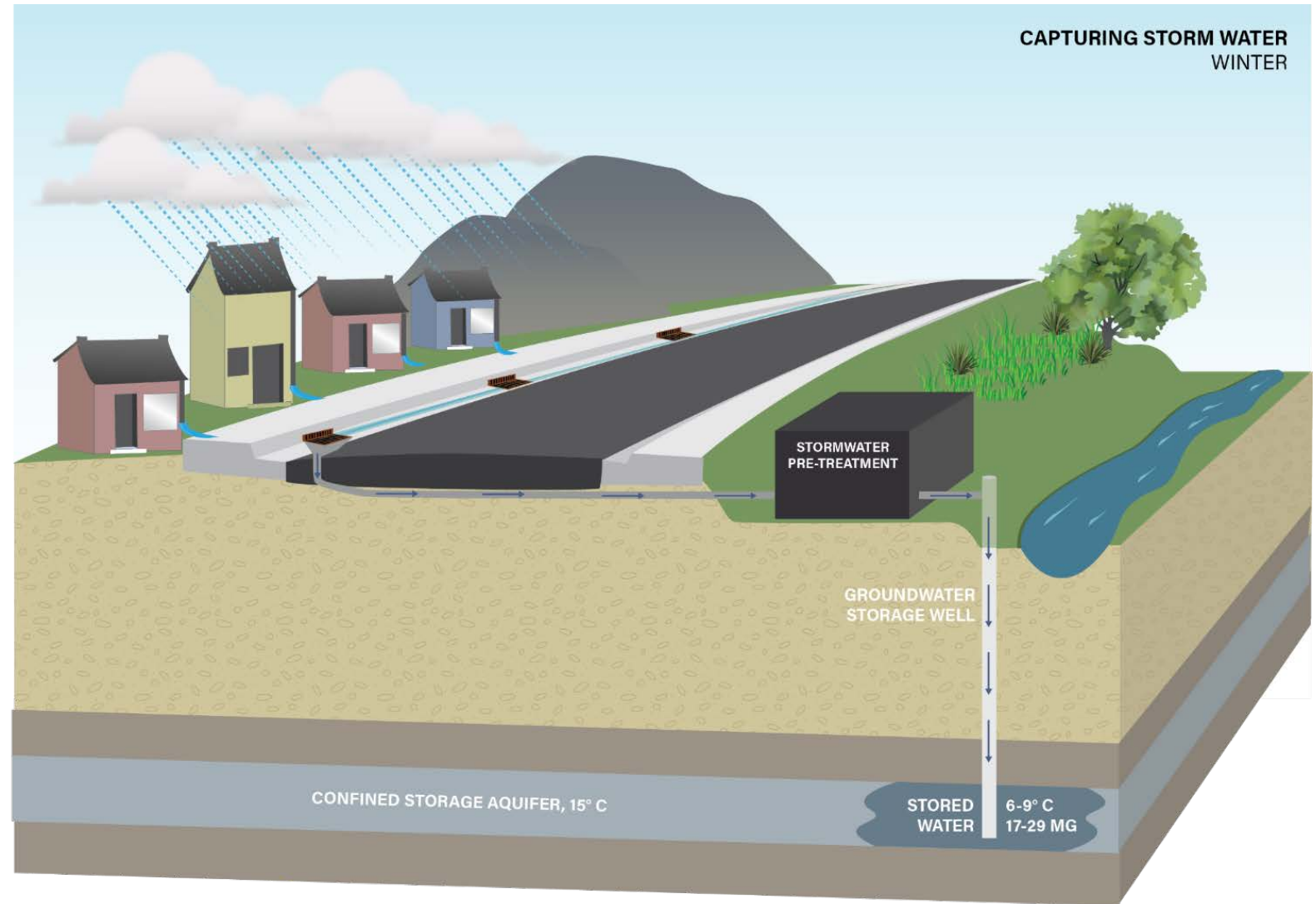
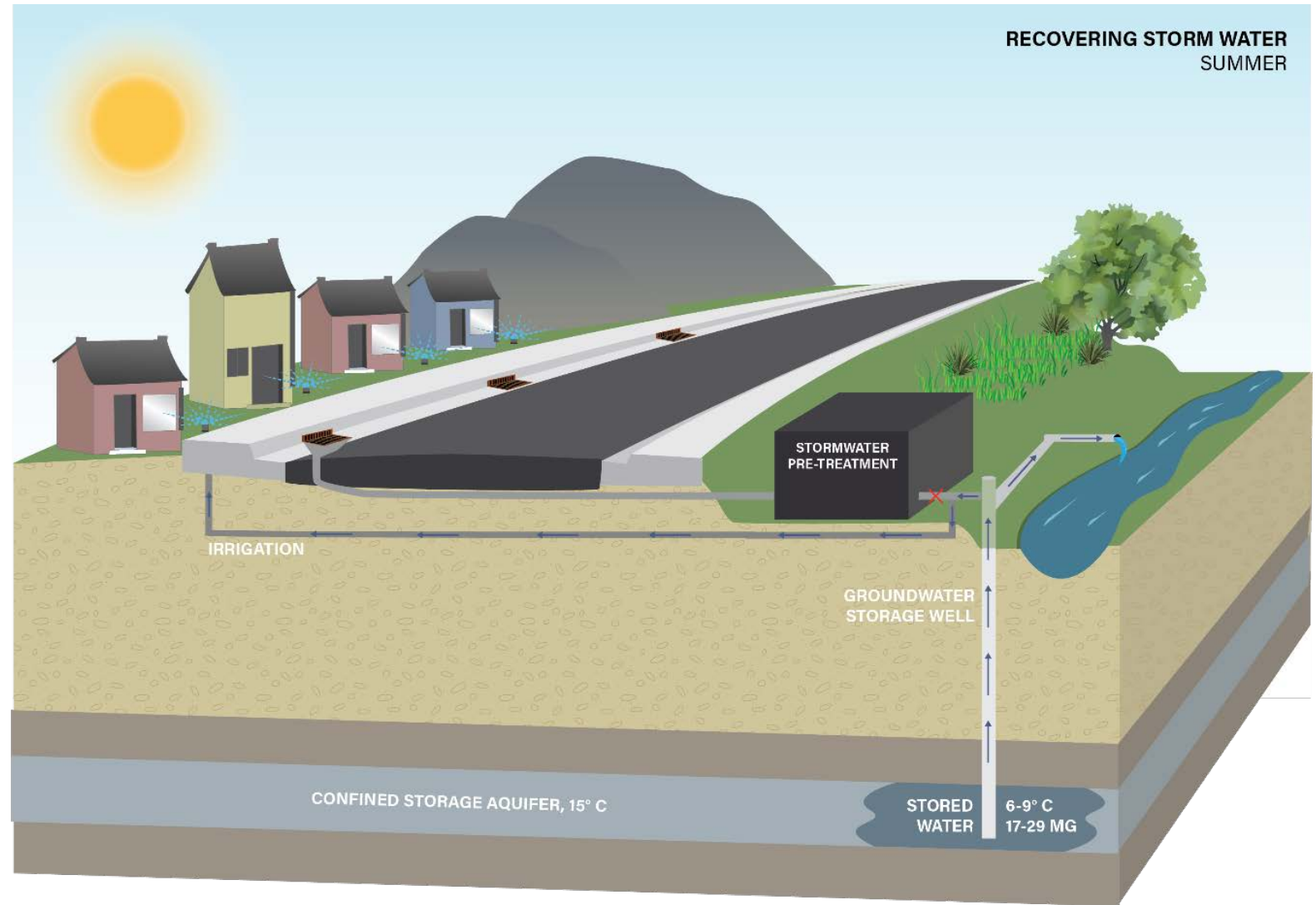


Stormwater Treatment and Storage Concept Winter



Stormwater Treatment and Storage Concept Summer



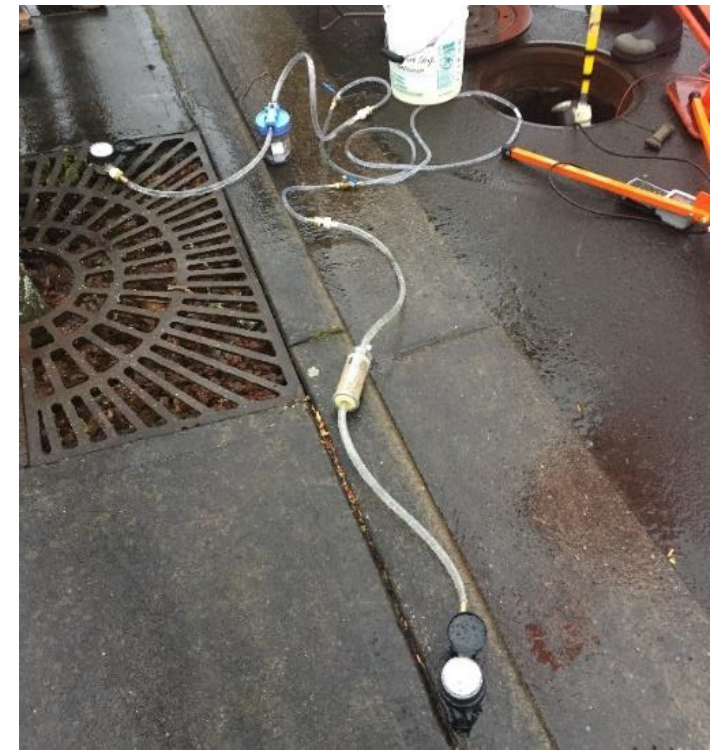
Regional Stormwater Quality

Analytes Detected in Oregon Municipal Stormwater Above MCLs					
		Total Number of Samples		Percent of Total Samples Exceeding the MCL	
Analyte	EPA MCL (mg/L)	Kennedy/ Jenks Study (2009)	DEQ Municipal Database (2015)	Kennedy/ Jenks (2009)	DEQ Municipal Database (2015)
Antimony	0.006	347	277	0.3	0.0
Arsenic (total)	0.01	846	1,183	0.2	0.08
Benzo(a)pyrene	0.0002	740	1,284	0.3	0.93 ^b
Cadmium	0.005	1,609	1,183	0.5	0.0
Chromium	0.1	1,226	1,183	0.8	0.0
DEHP	0.006	641	1,284	4.7	5.5
Lead (total)	0.015 ("Action level")	1,782	1,284	12.7	13.3
Nitrate-Nitrogen	10	633	1,136	0.3	0.0
PCP	0.001	675	1,279	11.7	14.5
Zinc (total)	5 ^c	1,661	1,284	0.1	0.0

Feasibility Study

OWRD Grant with CWS: 2016-2017

- Stormwater Flow
 - Radar/ultrasonic automated flow measurement in both basins
- Stormwater Quality Sampling
 - 4 sampling events in each basin (2 time series samples and 2 grab samples). First flush targeted in time series.
 - Samples analyzed for comprehensive list of stormwater contaminants of interest (COIs)
 - Over 300 analytes – pathogens, inorganics, DBP's, emerging urban contaminants, metals, SOC's, VOC's, radionuclides. Every constituent for which there is an MCL, SMCL, or TT.
 - More targeted list of indicator COIs for some samples



Stormwater Quality

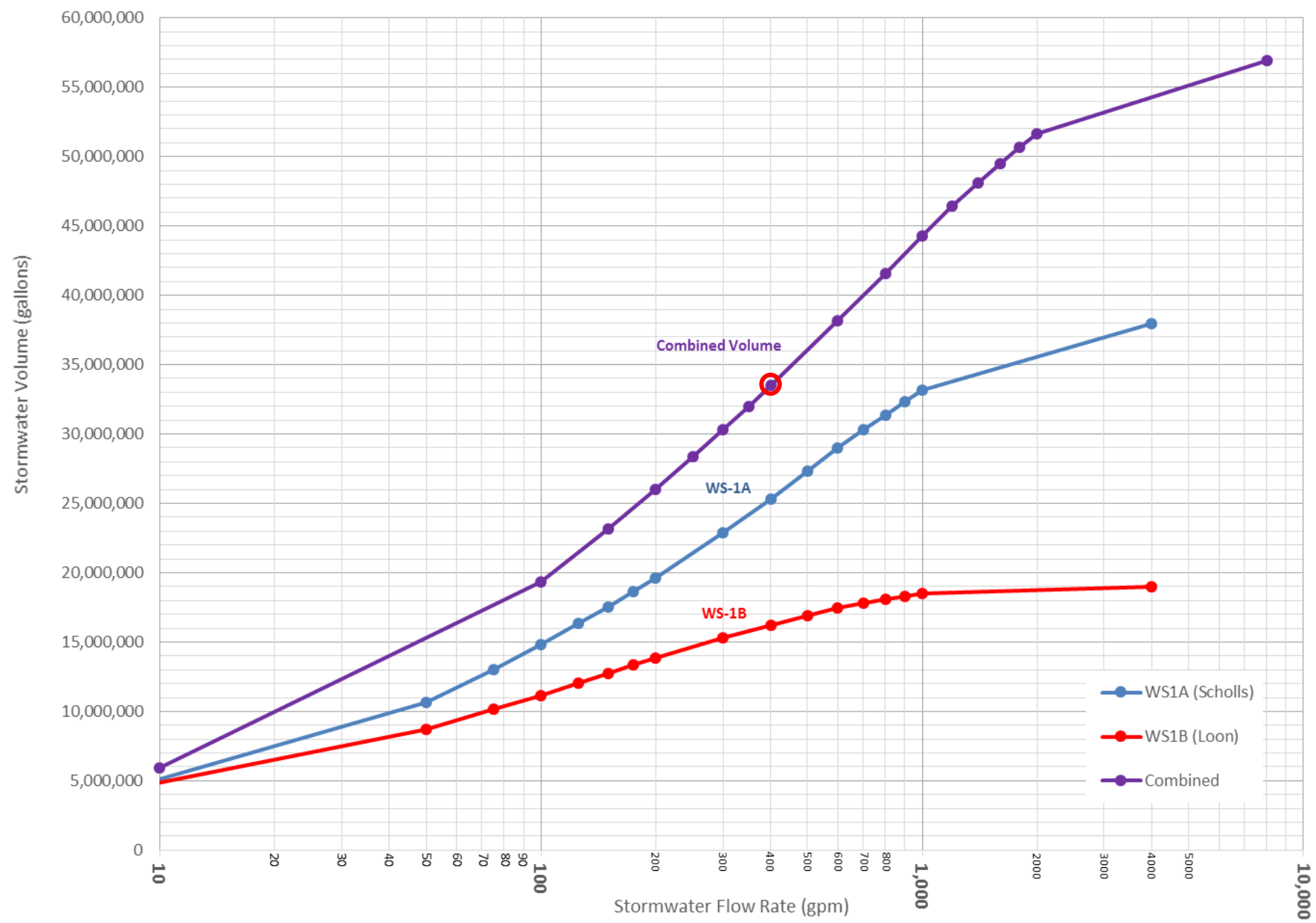
Just over 60 COIs detected above reporting limit in one or more sample(s), and only 8 COIs exceeded their respective screening level value (i.e. 1/2 MCL or SMCL)

Analytes Detected Above Respective Screening Level					
Analyte	Units	Regulatory Requirements		Geometric Mean	Percent of Total Samples Exceeding the MCL
		1/2 MCL	SMCL		
Fecal Coliform	MPN/100 mL	--	--	350	100
Total Coliform	Presence or Absence	--	--	present	100
E. Coli	P or A	--	--	present	100
Culturable Cytopathic Enteric Viruses, Primary Value	IU MPN	0	--	1	66
Culturable Cytopathic Enteric Viruses, Secondary Value	IU MPN	0	--	1	66
Apparent Color	Color Units	--	15	36	100
Turbidity	NTU	0.15 - 0.25	--	9	100
Aluminum	ug/L	--	200	323	100
Iron	mg/L	--	0.3	0.356	83

Stormwater Quality and Treatment Options

Data Source			Treatment Options
Sterling Park Site-Specific Stormwater Data (2017)	Oregon Municipal Stormwater Studies (Kennedy/Jenks, 2009; DEQ Municipal Database, 2015)	DEQ Municipal Database (2015)	
Metals			
Zinc (total), Aluminum (total), Iron (total)	Antimony, Arsenic (total), Cadmium (total), Chromium (total), Lead (total), Zinc (total)	Antimony, Arsenic (total), Cadmium (total), Chromium (total), Lead (total)	Total metals are often associated with particulates that can be removed through a filtration step (e.g. sand filter). Concentrations of dissolved metals may be removed through activated carbon/biochar adsorption , ion exchange processes, ultra or membrane filtration, precipitation, electrodialysis, and distillation. Removal may often depend upon pH and influent concentrations.
Solids, Nuisance, Odor			
Turbidity, Apparent Color, Odor	Not Analyzed	Not Analyzed	Turbidity may be removed with flocculants/coagulants, filtration , adsorption or some combination of all of these processes. Water quality issues associated with color and odor may be greatly reduced after water clarification/filtration processes. Color is often a result of dissolved material (Fe, Cu, NOM, Mn) or suspended solids and will resolve with treatment processes that eliminate these underlying constituents.
PAHs, phthalates, and other organics			
No COIs above screening levels	Benzo(a)pyrene, DEHP	Benzo(a)pyrene, DEHP, Benzene	Activated carbon is effective in removing concentrations of dissolved organics such as PAHs, phthalates, and benzene. DEHP is often associated with water pipes and can be readily removed with activated carbon.
Nitrate-Nitrogen			
No COIs above screening levels	Nitrate-Nitrogen	No COIs above screening level	Nitrates are difficult to remove from water sources with passive treatment options and would likely require ion exchange units, reverse osmosis, or distillation. Some nitrate-nitrogen may be removed through filtration and adsorptive treatment steps
Pesticides			
No COIs above screening levels	PCP	PCP	Activated carbon and other adsorptive media such as organoclay are often effective in removing pesticides such as PCP. PCP is also readily degraded in the environment at lower concentrations.
Potential Pathogens			
Fecal Coliform, Total Coliform, E. Coli, Enteric Viruses	Not Analyzed	Not Analyzed	Coliform bacteria, E. Coli, and culturable viruses are often ubiquitous in the environment. Various effective means of disinfection are readily available including chlorine, chloramines, ozonation, ultraviolet irradiation , etc.

Stormwater Quantity (2016-2017)



Feasibility Study Key Findings (2016-2017)

- Stormwater volume ~50 MG
 - Subsequent data suggests average of 40 MG annually
- 35 MG at rates of <400 gpm
 - Potential treatment and recharge rate
- Recovery rates 500 gpm
- Stormwater quality appears treatable to standards
- Stored water cooler than native groundwater (9°C vs 15°C)

Project Implementation Grant

- OWRD implementation grant – CWS and City
 - Awarded \$860,000 in 2019
- Stormwater treatment pilot testing
- Treatment system design
- Full scale implementation
- Initial operation



2018 SOLICITATION

WATER PROJECT GRANTS AND LOANS

GRANT APPLICATION

APPLICATION DEADLINE: BY 5:00PM ON APRIL 25, 2018

Application must be received by this date and time

Send application electronically to: waterprojects@wrdd.state.or.us

Mail application to:

OREGON WATER RESOURCES DEPARTMENT
Attention: Grant Program Coordinator
725 Summer Street NE, Suite A
Salem, OR 97301

APPLICATION SUBMISSION INSTRUCTIONS

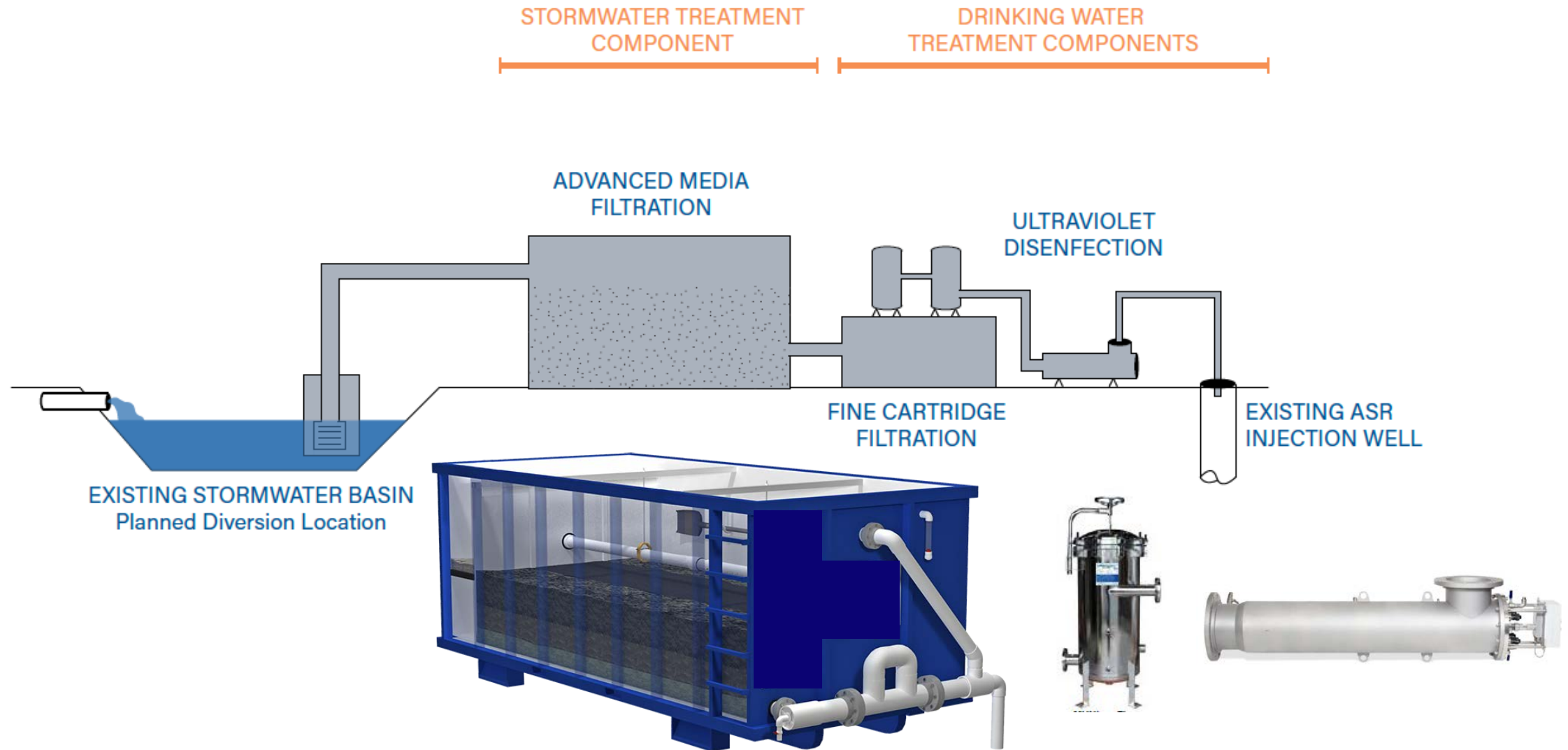
1. Complete Sections I through X in the spaces provided. Use the [grant application instructions](#) and [Guidance on the Evaluation of Public Benefits](#) when completing your application. Available at: http://www.oregon.gov/owrd/Pages/Water_Resources_Development_Program_Forms_and_Guidance.aspx
2. Taking part in a Pre-Application Conference prior to applying is *highly* recommended. The pre-application conference request form is available at: http://www.oregon.gov/owrd/docs/WRDP/WPGL_Water_Project_Grants_and_Loans_GRANT_Pre_Application_Conference_Checklist.docx. To learn more contact the Department.
3. Complete and sign the application checklist.
4. An application must be submitted on the attached form provided by the Department and may not be altered for the purpose of formatting or changing the document structure.
5. Please ensure that the Certification portion of Section II is signed with a live signature by the Applicant and, if applicable, the Co-Applicant.
6. Electronic application submission is the preferred method. You may scan a copy of the signed signature page and submit it with your application as long as both documents are included in the same email.
7. If application is submitted in hard copy - use 8 1/2" x 11" single sided, unstapled pages. Provide any attachments to the application on 8 1/2" x 11" single-sided, unstapled pages.
8. Contact the Department 503.986.0869 or waterprojects@wrdd.state.or.us if you have any questions.

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Stormwater Treatment Pilot Testing

Proposed Stormwater Treatment



Media/Membrane Filtration

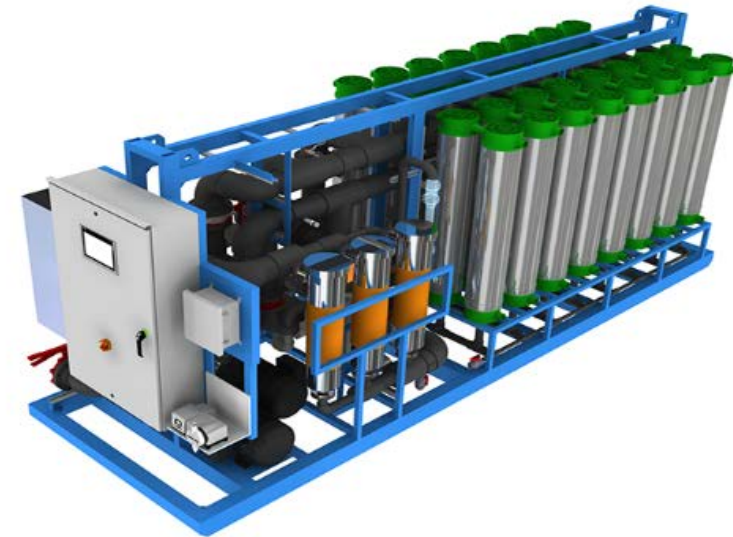
Advanced Media Filtration

- Effective sorptive media filtration with proven COI reduction capacity.
- Passive gravity driven system
 - No moving parts
 - Operates independently.
- Can accommodate flows of 400 gpm



Membrane Filtration

- Removal of particles down to <0.01 microns
- Little to no metals reduction
- Pressurized filtration
- Requires backflushing and dry season maintenance
- Can accommodate flows of 400 gpm

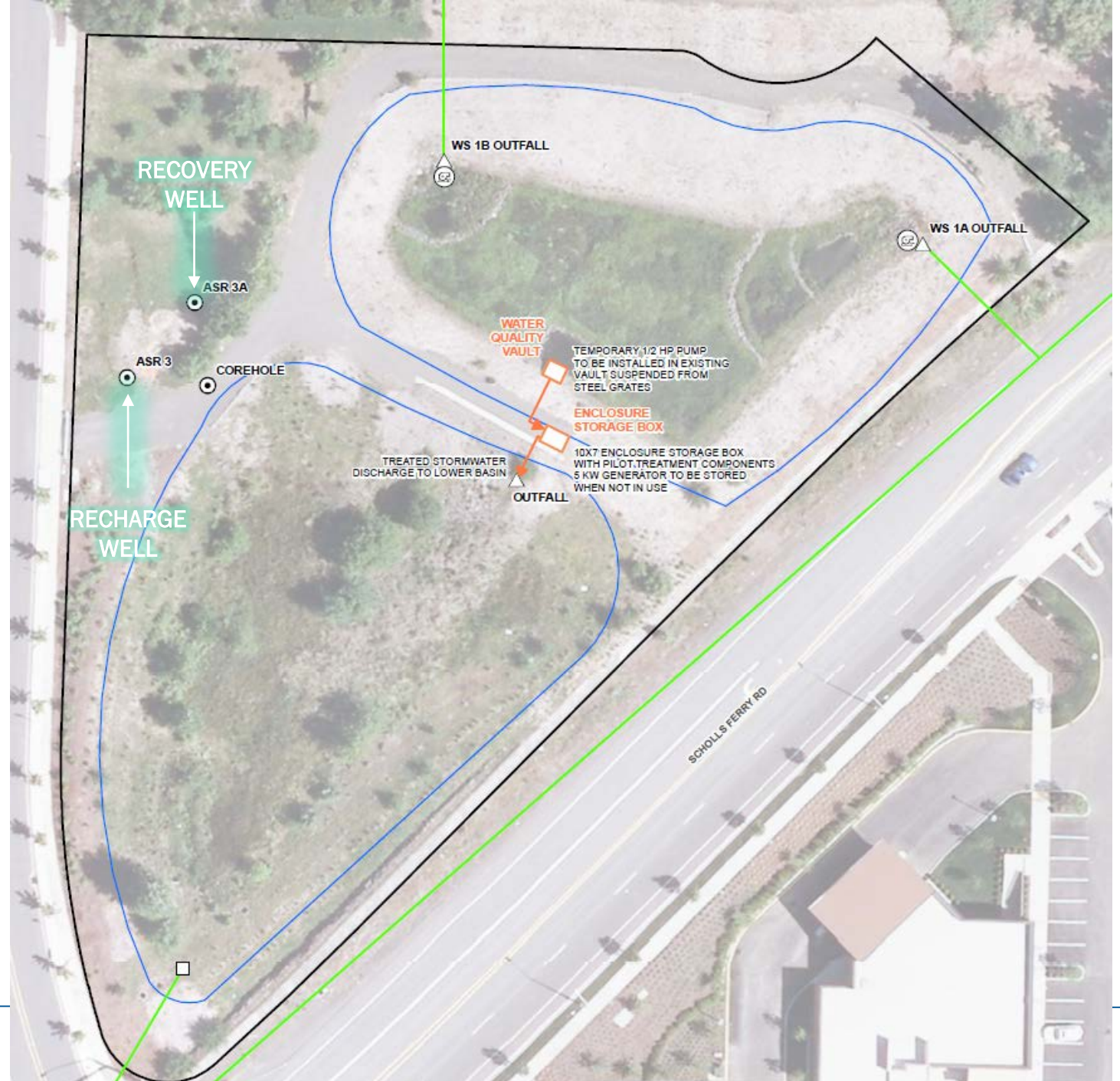


Cartridge Filtration and Ultraviolet Disinfection

- Effective Disinfection System with small footprint capable of handling flows up to 400 gpm.
- UV disinfection will not require regular addition and replacement of chemicals (e.g. chlorine, chloramines)



Stormwater Treatment Pilot Set-up





Stormwater Diversion and Pilot System





What's Next

- Pilot and Bench Testing
Data analysis and pre-design: Spring/Fall 2020
- Treatment Design: 2021-2022
- Full scale implementation: 2022-2023



Questions?

Acknowledgments



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