, Gore

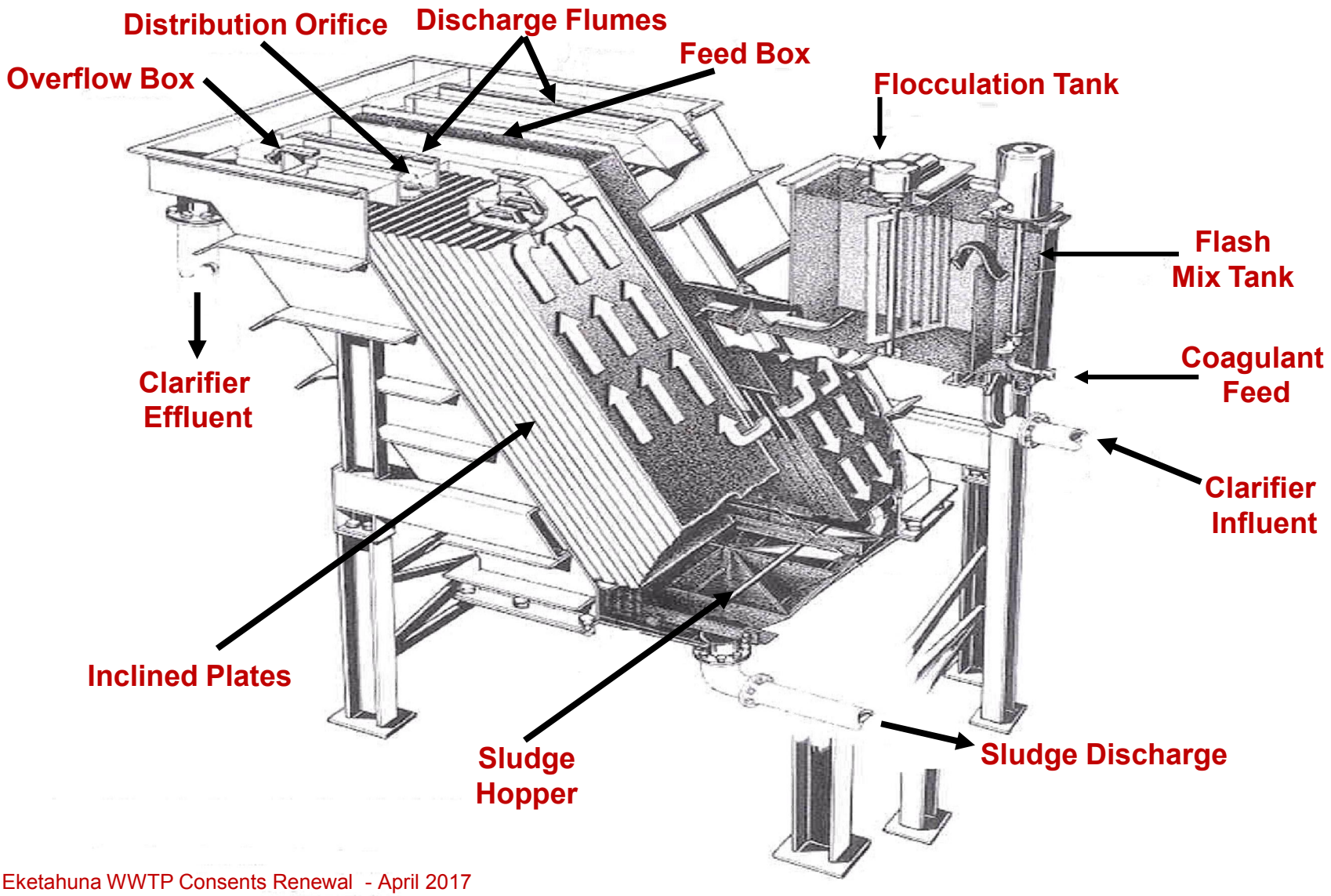
Inclined Plate (Lamella) Clarifier

Increased settling efficiency due to increased surface area

Smaller Area Needed for Installation

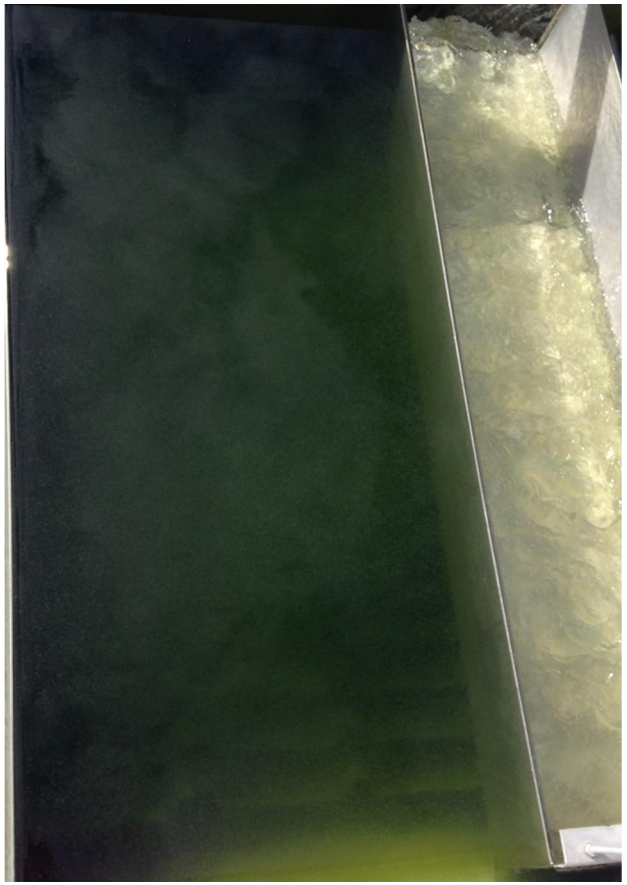


Lamella Clarifier



Example Lamella

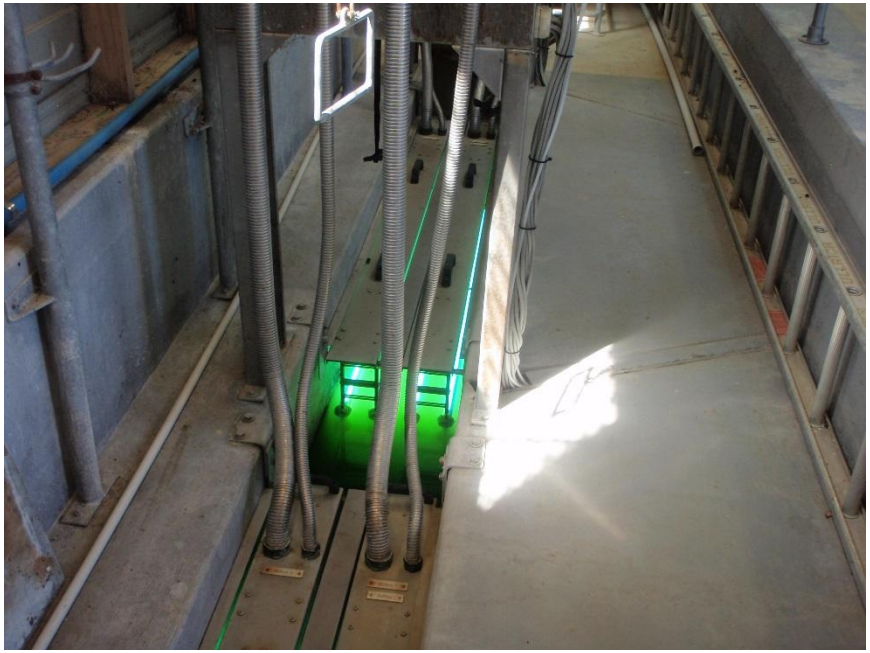
- Lamellas at Gore WW Oxidation ponds



Proposed Upgrades
UV Disinfection

- Requires good clarity effluent and low TSS
- Targets Pathogens: Coliform bacteria, Viruses, Protozoa
- Dose rates affected by: Flow rate, Clarity, Solids
- Currently used: Most NZ WWTPs

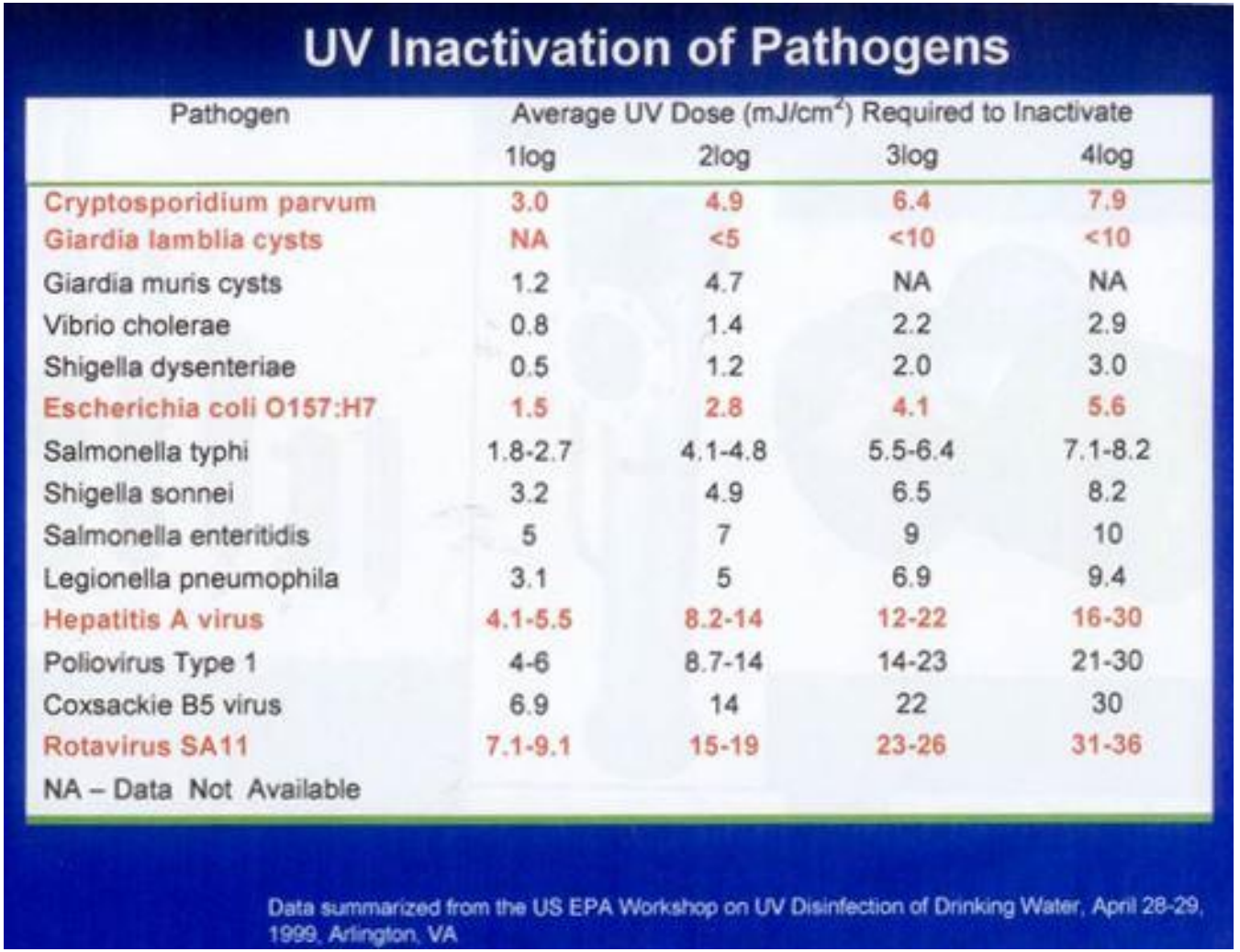
UV Reactor Types



Open Channel Reactor - Katikati

In-Pipe Reactor - Meremere

UV Dose Rates



UV Inactivation of Pathogens

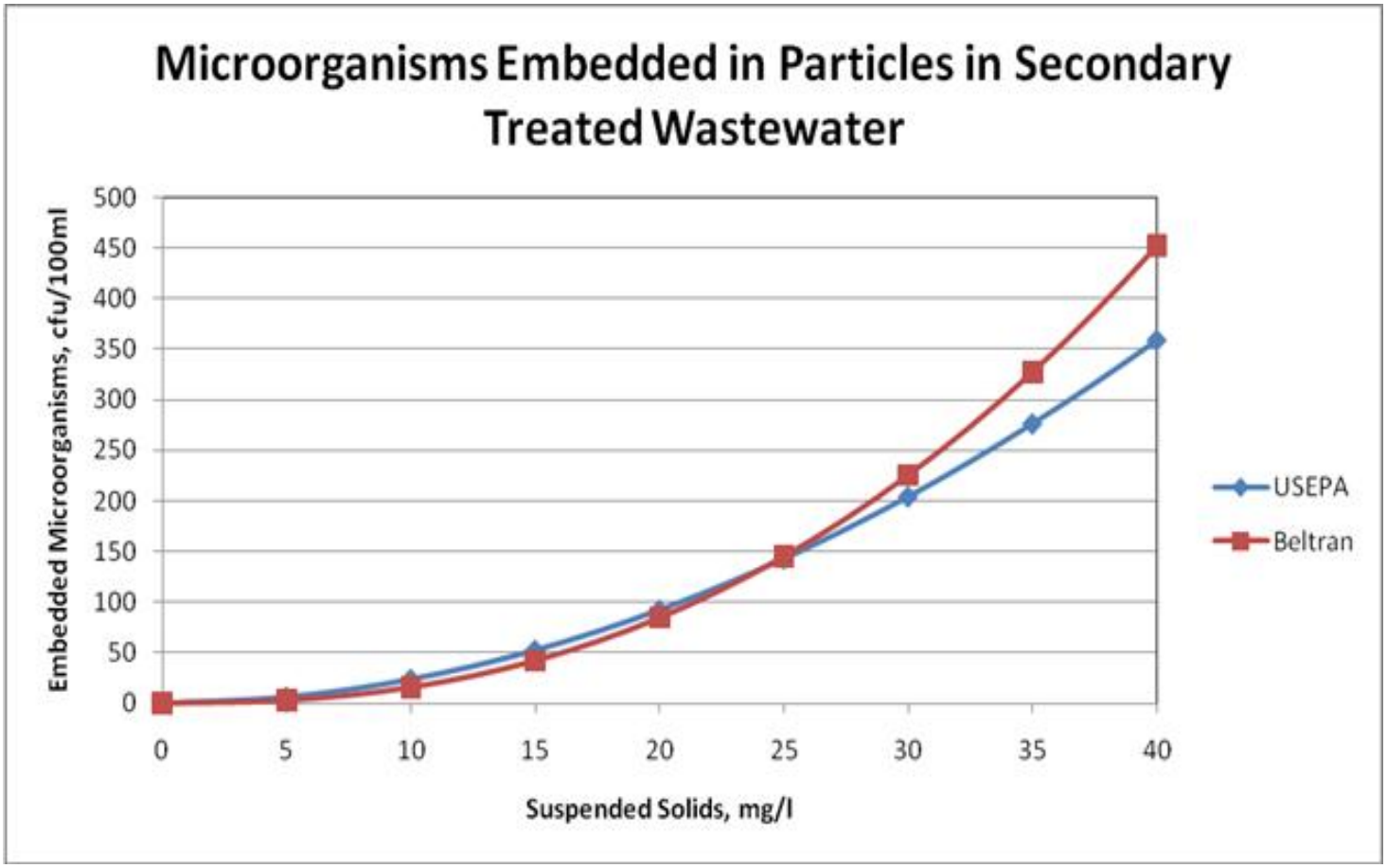
Pathogen	Average UV Dose (mJ/cm^2) Required to Inactivate			
	1log	2log	3log	4log
Cryptosporidium parvum	3.0	4.9	6.4	7.9
Giardia lamblia cysts	NA	<5	<10	<10
Giardia muris cysts	1.2	4.7	NA	NA
Vibrio cholerae	0.8	1.4	2.2	2.9
Shigella dysenteriae	0.5	1.2	2.0	3.0
Escherichia coli O157:H7	1.5	2.8	4.1	5.6
Salmonella typhi	1.8-2.7	4.1-4.8	5.5-6.4	7.1-8.2
Shigella sonnei	3.2	4.9	6.5	8.2
Salmonella enteritidis	5	7	9	10
Legionella pneumophila	3.1	5	6.9	9.4
Hepatitis A virus	4.1-5.5	8.2-14	12-22	16-30
Poliovirus Type 1	4-6	8.7-14	14-23	21-30
Coxsackie B5 virus	6.9	14	22	30
Rotavirus SA11	7.1-9.1	15-19	23-26	31-36

NA – Data Not Available

Data summarized from the US EPA Workshop on UV Disinfection of Drinking Water, April 28-29, 1999, Arlington, VA

Target 30 – 40 mJ/cm^2

Why Clarification? - UV Shielding



Effect of residual solid particles on ability to disinfect

Commissioning & Optimisation

- Hydraulic tests
- Short list coagulants – ‘Jar’ Testing
- Start up and trialling
- Optimise flash mixer operation
- Optimise flocculator operation
- Adjust and optimise Feed Box baffles
- Seasonal testing with shortlisted coagulants
- Measure UVT, TSS, E.coli, DRP regularly
- Order, install & commission UV reactor