2025 UNDERGROUND INJECTION CONTROL (UIC) STORMWATER MANAGEMENT PLAN

City of Spokane Valley
Public Works Department
Stormwater Utility

May 2025


CITY OF
Spokane
Valley®

Contents

Document Purpose

There are 5 primary purposes of the City's UIC Stormwater Management Plan (SWMP):

1. Enable departure from full jurisdictional coverage under the Phase ll Municipal Stormwater permit.
2. UIC program regulations require the development of a UIC Stormwater Management Plan (SWMP).
3. Define "New" UIC treatment and design requirements.
4. Define "Existing" UIC assessment and retrofit plan.
5. Serve as direction to Stormwater Utility staff for the current approved budget year.

This plan will be reviewed and updated annually by City Stormwater Utility staff. It is expected that annual updates will reflect updated inventory counts, data tables, and improvements to the plan.

The current UIC SWMP and other related documents are available on the City's Stormwater website: http://www.spokanevalley.org/stormwater

Background

What is an Underground Injection Control Well?

An underground injection control (UIC) well is a structure built to discharge fluids into the ground by gravity force. To qualify as a UIC, Ecology has set the following parameters for UIC qualification:

- Deeper than the largest surface dimension
- To contain an assemblage of perforated pipe
- As an improved sinkhole
- As a chamber or vault designed to capture and infiltrate stormwater

Examples include sump pumps, drywells, drainfields, infiltration trenches that include perforated pipes and stormwater chambers.

The U.S. Environmental Protection Agency groups UICs into 5 classes, depending on the type of fluid received by the well. For stormwater, Class 5 UIC wells are the most common, and are classified as shallow wells that discharge fluids into or above a groundwater aquifer. Spokane Valley primarily uses precast Type 'A' or Type 'B' drywells for discharge of stormwater into the ground. These drywells resemble type 2 catch basins with seepage ports in the structure walls to allow receiving stormwater to discharge from the well into the surrounding gravel beds and native undisturbed soil. See Spokane Valley Street Standards (SVSS) S-101 to S-104 for details.

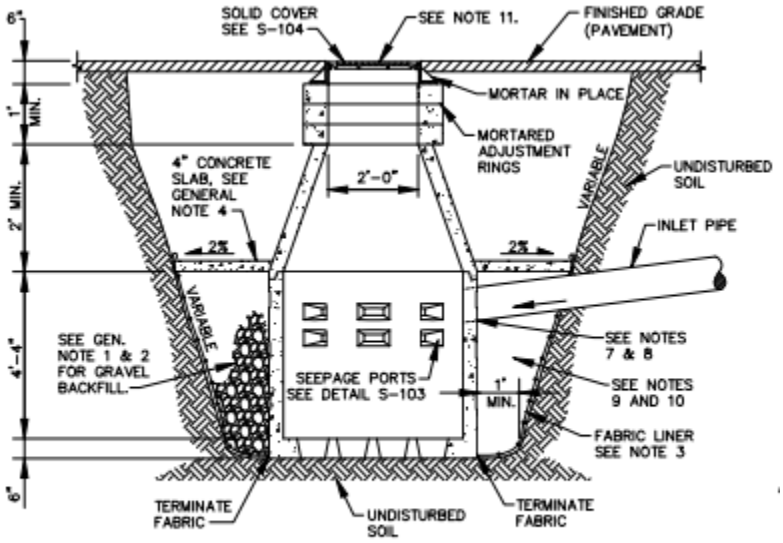


FIGURE 1 - DRYWELL STANDARD PLAN S-102 , SVSS

History of Drinking Water Protection, Safe Drinking Water Act

In 1974, Congress enacted the Safe Drinking Water Act (SDWA) to protect public health by regulating the nation's drinking water supply through the Environmental Protection Agency (EPA). Under the SDWA, the EPA designated the Spokane Valley-Rathdrum Prairie as one of the nation's first Sole Source Aquifers. The SDWA established the Underground Injection Control (UIC) Program to safeguard underground sources of drinking water. The EPA delegated UIC authority in 1986 to the Washington State Department of Ecology (Ecology).

In 1986, the UIC Program Rule, Chapter 173-218 WAC, was published and then revised in 2006. Ecology clarified the requirements for UIC wells that manage stormwater by publishing the *Guidance for UIC Wells that Manage Stormwater* (UIC Guidance) to explain the 2006 rule changes.

In 2019, Ecology updated the UIC guidance and incorporated the requirements into the updated 2019 *Stormwater Management Manual for Eastern Washington* (SWMMEW). The 2019 SWMMEW manual supersedes the 2006 UIC Guidance.

Regulation History and Plan Forward

Shortly after the City of Spokane Valley incorporated in 2003, the city was required to obtain coverage under the Phase ll Municipal Stormwater permit (MS4 permit) for compliance with state and federal stormwater regulations to improve and protect water quality.

The first permit term became effective February 16, 2007, and expired July 31, 2014. The second Permit term became effective August 1, 2014, and expired July 31, 2019. The third permit term became effective August 1, 2019, and expired July 31, 2024. The fourth permit became effective on August 1, 2024, and will expire July 31, 2029.

The MS4 permit is a combined National Pollutant Discharge Elimination System and State Waste Discharge General permit program. This permit is in compliance with the Federal Clean Water Act and the State Water Pollution Control.

The UIC program rule is the regulatory authority for UIC wells in Washington. The UIC program provides the option of applying the Stormwater Management Programs that comply with the MS4 Permit to meet the UIC program requirements. The MS4 Permit does not require jurisdictions to fulfill all the requirements of the UIC program.

Throughout the terms of the first, second, and the first year of the third permit, the City applied its MS4 Stormwater Management Plan/Program to the entire City to comply with both the MS4 permit (Clean Water Act) and UIC program (Safe Drinking Water Act) requirements.

Beginning in the second year of the third permit (2020) the city began preparations to apply separate Stormwater Management Plans to both MS4 and UIC areas. The city believes this action is the better approach to efficiently and effectively manage the approximately 7,600 public UICs in the jurisdiction.

At the time of this report the city has developed separate Stormwater Management Plans, Operation and Maintenance Plans, and has filed several MS4 annual reports that represents this separation.

Separate stormwater management plans are supported by the following:

- **Section S1.B.1 of the EW Phase ll Municipal Stormwater NPDES Permit:**

  "A regulated small MS4: Discharges stormwater from the MS4 to a surface Water of Washington State."

- **Section S2.A of the EW Phase ll Municipal Stormwater NPDES Permit**:

  "This permit authorizes the discharge of stormwater to surface waters and to groundwaters of the State from MS4s owned and operated by each Permittee covered under this Permit"

- **Section S2.A.1 of the EW Phase ll Municipal Stormwater NPDES Permit**:

  "Discharges to groundwater of the State through facilities regulated under the Underground Injection Control (UIC) program, Chapter 173-218 WAC, are not authorized under this permit."

- **Chapter 5.6.4 Stormwater Management Manual Eastern Washington (SWMMEW):**

  - MS4 permittees may have separate Stormwater Management Plans (SWMP) for the areas served respectively by their municipal UIC wells and by their MS4.
  - To comply with the UIC rule, new and existing UIC wells shall be managed by a SWMP per Chapter 5.6 of the SWMMEW.

- **Department of Ecology – Underground Injection Control (UIC) Stormwater Management Program Components_June 2021**

  "To use the presumptive approach to meet UIC Program rule authorization for municipal Class V UIC wells, jurisdictions have the option of applying a Stormwater Management Program (SWMP) that complies with their MS4 Permit to the areas served by their municipal UIC wells or use the other approaches or combination of approaches as listed below. Jurisdictions not covered by the MS4 Permits must also use one or a combination of the following approaches:

  1. Have a single jurisdiction-wide Stormwater Management Program (SWMP) that combines requirements for both the municipal UIC wells and the municipal separate storm sewer system (MS4); and or

  2. Have a separate and distinct SWMP developed specifically for the municipal UIC wells in the jurisdiction; and or

  3. Create a Stormwater Site Plan (SSP) for the area served by each municipal UIC well and complete a well assessment for each municipally owned existing (in use before 2/3/2006) UIC well."

- **WAC 173-218 – Underground Injection Control Program.**

For more information regarding City operations and compliance mechanisms related to the NPDES permit and the Clean Water Act, see the Stormwater Management Program Plan for MS4 Areas at the City's stormwater website: http://www.spokanevalley.org/stormwater.

UIC Regulatory Requirements

Through the SDWA, the EPA has delegated the UIC program to the Washington State Department of Ecology. To implement the program, Ecology has adopted WAC 173-218.

In order to operate an existing or new UIC well in Washington State, the UIC well must be registered with Ecology and either rule authorized or receive a state waste discharge permit. "Rule Authorized" means a UIC well that is registered with Ecology and meets the non-endangerment standard. "Non-endangerment standard" means to prevent the movement of fluid containing any contaminant into the ground water if the contaminant may cause a violation of the water quality standards for ground waters of the state of Washington.

Four regulatory paths have been identified to rule authorization. **See Figure 2.**

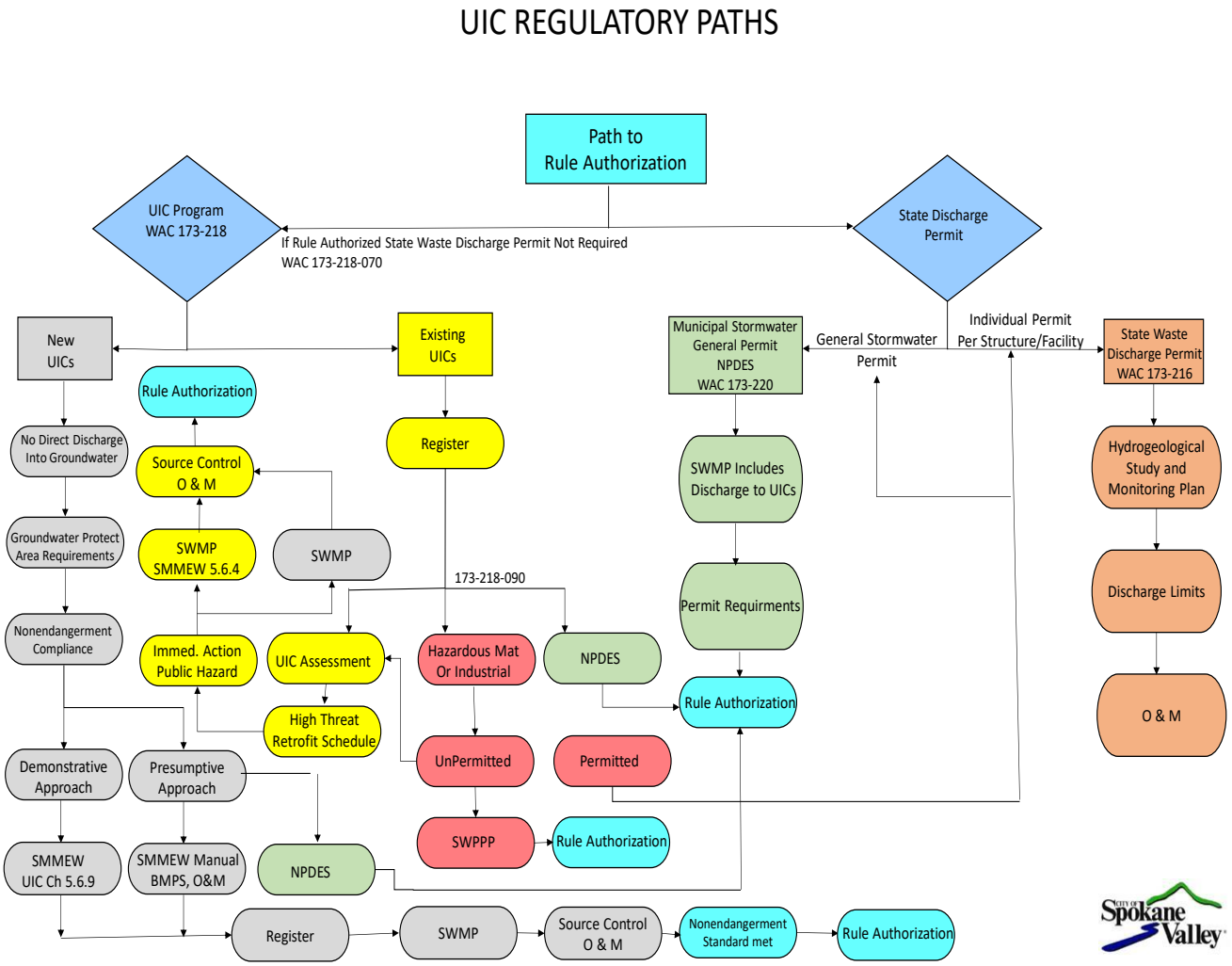


FIGURE 2 – UIC REGULATORY PATHS

The City of Spokane Valley has elected to regulate the areas of the City which do not outfall or overflow to surface waters of the State under the UIC Program WAC 173-218 for both public and private projects. **See Appendix A** for a delineation of the basins that are regulated under the UIC Program and those that are regulated under the MS4 Regulations.

Projects proposing UIC facilities must meet water quality standards (blue path) if they trigger Basic Requirement No. 3 – Water Quality per the Spokane Regional Stormwater Manual (SRSM), Chapter 2.1.1. Projects proposing UIC facilities that do not trigger Basic Requirement No. 3 follow the non-endangerment standard (green). UICs that are part of a retrofit project can follow the preferred non-endangerment standard, standard, or minimum water quality treatment method (yellow). **See Figure 3** for details.

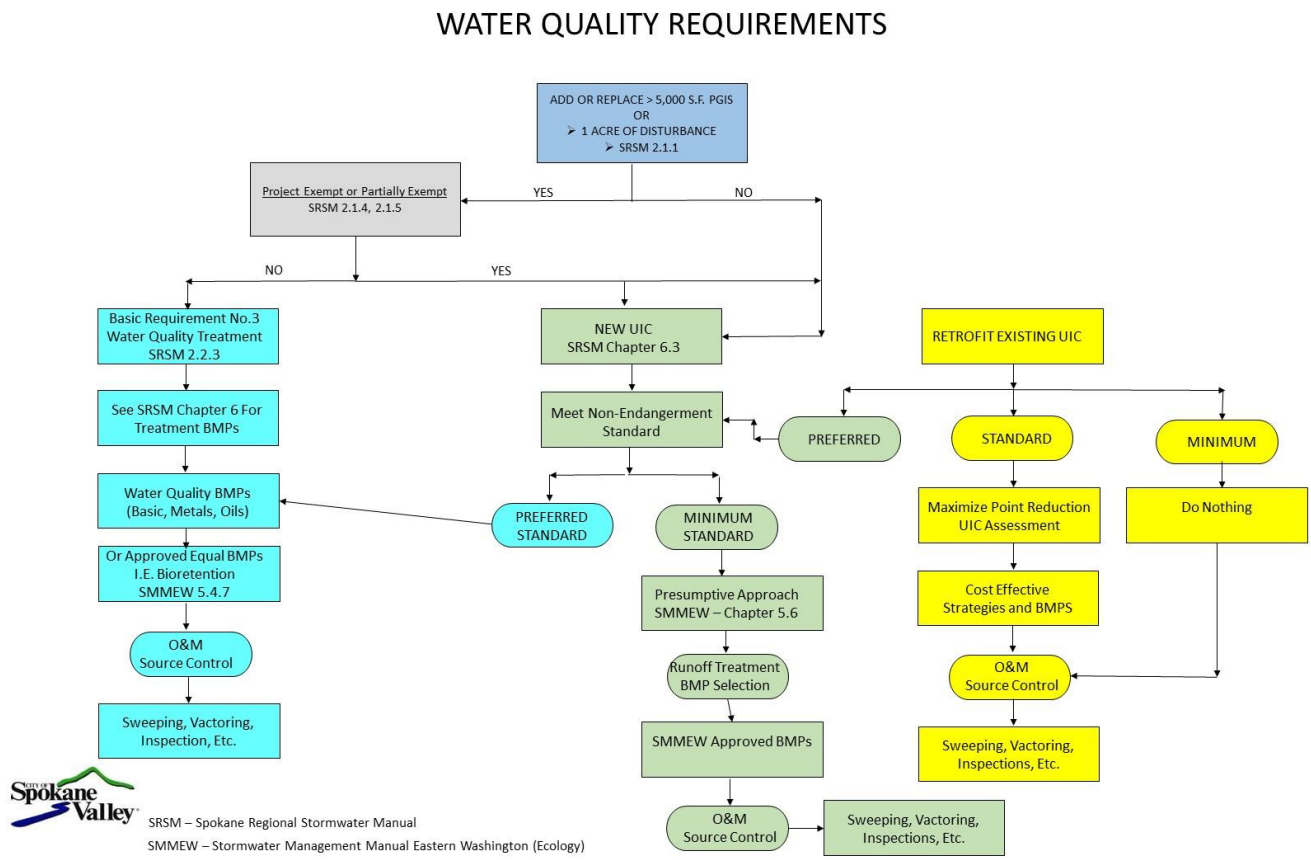


FIGURE 3- WATER QUALITY REQUIREMENTS FOR UICS

UIC Basin Analysis and Determination

Authorization and Evaluation

To comply and regulate under the UIC Program (WAC 173-218), the City points to authorization defined in the SWMMEW Chapter 5.6.4:

> *"The MS4 Permit does not authorize stormwater discharges to/from UIC wells unless the overflow discharges from a UIC well drains to a NPDES municipal separate storm sewer system (MS4)."*

A city-wide evaluation was carried out to determine UIC Program authorization. Ecology has declared that authorization under the UIC Program may be instituted if "all runoff is fully infiltrated", by UICs and/or to ground, for the 100-yr event (72-hr Type 1A or 3-hour short duration) event and does not overflow to the MS4.

The City has declared the following to meet this authorization:

- UICs in roadway subbasins are declared to be a series of structures and substructures with standard bypass. The ultimate roadway sag (curbed roadways) or natural sink area (non-curbed roadways) is declared to be the point of infiltration. **See Appendix B** for roadway sags and crests and natural sink locations in the City.
- The 100-yr Type 1A Regional event containment to declare UIC authorization. Per the SWMMEW, the 100-yr Type 1A regional event is the recommended long duration (72-hr) event for Eastern Washington.

Hydraulic Analysis

The purpose of the hydraulic analysis is to support the UIC Program authorization as described above.

To provide the hydraulic analysis and evaluate the storm hydrology, hydraulics and resulting flow paths, the FEMA-accepted 2-dimensional (2D) flood-routing model FLO-2D Pro was used. FLO-2D is described as a "volume conservation flood routing model" (FLO-2D Reference Manual).

First, the project area is divided up into a grid of equal-sized squares, also called cells. Then, in the time-step calculations, FLO-2D traverses the whole project area many times, moving and redistributing packets of flow volume into and out of adjacent and diagonally located cells in eight directions as the flood-wave progresses downslope. How much flow moves between cells is calculated using the continuity, momentum, and Manning equations in conjunction with the surface and subsurface characteristics of the cells (**Figure 4**). Basin conditions that can be modeled include topography, infiltration, surface roughness, hydraulic structures, and obstructions such as bridges and buildings. As the flow progresses downslope the model simulates flood wave attenuation, ponding, and backwater effects.

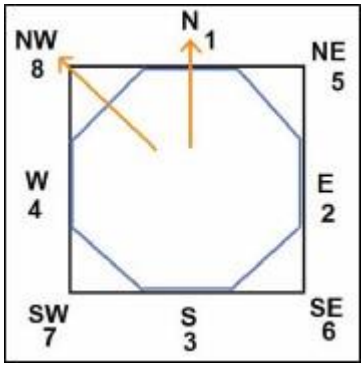


FIGURE 4 – FLOW ROUTE DIRECTIONS

The general steps for the modeling were:

1) First assemble the model components including:
    a. Drainage basin boundaries,
    b. Elevation points for surface topography,
    c. Hydrology,
    d. Stormwater losses, and
    e. Stormwater structures.
2) Then, using the above components, build and run the models.
3) Finally, display the run results and map the Municipal Stormwater Permit areas.

“New” UIC –Storm Water Management Plan (SWMP)

Overview

The purpose of the “New” UIC Stormwater Management Plan is to implement a plan that ensures appropriate strategy, siting, treatment, design, source control, and operation and maintenance to meet the non-endangerment standard for “New UIC” wells constructed. According to WAC 173-218, “New” UIC wells are those that were constructed on or after February 3, 2006.

Referenced throughout this plan is a preferred standard or a minimum standard for the level of treatment relative to the UIC. The preferred standard method is in reference to typical water quality standards and requirements as defined in the SRSM. The minimum standard method is in reference to the Ecology requirements for “New” UIC approval. See SWMMEW chapter 5.6 Subsurface Infiltration Underground Injection Control Well for complete detail and requirements.

Ecology is authorized in determining if a UIC well is rule authorized or requires a state waste discharge permit to meet the non-endangerment standard.

Under this plan, there are three design methods for a registrant of a new UIC well to show that the well meets the non-endangerment standard and therefore isn’t required to have an additional permit.

- **Method 1 – Preferred Standard Method** - Meet water quality (runoff treatment) treatment standards and requirements as detailed in the SRSM.
- **Method 2 - The Presumptive Approach –** The Department of Ecology will presume that the UIC well meets the non-endangerment standard, and the well will be rule authorized. This is the minimum standard method as detailed within the “New UIC” SWMP. This method is spoken to in additional detail in the SWMMEW.
- **Method 3 – The Demonstrative Approach –** This method is to allow alternative methods to demonstrate that the non-endangerment standard has been met and therefore the UIC well may be rule authorized. This method is not recommended by the City. If needed, see the SWMMEW chapter 5.6.9 for details.

See the following sections for City protocol to fulfill “New” UIC requirements:

- **Overview**
  - Implementation of New UICs
  - Standard of Treatment
  - New UIC Registration Requirements
  - Siting requirements
- **Treatment Requirements - Presumptive Approach**
  - Stormwater Pollutant Overview
  - Classification of Vadose Zone Treatment Capacity
  - Classification of Pollutant loading
  - Treatment Requirements
- **Design Requirements**

    - Water Quality (Preferred standard Method) Treatment BMP Design
    - Runoff Treatment (Minimum standard Method) BMP Design
    - BMP Selection – Preferred standard vs Minimum standard Method
    - Flow Control Design
- **Source Control**
    - Control Loading of Difficult Pollutants
    - Protect Pollutant Loading from Construction Activities
    - Operational Source Control BMP – Street Sweeping
    - Operational Source Control BMP – Storm Drain Cleaning
    - Material Reduction – Winter Maintenance Operations
    - Spill Response and Illicit Discharge and Connections on City Streets
    - Education, Training, and Collaboration
    - O&M Plan including SWPPP and SPP for City Properties
- **O&M**

See Appendix A for plan showing public UICs constructed after February 3, 2006.

Implementation of New UICs

New UICs may be implemented by the presumptive approach (Minimum standard Method) under the following conditions:

- Private or Public projects exempt from water quality treatment (Preferred standard) requirements per SRSM, section 2.1.
- Maintenance concerns regarding flooding.
- Maintenance concerns regarding erosion.

If the above conditions are met, implementation of New UICs will be evaluated for the following elements:

- To the extent possible, maintain elements of natural dispersion.
- To the extent possible, utilize existing UICs.
- Analyze for pollutant loading per existing UIC assessment protocol (see Existing UIC Stormwater Pollution Plan for more detail). New UICs that are assessed to be low to moderate pollutant loading will be approved**. This assessment protocol follows similar procedures as Siting Requirements for New UICs.** See Siting Requirements section below.
- Consider alternate BMPs (that provide increased runoff treatment) for flow control such as pervious gravel shoulder sections.

New UICs not meeting the above conditions for the Minimum standard Method will be required to follow the Preferred standard Method and meet water quality treatment standards as defined in the SRSM. The next section, **Standard of Treatment** will cover this in more detail. See also the SRSM Basic Requirement No.3 (Water Quality Treatment) and Section 2.1.

Standard of Treatment - Water Quality Treatment (Preferred standard) vs Presumptive Approach (Minimum standard)

All new public and private UIC wells within the City's jurisdiction are required to either meet water quality treatment standards or meet the presumptive approach requirements. The standard of treatment required is based on project type and if Basic Requirement No. 3 Water Quality Treatment, section 2.1 of the SRSM, is triggered. See **Figure 2** shown above.

Nearly all stormwater systems within Spokane Valley site discharge to a UIC well. Site discharge to New UICs can be classified into two categories (methods):

1. Preferred standard Method - The UIC well serves as site discharge, preceded by a water quality treatment facility.
    - Projects triggering Basic Requirement No.3 Water Quality Treatment, require these facilities.
    - See SRSM Chapter 6 (Water Quality Treatment Design).

    OR
2. Minimum standard Method - The UIC well serves as site discharge, preceded by runoff treatment BMPs to meet the presumptive approach and the non-endangerment standard.
    - Projects <u>not</u> triggering Basic Requirement No. 3 Water Quality Treatment, <u>may</u> consider these facilities.
    - Project constraints may dictate these types of facilities.
    - Runoff treatment BMP selection are prescribed by the presumptive approach as defined in the Department of Ecology SWMMEW chapter 5.6.8.

The City considers both categories to be in compliance with the UIC program WAC 173-218.

See also section "**Treatment Requirements – Presumptive Approach**" below for additional City protocol.

The SRSM chapter 6.3 allows consideration for the use of UICs:

> "*For discharge to UIC facilities, site BMPs must be chosen that will remove or reduce target pollutants to levels that comply with state groundwater quality standards when the discharge reaches the water table or first comes into contact with the aquifer. Ecology's SWMMEW provides additional information.*"

The primary element lies in the "remove or reduce target pollutants to levels that comply with state groundwater quality standards." To validate known treatment methods and the use of Ecology BMPs to meet the presumptive approach, Ecology BMPs are approved to meet the following treatment requirements:

- Control quantity and quality of stormwater runoff from new development and redevelopment projects. (Source – SWMMEW, section 1.1.2)
- Achieve compliance with state water quality standards both surface and ground waters. (Source – SWMMEW, section 1.1.2)
- Meet requirement of state law to provide All known, available and reasonable methods of prevention, control, and treatment (AKART). (Source – SWMMEW, section 1.1.2)

- Ecology BMPs capture and remove or reduce target pollutants to levels that:
  (Source – SWMMEW, section 5.4.2)
  - will not adversely affect public health or beneficial uses of surface and ground water resources.
  - will not cause a violation of ground water quality standards.

Generally, the regulated water quality standard or maximum contaminant levels to surface waters have higher restrictions (lower-level requirements) than those to drinking waters (ground). **See Table 1**.

Alalytes	Category	(3) Washington Drinking Water Standards (mg/l)(ppm)				(4) Surface Water Standards (mg/l)(ppm)		
		MCL (1)	Trigger Level (2)	Secondary		Aquatic Life (freshwater)		Human Health Criteria
Typical Stormwater Pollutant						Acute	Chronic	(Water and Organisms)
Phosphorus	Fertilizer	N/A	N/A	N/A		N/A	N/A	N/A
Soluble Phosphorus	Fertilizer	N/A	N/A	N/A		N/A	N/A	N/A
Nitrate+Nitrite	Fertilizer	10	5	N/A		N/A	N/A	N/A
Zinc	Heavy metals	N/A	5	5		0.12	0.12	2.3
Lead	Heavy metals	0.015	N/A	N/A		0.065	0.0025	N/A
Copper	Heavy metals	1.3	N/A	N/A		N/A	N/A	1.3
Sodium	Winter operations	N/A	N/A	N/A		N/A	N/A	N/A
Magnesium	Winter operations	N/A	N/A	N/A		N/A	N/A	N/A
Chloride	Winter operations	N/A	250	250		0.86	0.23	N/A
Other								
Mercury	Heavy metals	0.002	0.0004	N/A		0.0014	0.00077	N/A
Cadmium	Heavy metals	0.005	0.005	N/A		0.0018	N/A	N/A
Chromium	Heavy metals (naturally occurring)	0.1	0.02	N/A		0.015	0.01	N/A
Fluoride	Other	4	0.5	2		N/A	N/A	N/A
Arsenic	Heavy metals (naturally occurring)	0.01	0.005	N/A		0.36	0.19	0.01
Potassium	Fertilizer	N/A	N/A	N/A		N/A	N/A	N/A
Manganese	Other	N/A	0.05	0.05		N/A	N/A	N/A
Calcium	Other	N/A	N/A	N/A		N/A	N/A	N/A
PCBs	Pesticides/PCBs	0.0005	N/A	N/A		0.002	0.000014	0.00000017

(1) Maximum Contaminant Level
(2) Trigger Level
(3) Spokance County Wellhead Monitoring Program
(4) Water Quality Standards for Surface Waters - WAC 173-201A
DOH webpage contaminants

TABLE 1 – REGULATED WATER QUALITY STANDARDS IN WASHINGTON STATE

New UIC – Registration Requirements

All new public or private UIC wells proposed for construction within the City's jurisdiction are required to be registered with the Department of Ecology at least 60 days prior to beginning well construction. The registration provides Ecology with information to determine if the new UIC well meets the conditions to be rule authorized. The City has instituted the following processes for UIC registration.

New UIC registration process for **private projects**:

1. Provided notification letter of 60-day UIC requirement to known local consultants, engineers, and developers.
2. Project proponent is notified by City of registration requirements through the pre-application and pre-construction process.
3. At time of registration submittal, the well owner, technical contact, and authorizing representative shall be the developer, private engineer, or consultant associated with the development of the UIC.
4. Prior to approval of a private project's certification package, the City will require verification that UIC is approved, and rule authorized or that the 60-day review period has passed since registration submittal.
5. Development engineering will provide notification to Stormwater Utility that certification package is approved.
6. After certification package is approved, Stormwater Utility will amend UIC ownership to COSV for UICs receiving public water and/or associated with a border or drainage easement.

New UIC registration process for **public projects/consultant**:

1. Project manager is notified of new UIC registration requirement.
2. Consultant is notified by City of registration requirements through the project initiation process.
3. Registration should occur at approximately the 90% project review to allow enough lag time for the 60-day review period to pass before construction.
4. At time of registration submittal, the well owner, technical contact, and authorizing representative shall be the private engineer or consultant associated with the development of the UIC.
5. The consultant will contact the City when the UIC is approved and rule authorized, or the 60-day review period has passed since registration.
6. The consultant or Stormwater Utility will amend UIC ownership to COSV for UICs receiving public water and/or associated with a border or drainage easement.

New UIC registration process for **public projects/non-consultant**:

1. Project manager notification of new requirement.
2. At 90% project review, project manager provide notification to Stormwater Utility of UICs requiring registration.
3. Stormwater Utility submits registration application for rule authorization of UICs.
4. The well owner shall be COSV.
5. Technical contact and authorizing representative shall be the signatory of the plans and contract documents (project manager).

Siting Requirements

See SWMMEW Chapter 5.6. for complete detail on these restrictions.

For New UIC wells, the following siting restrictions apply to meet the non-endangerment standard per the SWMMEW under the presumptive approach:

- *SSC-1 – Setback Criteria
  - > 100’ from drinking water wells.
  - > 200’ from springs used for drinking water.
  - Building Foundations > 20’ downslope, > 100’ upslope
  - From top of slope > 15% > 50’
  - Restrictions per local ordinances related to drinking wells – **Not applicable to COSV**
  - * See Below
- SSC-2 – Ground Water Protection Areas
  - BMP selection and known treatment method validation - See **Table 1** above for surface vs drinking water standards.
  - COSV to observe Spokane County Drinking Water monitoring data for contaminant level evaluation– **See Appendix C**
  - Per SVMC 21.40.061 the entire City is identified as high susceptibility Critical Aquifer Recharge Areas (CARA) area. See section “Treatment Requirements” for more detail.
- *SSC-3 – High Vehicle Traffic Areas
  - See SRSM 6.4.1 and 6.4.2.
  - * See Below
- SSC-5 – Depth to Bedrock, Ground Water Table, or Impermeable Layer
  - COSV to evaluate USGS well log data. See presumptive approach section - Classification of Vadose Zone Treatment Capacity for more detail.
- SSC-7 – Seepage Analysis and Control
  - Predominant valley soils typically void this requirement.
  - SSC1 covers portions of this.
- *SSC-8 – Cold Climate and Impact of Roadway Deicing Chemicals
  - * See Below
- SSC-9 – Previously Contaminated Soils or Unstable Soils
  - COSV will evaluate based on Department of Ecology Toxic Cleanup Site reports.
  - See https://apps.ecology.wa.gov/neighborhood/

* SSC-1, -3, -8 will be reflected in the analysis for pollution risk assessment (**See Existing UIC Stormwater Pollution Plan**) and will be used in the determination to implement New UIC. See above section – “Implementation of New UIC”.

Treatment Requirements - Presumptive Approach

Stormwater Pollutant Overview

The best management practices chosen for the site must remove or reduce the target pollutants to levels that will comply with state ground water quality standards when the discharge reaches the water table or first meets an aquifer (see WAC 173-200). Each approved best management practice is designed to reduce or eliminate certain pollutants.

The Department of Ecology has determined that urban areas and roads contribute to stormwater contamination and the following potential pollutants:

- **Cadmium, chromium, lead, iron, and arsenic**
  Most of the suspended portion of the total concentrations of these metals in urban and road runoff may be removed by settling or filtration. This typically leaves dissolved fractions that are expected to meet state ground water quality standards. See Source Control section for more information on service contracts that help manage these pollutants.

- **Copper, zinc, and total suspended solids**
  Typical concentrations in urban and road runoff do not generally appear to be an issue of concern for meeting Washington State ground water quality standard. See Source Control section for more information on service contracts that help manage these pollutants.

- **Oil, grease and polynuclear aromatic hydrocarbons (PAHs), and fuel additives**
  Oil, grease, and PAHs are of potential concern, particularly in the event of a large spill reaching unprotected UIC wells. See Source Control section for more information on spill control.

- **Pesticides and nitrates**
  Pesticides and nitrates may be a concern in areas where they are intensively applied.

- **Chloride**
  Typical concentrations of chloride in urban and road runoff do not generally appear to be an issue of concern form meeting Washington State ground water quality standards. Frequent use of road salts and other de-icers and anti-icers may result in pollutant concentrations that exceed ground water quality standards. See Source Control Section for more information on winter maintenance operations.

- **Phosphorus**
  Phosphorus is primarily a concern in small lake watersheds.

See Table 2 for potential sources of these contaminants. **See Table 3** for facilities contributing to these sources.

Pollutant	Potential Sources
Lead	Motor oil, transmission bearings, gasoline
Zinc	Motor oil, galvanized roofing, tire wear, down spouts
Cadmium	Tire wear, metal plating, batteries
Copper	Brake linings, thrust bearings, bushings
Chromium	Metal plating, rocker arms, crank shafts, brake linings, yellow lane strip paint
Oil and Grease	Motor vehicles, illegal disposal of used oil
Sediments	Construction sites, poorly vegetated lands, slope failure, vehicle deposition
Nitrate-Nitrite	Fertilizer, animal waste, septic tank wastes, automobile exhaust, soil erosion

TABLE 2 – POTENTIAL SOURCES TO COMMON STORMWATER CONTAMINANTS*

*Department of Ecology – Guidance for UIC Well that Manage Stormwater

Facilities Contributing to Typical Sources of Pollutants in Stormwater	
Pollutant Sources	**Pollutants of Concern**
Roofs:	
Uncoated metal	Zn
Vents and emissions	O&G, TSS, organics
Parking Lot/Driveway:	
>High-use site	High O&G, TSS, Cu, Zn, PAHs
<High-use site	O&G, TSS
Streets/Highways:	
Arterials/highways	O&G, TSS, Cu, Zn, PAHs
Residential collectors	Low O&G, TSS, Cu, Zn
High-use site intersections	High O&G, TSS, Cu, Zn, PAHs
Other Sources:	
Industrial/commercial development	O&G, TSS, Cu, Zn
Residential development	TSS, pesticides/herbicides, nutrients
Uncovered fueling stations	High O&G
Industrial yards	High O&G, TSS, metals, PAHs

TABLE 3 – FACILITIES CONTRIBUTING TO TYPICAL SOURCES OF POLLUTANTS IN STORMWATER*

*Table 5.2.1 - 2019 Stormwater Management Manual for Eastern Washington
Application of effective source control measures is the preferred standard approach for pollutant reduction. Where source control measures are not used, or where they are ineffective, stormwater treatment is necessary.
Cu = copper
O&G = oil and grease
PAH = polycyclic aromatic hydrocarbons
TSS = total suspended solids
Zn = zinc
[a] Manufacturing and food production

Within the City there are approximately 17 wells that Spokane County monitors. The City continues to examine this monitoring data to help identify if pollutants in **Table 2** or **Table 3** are trending toward maximum contaminant levels (and corresponding trigger levels). To evaluate these trends, the City will continue to maintain 10 years of trending data. Due to the amount of data and the number of wells, the

graphed data per analyte (pollutant level) represents the highest recorded data point/year amongst all the wells.

At this time, the only pollutant trending near the trigger level is Nitrate + Nitrite. Well No. 15, the East Valley High School monitoring well has historically (over last 10-yr) been running levels near or over the trigger level. As a result, charting was added for Nitrate + Nitrite representing data for all wells/per year. **See Appendix C** for this information.

Treatment requirements are based on the types and quantities of pollutants expected from the proposed land use contributing storm runoff to the New UIC well. The presumptive approach determines these treatment requirements based on the following:

1) Classification of Pollutant Loading.
2) Classification of Vadose Zone Treatment Capacity.

See the following sections.

Classification of Pollutant Loading

The Department of Ecology has identified four pollutant loading classifications for solids, metals, and oil in stormwater runoff directed to UIC wells. These classifications capture typical land use criteria and correlate those to potential pollutant loading and subsequent treatment requirements. **See Table 4** to determine the pollutant loading classification.

Pollutant Loading For Solids, Metals, And Oil In Stormwater Runoff	
Classification	**Areas Contributing Runoff to the UIC Well**
Insignificant	• Impervious surface not subject to motor vehicle traffic
Low	• Parking Area < 40 trips /1,000 s.f. of building area • < 100 total trips • Inside UGA - Roads with ADT < 7,500 • Outside UGA - Roads with ADT < 15,000
Medium	• Parking Area 40 - 100 trips/ 1,000 s.f. of building area • Parking Area 100 to 300 total trip ends • Primary access point for high-density residential apartments • Intersections controlled by traffic signals, not defined as high-density • Transit center bus stops • Inside UGA - Roads with ADT 7,500 - 30,0000 • Outside UGA - Roads with ADT between 15,000 - 30,000
High	• High-use Sites - Roads with ADT > 30,000 • Other land uses with similar traffic use/characteristics

TABLE 4 – POLLUTANT LOADING FOR SOLIDS, METALS, AND OIL IN STORMWATER RUNOFF (TABLE 5.22 – 2019 SWMMEW)

Classification of Vadose Zone Treatment Capacity

The vadose zone, the zone from bottom of UIC well to top of aquifer surface, may provide adequate filtration, adsorption, and other pollutant reduction capacity to meet the non-endangerment standard for solids, metals, oils and PAHs. **Table 5** may be used to evaluate the use of the vadose zone for treatment and to determine pre-treatment requirements for these pollutants. See chapter 5.6.17 of the 2019 SWMMEW for additional information.

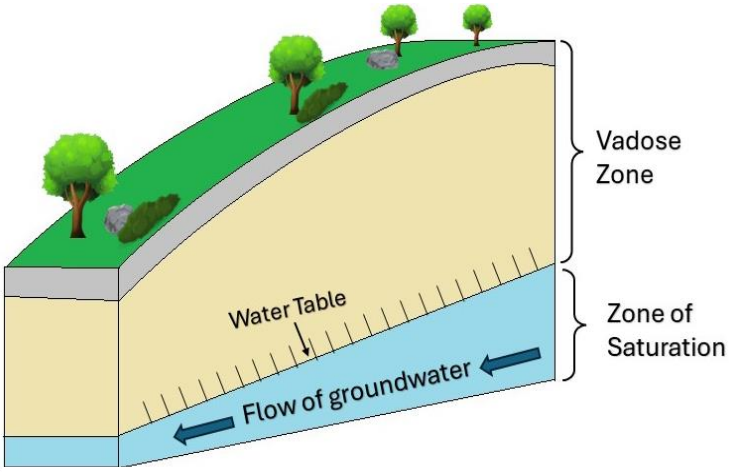


FIGURE 5: VADOSE ZONE AND ZONE OF SATURATION (AQUIFER)

Table 5 classifies the treatment capacity of the vadose zone as high, medium, low, and none. These classifications are based on minimum thickness and the geologic material that make up the treatment layer. If vadose zoned conditions are unknown, use "none" for treatment capacity.

Vadose Zone Treatment Capacity	
Treatment Capacity Classification	**Description of Vadose Zone Layer**
HIGH A minimum thickness of 5 feet	• Materials with median grain size < 0.125 mm • Having a silt/clay ratio of < 1:1; sand + gravel < 50% • Field tested saturated hydraulic conductivity < 2.4 in/hr • CEC>5; organic content > 1%; > 18 in. min. thickness • Outside UGA - Roads with ADT < 15,000 • Geotechnical description lean, fat or elastic clay sandy or silty clay Silt Clayey or sandy silt Sandy loam or loamy sand Silt/clay with interbedded sand Well-compacted, poorly sorted materials • This category generally includes till, hardpan, caliche, and loess
MEDIUM A minimum thickness of 10 feet	• Materials with median grain size < 0.125 to 4 mm • Having a silt/clay ratio of < 1:1 and 9:1; percent sand > percent gravel • Field tested saturated hydraulic conductivity between 2.4 -6 in/hr • CEC 2 - 5; organic content 0.5 to 1% • Geotechnical description Fine, medium, or coarse sand Sand with interbedded clay and/or silt Poorly compacted, poorly sorted materials • This category generally includes alluvium and outwash deposits
LOW A minimum thickness of 25 feet	• Materials with median grain size > 4 mm to 64mm • Having a silt/clay ratio > 9:1; percent sand < percent gravel • Field tested saturated hydraulic conductivity between 6 - 12 in/hr • CEC < 2; organic content < 0.5% • Geotechnical description Poorly sorted, or muddy gravel Sandy gravel, gravelly sand, or sand and gravel • This category generally includes some alluvium and outwash deposits
NONE A minimum not applicable	Meets any of the characteristics: • Vadose zone conditions are unknown; or • Sedimentary materials with median grain size > 64 mm • Total fines < 5% • Field tested saturated hydraulic conductivity between > 12 in/hr • Materials with no measurable CEC • Geotechnical description Well-sorted or clean gravel Boulders and/or cobbles Fractured rock • This category generally includes fractured basalt, bedrock, and limestone

TABLE 5 – VADOSE ZONE TREATMENT CAPACITY (TABLE 5.2.1 – 2019 SWMMEW)

Typical City of Spokane Valley process for determining the Treatment Capacity Classification:

1. Identify New UIC project location.
2. Identify available well log data. Go to Department of Ecology Well Construction Map at site: https://appswr.ecology.wa.gov/wellconstruction/map/WCLSWebMap/WellConstructionMapSearch.aspx
    a. Additional supporting data can be reviewed/found at USDA Web Soil Survey Site: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx
3. Develop Well Log Summary Map. Provide geotechnical description summary from well report. **See Figure 6** for an example.
4. Analyze the geotechnical description from well report and associate with geotechnical description in **Table 5**.
5. Assign appropriate treatment classification.

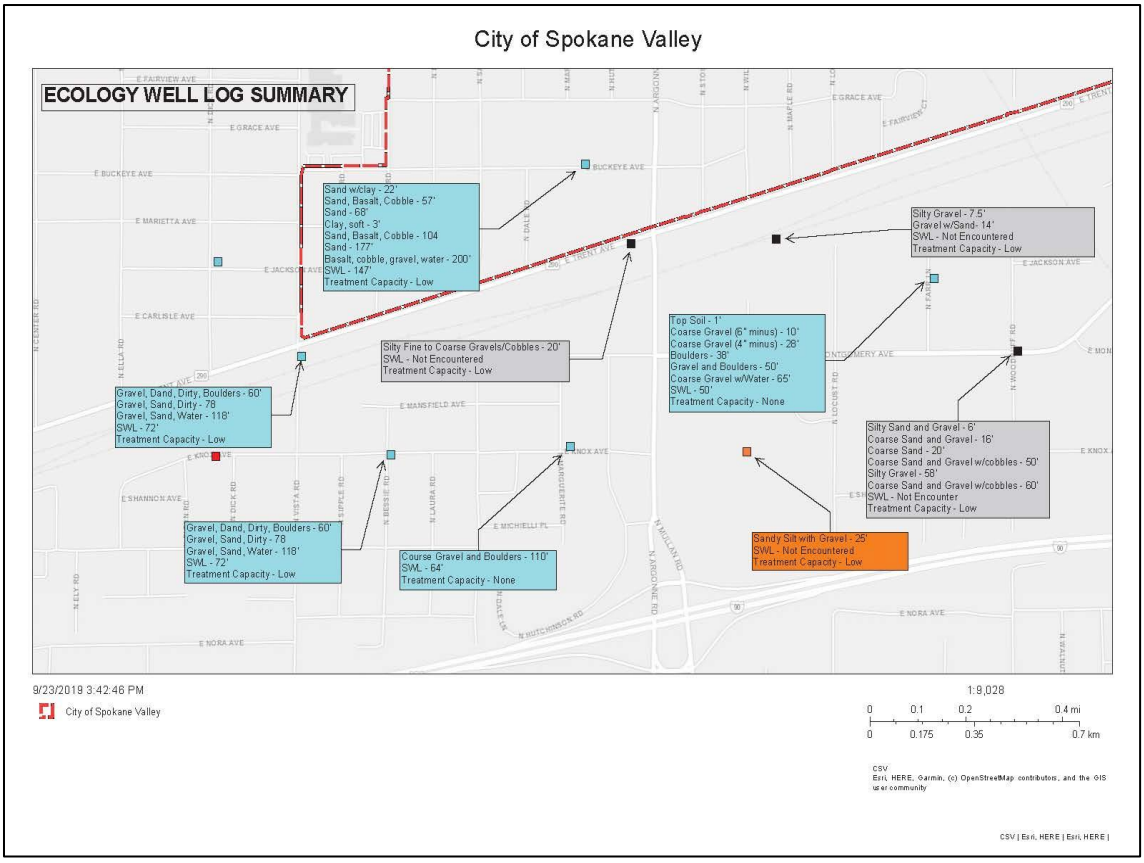


FIGURE 6- EXAMPLE WELL LOG SUMMARY MAP

Treatment Requirements

See Table 6 for treatment requirements based on pollutant loading and treatment capacity. Discharge to New UIC wells that rely on treatment through the vadose zone also requires treatment of the discharge to the UIC. To determine pretreatment requirements using the presumptive approach **use Tables 4 and 5** to determine treatment requirements as a function of pollutant loading classification and vadose zone treatment classification.

Treatment Requirements for Pollutant Loading				
Pollutant Loading	**Treatment Capacity**			
	High	**Medium**	**Low**	**None**
Insignificant	Two-stage drywell (a)	Two-stage drywell (a)	Two-stage drywell (a)	Two-stage drywell (a)
Low	Two-stage drywell (a)	Pretreatment (b)	Pretreatment (b)	Remove Solids (c)
Medium	Pretreatment (b)	Remove Solids (c)	Remove Solids (c)	Remove Solids (c)
High	Remove oil (d)	Remove oil (d)	Remove oil & solid (c,d)	Remove oil & solid (c,d)

a. - A two-stage drywell has a catch basin or other presettling device that traps small quantities of oils and solids.

b. - Pretreatment is 50% removal of solids.

c. - Treatment to remove solids means basic treatment.

d. - Treatment to remove oil is to be accomplished by applying one of the oil control BMPs.

See SWMMEW Table 5.23 for additional information

TABLE 6 – TREATMENT REQUIREMENTS BY POLLUTANT LOADING

At a minimum, basic treatment to remove solids prior to discharge to the UIC well is required for UIC wells located in groundwater protection areas:

- In a wellhead protection area where the drinking water well is categorized with a high-susceptibility rating by the Washington State Department of Health and/or
- Where a confining layer is not present between the base of the UIC well and the top of the aquifer used as a drinking water source, except when a UIC well receives an insignificant and or low pollutant load from stormwater. **See Table 5**.

SRSM chapter 6.2.2 indicates areas within a 1000’ radius of Group A and Group B wells are treated as high-susceptibility areas. Per the bullets above, these areas trigger minimum basic treatment requirements. Currently there are approximately 80 Type A and B wells in the City where this requirement is triggered. **See Appendix A** for **2025 UIC Assessment Plan** map showing locations of these well areas. Stormwater Utility staff can be contacted for more detail.

Design Requirements

New UICs require the implementation of the following design requirements:

- Water Quality (Preferred standard Method) Treatment BMP Design
- Runoff Treatment (Minimum standard Method) BMP Design
- BMP Selection – Preferred standard vs Minimum standard Method
- Flow Control BMP Design – If applicable. See SRSM Chapters 2 and 7 for details.

The City has identified two allowable methods to meet these requirements.

The preferred standard method (water quality) is to implement design procedures and BMPs as defined in the Spokane Regional Stormwater Manual. The implementation of these procedures and BMPs will most often meet the higher standard of water quality treatment.

The minimum standard method (presumptive approach) is to implement design procedures and BMPs as defined in the 2019 SWMMEW. **See Figure 7 below**.

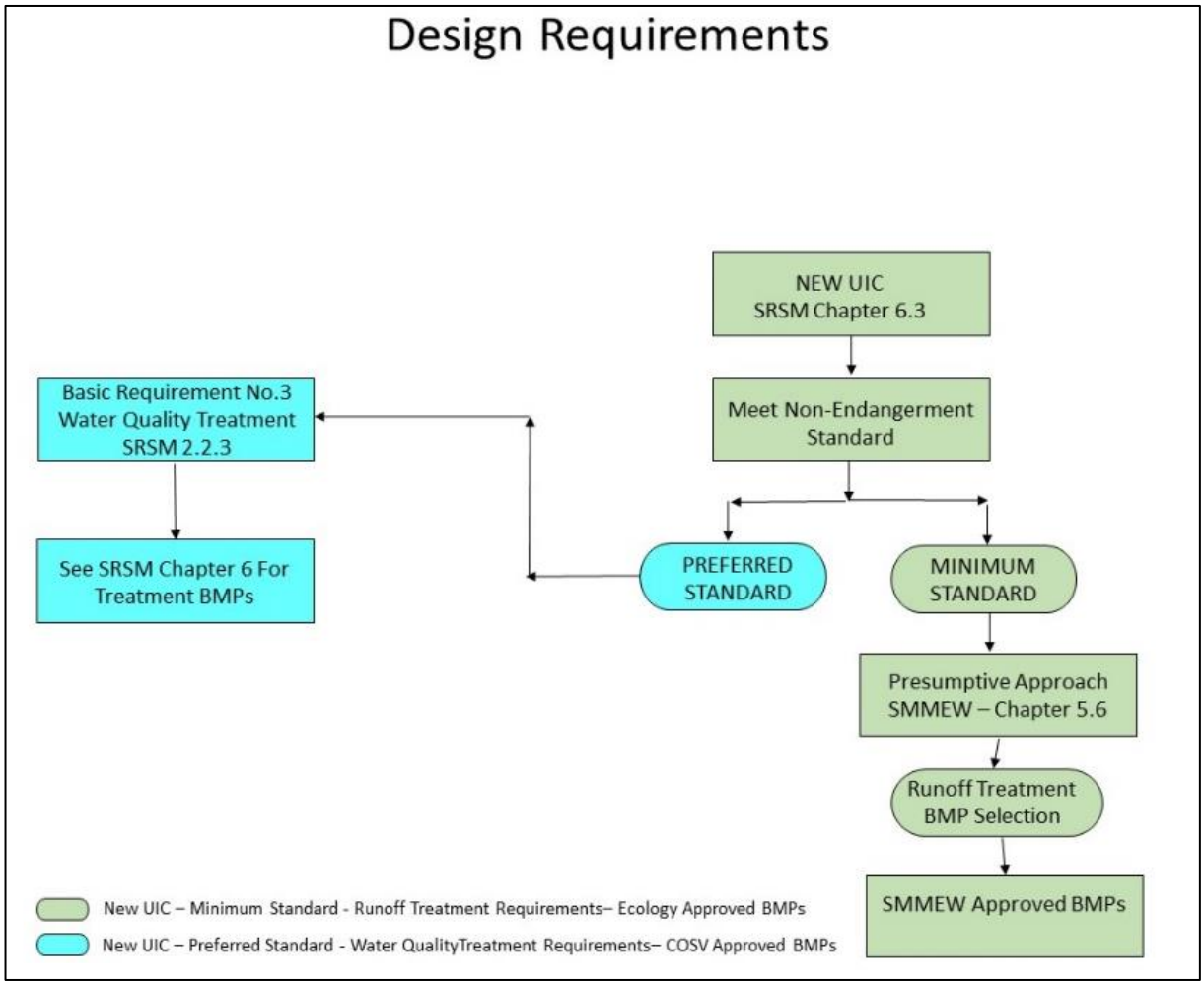


FIGURE 7 – DESIGN REQUIREMENTS FOR NEW UICS

Water Quality (Preferred Standard Method) Treatment BMP Design

- **Preferred Standard Method – Water Quality -** To meet New UIC treatment requirements by implementing the preferred standard method, water quality treatment BMPs are selected and designed according to SRSM chapter 6.

  As per the SRSM Chapter 6, the goal for Water Quality Treatment is to treat approximately 90% of annual runoff volume generated from a project site. UIC vadose zones are expected to provide additional levels of treatment but are not relied upon under the preferred standard method. In urban areas, SRSM Chapter 6.5 indicates bio-infiltration swales are the expected water quality treatment BMP for providing basic treatment. Bio-retention swales may also be used, conditioned by City approval. Bio-infiltration swales meet all requirements as shown below except those for phosphorus and high-use or ADT sites requiring baffle type oil control mechanisms.

  <u>See the following Minimum Treatment Requirements for water quality treatment:</u>

  - <u>Basic Treatment</u> – TSS – 80% removal
    - All projects triggering water quality requirements proposing UICs within City of Spokane Valley due to Aquifer Sensitive Area limits.
    - Per SRSM Chapter 6.5, in urban areas, bio-infiltration swales are the expected BMP for providing basic treatment.
  - <u>Moderate Treatment</u> – Metals - > 30% dissolved copper removal; > 60% dissolved zinc removal
    - All projects that are high-use or ADT sites.
    - Moderate use sites that discharge to a surface water or UIC (SVRP aquifer is hydraulically connected to a surface water of state) and meet any of the following:
      - Urban ADT > 7500
      - Rural ADT > 15,000
      - Commercial/Industrial sites equivalent trip end (ETE) > 40 vehicles per 1000 S.F. of building area.
      - Parking lots with > 100 ETE.
      - Public on-street parking in commercial/industrial zones
      - Industrial sites that handle metallic products
      - Runoff from metal roofs not coated with inert material
    - Some exemptions – See Section 6.6.3 of the SRSM.
  - <u>Enhanced Treatment</u> - Oils and Hydrocarbons – no visible sheen; < 10mg/L petroleum hydrocarbon concentration
    - High-Use Site – <u>Requiring baffle type oil control mechanisms</u>
      - Commercial/Industrial sites storing/transferring petroleum
      - Commercial/Industrial sites that use/store/maintain > 25 vehicles > 10 ton gross weight.
      - Fueling stations and facilities
      - Maintenance/repair facilities for vehicles, aircraft, construction, railroad, industrial equipment.
      - Railroad yards.

        - High-density intersections with ADT > 25,000 on main roadway and > 15,000 on any intersecting roadway.
    - High-Use Site – Requiring only adsorptive measures such as swales
        - Commercial/Industrial sites equivalent trip end (ETE) > 40 vehicles per 1000 S.F. of building area.
        - Parking lots with > 300 ETE.
        - Commercial on-street parking with ADT > 7500.
        - Outdoor storage yards or other sites that store/use hydraulic equipment.
    - High-ADT Sites - Requiring baffle type oil control mechanisms
        - Non-employee parking areas with trip ends > 100 vehicles per 1000 S.F. building area or > 300 total trip ends.
        - Road or parking area with ADT > 30,000.
    - Non-high-use sites and non-high-ADT sites are exempt from oil treatment requirements

- Enhance Treatment – Phosphorus – 50% removal
    - Primary emphasis area – within 1,000 ft of gaining reach of the Spokane River *(source – Spokane River Watershed Nonpoint Source Phosphorus Reduction Plan).*
    - Primary emphasis area – Saltese Creek and Liberty Creek subbasins *(source – Spokane River Watershed Nonpoint Source Phosphorus Reduction Plan).*

Bio-infiltration swales shall be designed to treat the volume equivalent to the 6-month NRCS Type II 24-hour water quality event. The sizing of bio-infiltration swales was developed by using the Alternate Hydrograph Method found in the SRSM and is calculated by the following equation:

$$V = 1133\ A$$

Where: V = volume of bio-infiltration swale (cubic feet);

A = hydraulically connected impervious area to be treated (acres);

The SRSM does allow for other water quality treatment BMPs, which include Biofiltration Channels, Vegetated Buffer Strips, Approved LID BMPs (bio-retention), and some Emerging Technologies. See SRSM Chapter 6 for additional information.

Runoff Treatment (Minimum Standard Method) BMP Design

- **Minimum Standard Method – Presumptive Approach –** The Minimum standard Method implements prescribed runoff treatment BMPs. Runoff treatment BMPs are prescribed by the presumptive approach as detailed in the above section (Treatment Requirements – Presumptive Approach) and as defined in the Department of SWMMEW chapter 5.6.8.

  Treatment requirements as prescribed by the presumptive approach include the following:

    - Pretreatment – TSS – 50% removal
    - Removal of Solids - Basic Treatment – TSS – 80% removal and removes large portion of metals.

- Remove Oil – Requiring baffle type oil control mechanisms.
  - High-density intersections and at commercial or industrial sites subject to an expected ADT of 100 vehicles/1,000 sf gross building areas.
- Remove Oil – Requiring only adsorptive measures such as bio-infiltration or bio-retention swales.
  - At other high-use sites, project proponents may select a basic treatment BMP that also provides adsorptive capacity, such as biofiltration or bio-infiltration swale, a filter, or other adsorptive technology, in lieu of an oil control mechanism BMP.
  - For roads in eastern Washington with ADT > 30,000, basic treatment with sorptive characteristics (swale or sand filter) is required, and suffices for oil treatment requirements.
  - The requirement to apply a basic treatment BMP with adsorptive characteristics also applies to commercial parking and to streets with ADT > 7,500.

Guidance for sizing runoff treatment BMPs can be found in Chapter 4 of the SWMMEW. Hydrologic analysis methods in this section do not include the above Alternate Hydrograph Method but does approve the following methods for implementation of Ecology approved BMPs:

- Single-event hydrograph methods
- SCS curve number equations
- Level-pool routing method
- Rational method

BMP Selection – Preferred Standard vs Minimum Standard Method

The following tables identify typical BMPs to be considered for selection to meet standards of treatment for both the Preferred standard and Minimum standard Methods.

- Pretreatment - TSS – Mechanical removal. **See Table 7**

Method for Mechanical Removal for Pretreatment		
Method	**Stormwater Manual**	**Typical BMPs**
Preferred standard	N/A	N/A
Minimum standard	SWMMEW	CDS Units, Source Control

TABLE 7 – METHOD FOR MECHANICAL REMOVAL FOR PRETREATMENT

- Basic Treatment - TSS – Controlled Infiltration within treatment zone – influenced by soil gradation and organic content. **See Table 8**

Method and Typical BMPs for Pretreatment

Method	Stormwater Manual	Typical BMPs	Short-Term Infil. Rate	# Long-Term Infil. Rate	* Depth
Preferred standard	SRSM	Bio-infiltration	Not Specified	0.25 – 0.50 in/hr	12”
Minimum standard	SWMMEW	Infiltration	< 9.0 in/hr	< 3.0 in/hr	18”

SRSM – Spokane Regional Stormwater Manual

SWMMEW – Stormwater Management Manual for Eastern Washington

- Long-term correction factor – Divide short – term rate by 2 if contributing PGIS < 5000 SF, < 10,000 SF of surface area, < 0.75 Acres of pervious surface.

- Long-term correction factor – Divide short-term rate by 4 if PGIS > 5,000 SF, > 10,000 SF of surface area, > 0.75 Acres of pervious surface.

* SWMMEW depth for bio-infiltration swales is 6 inches.

TABLE 8 – METHOD AND TYPICAL BMPS FOR PRETREATMENT

- Moderate Treatment – Metals – Primary enhancement is the cationic exchange capacity (CEC) level which is associated with organic content. **See Table 9**.

Method and Typical BMPs for Moderate Treatment			
Method	**Stormwater Manual**	**Typical BMPs**	**Average Cation Exchange Capacity**
Preferred standard	SRSM	Bio-Infiltration	> 15 milliequivalents/100 grams
Minimum standard	SWMMEW	Infiltration	> 5 milliequivalents/100 grams

TABLE 9 – METHOD AND TYPICAL BMPS FOR MODERATE TREATMENT

- Enhanced Treatment - Oil and Hydrocarbons - Oil separator mechanism, adsorptive capacity of roots/groundcover, organic content. **See Table 10.**

Method and Typical BMPs for Enhanced Treatment – Oil and Hydrocarbons				
Method	**Treatment BMPs**	**Sorptive Capacity**	**Organic Content**	**Structural**
Preferred standard	SRSM Bio-Infiltration	Sod, dryland grass, root mass	> 2 %	N/A
Minimum standard	SWMMEW Bio-Infiltration	Native/adapted grass, root mass	> 1 %	N/A
Minimum standard	SWMMEW Bio-Retention	Regional plantings 3’ o.c., roots	8 – 12%	N/A
Preferred standard Standard	SRSM/SWMMEW Oil Control Mechanism	Not Applicable	Not Applicable	Coalescing plate, Baffle, etc.

TABLE 10 – METHOD AND TYPICAL BMPS FOR ENHANCED TREATMENT – OIL AND HYDROCARBONS

- Enhanced Treatment – Phosphorus – 50% solid removal - sand filter; dissolved phosphorus removal - vegetative processes, sorption, ion exchange *(Source – University of Minnesota study).* **See Table 11.**

Method and Typical BMPs for Enhanced Treatment - Phosphorus				
Method	**Treatment BMPs**	**Sorptive Capacity**	**Organic Content**	**Soil Media Gradation**
Preferred standard	SRSM Bio-Infiltration	Sod, dryland grass, root mass	> 2 %	See Bio-infiltration Spec.
Minimum standard	SWMMEW Bio-Infiltration	Native/adapted grass, root mass	> 1 %	See Sand Media Spec
Minimum standard	SWMMEW Bio-Retention	Regional plantings 3' o.c., roots	8 – 12%	See Bio-retention spec
Minimum standard	SWMMEW Sand Filter	Not Applicable	Not Applicable	See Sand Media Spec.

TABLE 11 – METHOD AND TYPICAL BMPS FOR ENHANCED TREATMENT – PHOSPHORUS

See Table 12 for a summary of BMP selections to meet treatment requirements for the minimum standard method.

Minimum Standard Method – BMP Selection Summary				
Pollutant Loading	**Treatment Capacity**			
	High	**Medium**	**Low**	**None**
Insignificant	Two-stage drywell	Two-stage drywell	Two-stage drywell	Two-stage drywell
Low	Two-stage drywell	CDS/ Source Control	CDS/ Source Control	Infiltration
Medium	CDS/ Source Control	Infiltration	Infiltration	Infiltration
High	Mechanical or Adsorptive	Mechanical or Adsorptive	Infiltration and Mechanical or Adsorp.	Infiltration and Mechanical or Adsorp.

TABLE 12 - MINIMUM STANDARD METHOD – BMP SELECTION SUMMARY

See Tables 13-15 to identify the appropriate treatment soil specifications for select infiltration BMP treatment applications**.**

Infiltration Treatment BMP and Soil Specifications							
Treatment BMP	**ST Infil (In/hr)**	**LT Infil (In/hr)**	**CEC (mq/g)**	**Organics (%)**	**PH**	**Depth (in.)**	**Soil Spec.**
SRSM Bioinfiltration Swale	NA	0.25 - 0.50	> 15	2	NA	12	50/50 mix – see attached soil cut sheets
SWMMEW Bioinfiltration Swale	< 9	< 3	> 5	1	NA	6	See SWMMEW sand filter soil specification
SWMMEW Approved Bioretention Swale	< 6	1 - 3	NA	8 - 12	NA	18	See SWMMEW bioretention soil spec. – 60/40 mix
SWMMEW Non-Approved Bioretention Swale	< 12	1 - 3	> 5	4-8	5.5 - 7	18	2 – 5% passing No. 200 sieve. Ksat test required.
SWMMEW Infiltration trench	< 9	< 3	> 5	> 1	NA	18	No gradation requirements
SWMMEW Sand Filter	NA	1	NA	NA	NA	18	See SWMMEW sand media specification

SRSM – Spokane Regional Stormwater Manual

SWMMEW – Stormwater Management Manual for Eastern Washington

TABLE 13 – INFILTRATION TREATMENT BMP AND SOIL SPECIFICATIONS

Sand Media Specifications and Bioretention Approved Specifications			
Sand Media Specification		**Bioretention Approved Specification**	
U.S Sieve Number	**Percent Passing**	**U.S Sieve Number**	**Percent Passing**
4	95 to 100	3/8	100
8	70 to 100	4	95 - 100
16	40 to 90	10	75 - 90
30	25 to 75	40	25 - 40
50	2 to 25	100	4 - 10
100	< 4	200	2 - 5
200	< 2		

TABLE 14 – SAND MEDIA SPECIFICATIONS AND BIORETENTION APPROVED SPECIFICATIONS

Compost

1. Organic soil amendment, suitable for landscaping and storm water management, should be a stable, mature compost derived from organic waste materials that meet the intent of the organic soil amendment specification.
2. Compost quality can be determined by qualitative testing. Compost shall have the following characteristics:
    a. Earthy smell that is not sour, sweet, or ammonia like.
    b. Brown to black in color.
    c. Mixed particle sizes.
    d. Stable temperature and does not get hot when re-wetted.
    e. Crumbly texture.

Identify Local Materials Meeting Soil Specification for Appropriate Treatment Application

Infiltration Treatment BMP and Soil Type - Supplier	
Treatment BMP	**Soil Type - Supplier**
SRSM Bioinfiltration	Turf Builder plus – Witkopf; 30/70 sand/topsoil – Action Material
SWMMEW Bioretention	60/40 sand/compost C33sand/BarrTech BT Green compost – Action Material
SWMMEW Infiltration Trench	Sandy (89%) silty (6%) clay (5%)

TABLE 15 – INFILTRATION TREATMENT BMP AND SOIL TYPE – SUPPLIER

Flow Control Design

In context to this document, flow control design is regarding those stormwater systems that site discharge to a “New UIC” well and mitigate the following:

- Mitigate impact to down-gradient properties and facilities (includes roadway flooding).
- Mitigate overflow to MS4 areas and surface waters.

Mitigate impact to down-gradient properties and facilities

To determine if flow control design is applicable for "New UIC", see SRSM Chapter 2.

"New UICs" that serve to mitigate impact to down-gradient properties and facilities shall be designed in accordance with SRSM chapter 2.2.4 and chapter 7. These "New UICs" shall be designed to infiltration facility requirements. The SRSM provides that these facilities are designed based on the 10-year design storm frequency.

The SRSM recommends the use of the following design storm events:

- NRCS Type ll 24-hour – Storm for sizing water quality treatment facilities.
    - In most cases, recommend using this event for treatment facility associated UICs.
- NRCS Type lA 24-hour – Storm for sizing flow control facilities.

This document recommends the use of the following design storm events:

- Short-duration storm (3-hour) – Storm for sizing flow-through facilities.

As discussed in the above section "UIC Basin Analysis and Determination" the total capacity of all UICs, the available storage within roadway sags and natural sinks allows the UIC_MS4 exempt basin areas to meet containment requirements of the 100-yr event, while maintaining the current SRSM design standards (10-year design storm frequency) for "New UICs". **See Appendix B** for roadway sags and crests in the City.

Mitigate overflow to MS4 areas and surface waters

Overflow to MS4 areas and surface waters was evaluated in the hydrologic/hydraulic modeling of the City. See section above "UIC Basin Analysis and Determination" for additional details. Complete details regarding the city-wide hydrologic/hydraulic modeling are available.

Flood path mapping was generated from this study. This document recommends these maps be studied to determine strategy and coordination to further mitigate overflow to MS4 areas and surface waters. Recommended mitigation is the development of UIC galleries at intercept points of the flood path.

Existing UIC – Stormwater Management Plan (SWMP)

Overview

The purpose of the "Existing" UIC - Stormwater Management Plan is to implement a plan that accomplishes UIC well rule authorization through registration, well assessment (or other), retrofit strategy, source control, and operation and maintenance. According to WAC 173-218, "Existing" UIC wells are those that were constructed before February 3, 2006.

Existing UIC wells do not have to meet "New" well requirements including the non-endangerment standard. WAC 173-218-090 requires "New" UICs meet the non-endangerment standard as described in WAC 173-218-080.

Ecology has the authority to determine if a UIC well is either rule-authorized or requires a state waste discharge permit for operation. As shown in **Figure 2,** there are three methods for a registrant (public or private) of an existing UIC well to receive rule authorization.

- Method 1 – UIC well assessment
- Method 2 – Stormwater Pollution Prevention Plan (SWPPP)
- Method 3 – NPDES permit (Municipal or General)

If rule authorization is not granted, another method allows a registrant to operate a UIC well.

- Method 4 – State Waste Discharge Permit

See following section on UIC well assessment for more information on these methods.

See the following sections for City protocol to fulfill "Existing" UIC requirements:

- Registration
- UIC Assessment
- Retrofit Plan
- Source Control
- Operation and Maintenance

"New" and "Existing" UIC wells share the Source Control and Operation and Maintenance sections.

Registration

Per WAC 173-218-070, both public and private "Existing" UIC wells must be registered with the Department of Ecology to receive rule authorization. If a UIC well is rule authorized, then a state waste discharge permit is not required. Registration of "Existing" UIC wells was required within 3 to 5 years from the adoption of WAC 173-218 on 6/19/2008.

Existing UIC wells not registered during this time frame should be registered. Follow instructions at the following site to register Existing UIC wells:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Underground-injection-control-program/Register-UIC-wells-online

Typical questions asked include:

- Operator/owner information
- Site location
- Best management practices used to protect groundwater quality
- UIC well description
- Other information the department determines necessary to meet the non-endangerment standard – This typically applies to "New" UICs

Ecology will determine if the UIC well is rule authorized based on the information provided in the registration packet. The department has 60 days to make this determination. If there is no notice after 60 days, the UIC well will be registered.

Existing UICs may not receive rule authorization until an Existing UIC assessment is complete**. See the following UIC Assessment section** for detail.

Existing UIC Assessment Plan

Overview

The City of Spokane Valley discharges roadway stormwater to over 7,600 Class V Underground Injection Control structures (UICs), also known as drywells, french drains, seepage beds, and pipe sumps. The Washington Administrative Code (WAC) 173-218-090 requires the City to perform a UIC assessment. The well assessment will be met if the owner or operator applies stormwater best management practices (BMPs) contained in an approved guidance document, which the City documents in its Operation and Maintenance Plan for UICs. Any well assessment that identifies a well as a high threat to groundwater must include a retrofit schedule. The original assessment was performed by Stormwater Utility staff in 2013 to satisfy the requirements of WAC 173-218. The City's Stormwater Utility staff performed the assessment and evaluation per state code utilizing cost effective mapping database tools. This document summarizes the City's assessment process and the retrofit plan for Class V UICs.

PICTURED: NEW DRYWELL AND TYPE II CATCH BASIN

Approach

The UIC owner determines the approach to the assessment according to WAC 173-218-090(2). The regulations also state that UIC owners must create a retrofit schedule for UICs that are determined to be a "high threat to groundwater". While there are many ways to perform the assessment, City Stormwater staff followed published Department of Ecology guidance, known information in the community about the Spokane Valley-Rathdrum Prairie aquifer, and work completed to date. Stormwater Utility staff also used Geographic Information System (GIS) mapping data in creating a model to evaluate the over 7,600 UICs, and graphically represent their assessment scores.

Assessment Criteria

Assessment criteria from regulators, City collected data, and previous research conducted on the aquifer was considered and was distributed into three categories:

1. Pollutant Generating Factors
2. Sensitivity Factors
3. Pretreatment Reduction Factors

Factors 1 and 2 were generated from both the SRSM and the SWMMEW. These factors are associated with guidance provided regarding pollutant distribution and pollutant loading of UICs. See UIC Assessment and Retrofit Plan for more detail. The following factors contribute to the UIC assessment score total:

Pollutant Generating Factors	Sensitivity Factors
• Zoning	Proximity to Drinking Well – 300 ft.
• Average Daily Traffic (ADT)	Proximity to Surface Waters – 1000 ft.
• Proximity to Intersection	Proximity to Ecology Permitted Facility
• Proximity to High Access Facility (Apartments)	

The pretreatment reduction factor (factor No. 3) recognizes the expected level of pollutant removal provided by best management practice facilities. These recognized levels are generated from Ecology and other research documentation available. The following facilities and the associated factors reduce the UIC assessment score total:

Pretreatment Reduction Factors

- Catch Basin Type 1 – 10%
- Spill Control Separator (SPC) – 10%
- Should Conveyance (runoff Coefficient) – 10%
- Catch Basin Type 2 – 25%
- CDS Unit – 50%
- Natural Dispersion - gravel – 50%
- Nonstandard Infiltration – 75%
- Natural Dispersion – grassed – 80%
- Flow Through – Filtera, Cartridge, etc. – 80%
- Infiltration – bioinfiltration, bioretention – 100%

Criteria Considered, Not Utilized

Other criteria evaluated but not included in the assessment scoring include questions about soils, depth to groundwater, and UIC structural or hydraulic deficiencies. With further review, these criteria turned out to pose a relatively similar threat or no threat to groundwater throughout the City and therefore were not used in final scoring. The following describes the evaluation of these relatively similar or neutral factors.

Soils

Consistent soil treatment capacities throughout the Valley area mean that the soils criteria would not be a determining factor in which UICs are of higher risk to groundwater. Data indicates that the City is located over a consistent mix of sand, silt, and gravel that scientists claim was deposited during outwashes from a series of floods during previous Glacial and Ice Ages. City staff sampled soils below new or retrofitted UICs at various locations around the City. Analysis of the soils and comparisons indicated soils with low to medium treatment capacities.

Depth to Groundwater

Soils analysis indicates at least a low treatment capacity and there is at least 25 feet of vadose zone between the bottom of City UICs and the highest levels of the aquifer. Depth to groundwater is relatively similar throughout the City and would not be any more or less a factor for risk to the aquifer.

The City of Spokane Valley lies entirely over the Spokane Valley-Rathdrum Prairie aquifer, a sole source aquifer designated by the U.S. Environmental Protection Agency. Surveys and groundwater monitoring by Spokane County and the U.S. Geological Survey indicate a minimum seasonal groundwater depth of about 40 feet citywide. Standard UICs are 14 feet deep or less, ensuring at least 25 feet of vadose zone between UIC bottoms and the aquifer's seasonal high, meeting minimum standards for low treatment capacity soils. Consequently, groundwater depth was not further considered in this assessment.

UIC Structural or Hydraulic Deficiencies

The City maintains a detailed inventory map of its drainage structures, but current data does fully reveal potential deficiencies in UIC structures or their hydraulic capacity limits. Street flooding reports from the community and staff highlight structural or hydraulic issues, but do not address unidentified problems remaining in the inventory.

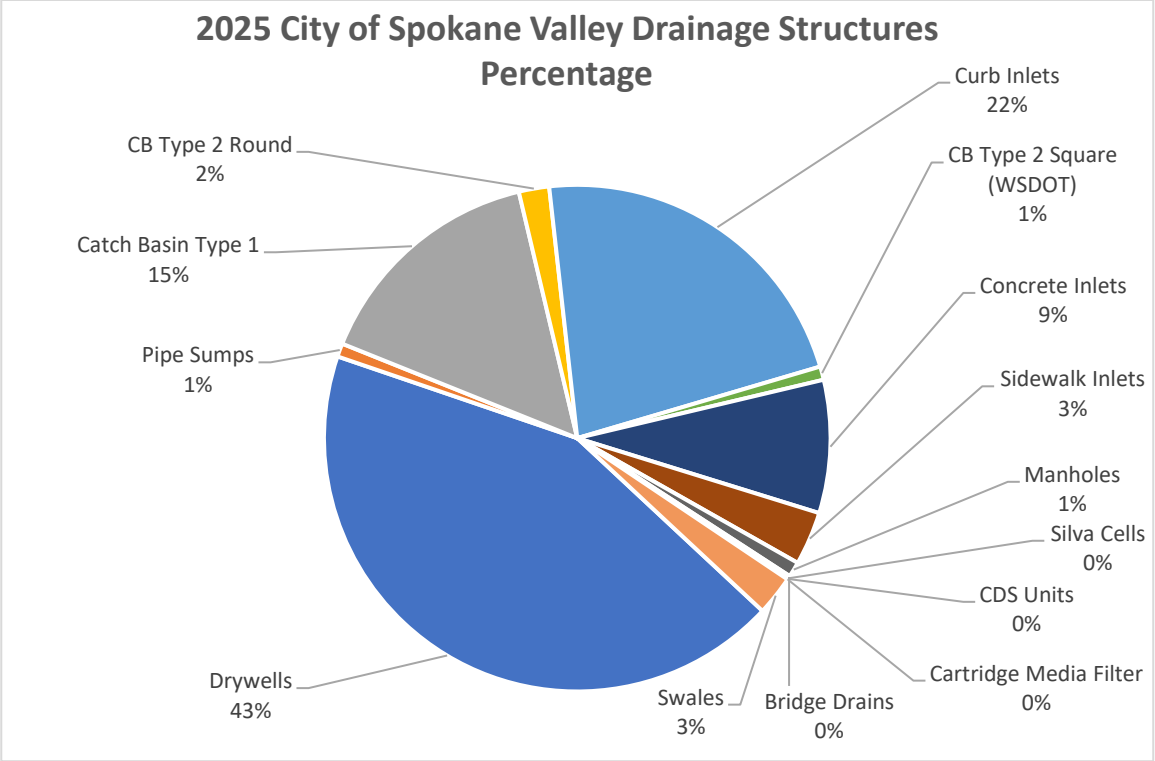
While full condition inspection would generally be helpful in making decisions for prioritizing which UICs to retrofit, it is not necessary in the initial assessment for water quality and threat to groundwater since structural or hydraulic deficiencies in UICs typically do not affect that.

Inventory

A GIS database of stormwater UICs was started by Spokane County in the early 1990's and mapping has continued through city incorporation to today . City staff substantially completed the inventory of stormwater UICs in 2008, 2 years ahead of the Ecology deadline using a combination of GPS and GIS technologies. Inventory is updated annually as Utility staff review new public and private construction projects or discover existing Inventory that was not previously mapped. Collected stormwater UIC structure data includes location, size, type, and any structural Best Management Practices (BMPs) that are helping to protect the UIC (e.g. catch basins or bio-infiltration swales).

2025 City of Spokane Valley Drainage Structures (Owned or operated)	
Structure	Number
UICs -Active Drywells	7,600
UICs-Active Pipe Sumps	150
Catch Basin Type 1	2,650
CB Type 2 Round	340
CB Type 2 Square (WSDOT)	150
Sidewalk Inlets	600
Curb Inlets	3,900
Manholes	170
Concrete Inlets	1,490
Bridge Drains	26
Silva Cells	7
CDS Units	8
Cartridge Media Filter	3
Swales	445
Total:	**22,110**

TABLE 16 – CITY OF SPOKANE VALLEY DRAINAGE STRUCTURE COUNTS



GRAPH 1 - CITY OF SPOKANE VALLEY DRAINAGE STRUCTURES BY PERCENTAGE

UIC Risk Scoring

A scoring schedule for the UIC Assessment used the criteria previously outlined and will be updated annually. The intent of the schedule is to show that those UICs with a higher overall score pose a higher relative potential threat to groundwater. Therefore, each UIC received a relative groundwater risk score based on potential threats from pollution generating areas. The scoring was assigned as follows:

- Land Use Zoning:
  - Add 5 pts for Industrial, Regional Commercial, or
  - Add 2 pts for Neighborhood Commercial, Corridor Mixed Use, or High-Density Residential, or
  - Add 1 pt for Low-Density Residential, or
  - Add 0 pts for Parks

- Apartment Complexes: if within 200 feet of an apartment main accesses, add 1 pt

- Average Daily Traffic Counts (ADT):
  - Add 3 pts for >30,000 vpd, or
  - Add 1 pt for > 7,500 vpd, or
  - Add 0 pts < 7,500 vpd

- Signalized Intersections:
  - Add 2 pts for High-Density Intersections (over 25,000 ADT one direction and over 15,000 ADT in the other direction)
  - Add 1 pt for all other signalized intersections or non-signalized intersections along arterial roadways.

- Class A/B Drinking Wells: if within 1,000 feet of a Drinking Well, add 1 pt. If within 300 feet of a drinking well, add an additional 1 pt.

- Within 100-feet of an Ecology Regulated Facility, and/or within the City of Spokane's CSO 34 zone, add 1 pt.

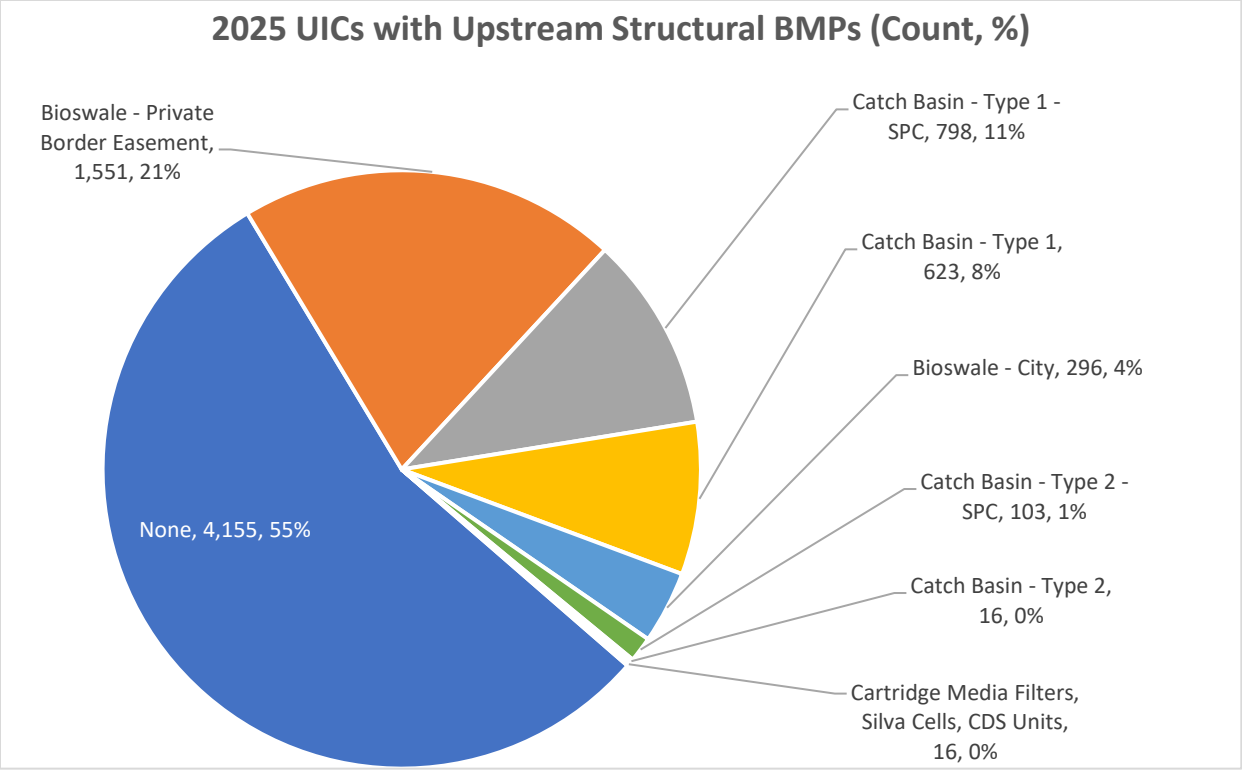
- Surface Waterbodies: within 1,000 feet, add 1 pt.

The accumulated score from the above criteria is reduced by the pretreatment factors indicated above.

- UICs were mapped according to potential pollutant loading and prioritized for retrofit consideration as follows:
  - 7 pts or higher – 1st Priority consideration for retrofit.
  - 4-6 pts – 2nd Priority consideration for retrofit.
  - 1-3 pts – 3rd Priority consideration for retrofit.
  - 0 pts – Condition meets current water quality treatment stormwater standards.

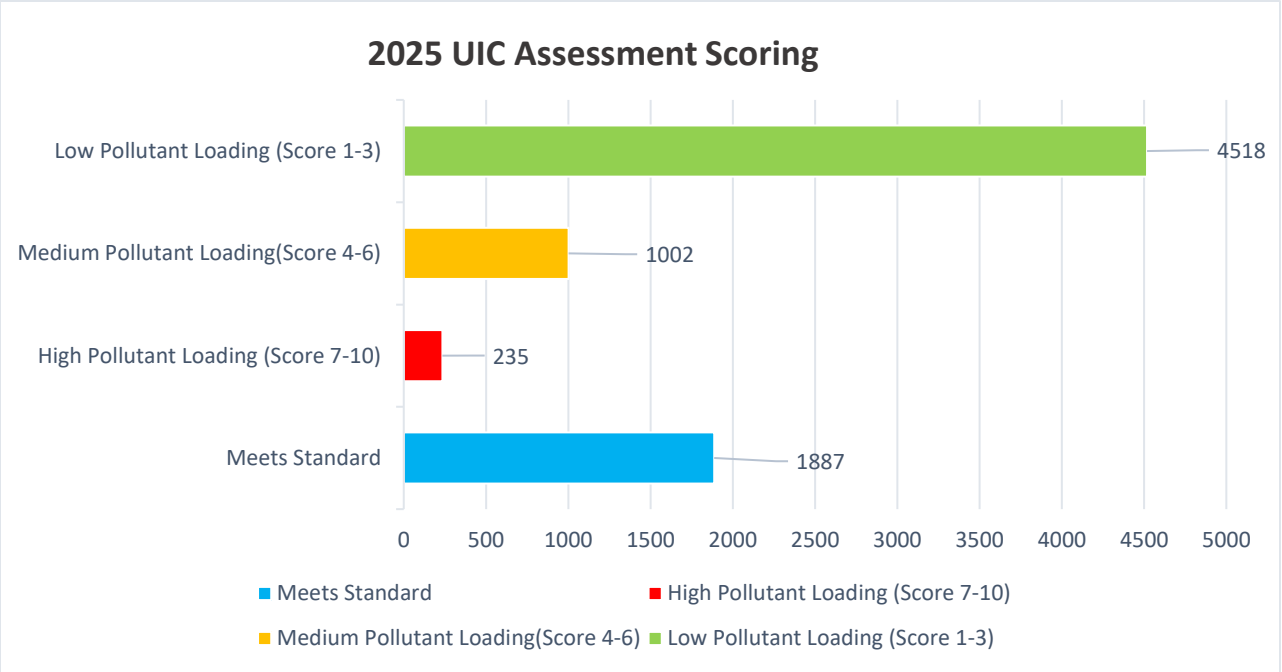
Evaluation

Of the approximately 7,600 UICs the City owns or maintains, 1,887 receive the highest level of treatment through bio-infiltration swales. However, another 4,155 UICs have no structural BMPs protecting the UIC. **See Graph 2** indicating the percentage of all UICs with and without structural BMPs upstream and the type of treatment provided. **See Graph 3** for the scoring results of all UICs.



GRAPH 2 – 2025 UICS WITH UPSTREAM STRUCTURAL BMPS

Results:



GRAPH 3 – 2025 UIC ASSESSMENT SCORING (QUANTITY OF STRUCTURES BY TIER)

See Appendix A for 2025 UIC Retrofit Plan map based on priority ranking**.**

GIS Model

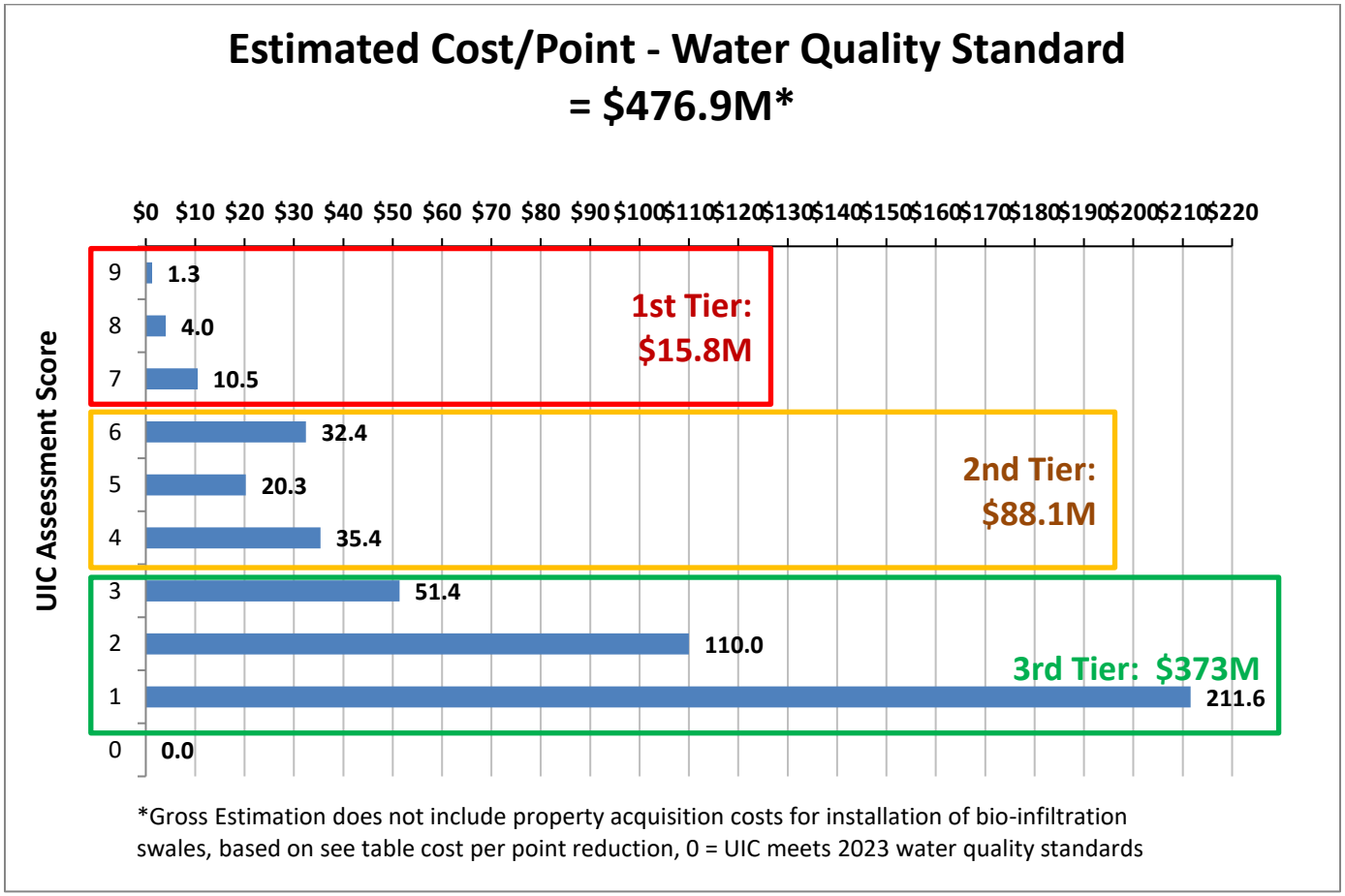
The model was developed utilizing:

- Existing GIS data: Zoning, ADT's, Public Drinking Wells, Drywell Pretreatment, Apartment High Access, Intersections, and Ecology Regulated Sites.
- Over 6,000 UICs that are not an overflow from a bio-infiltration area or swale;
- The model building process assigning each UIC with a set of values for current zoning, ADT, and BMP Treatment.
- The built model helps "re-assess" whenever changes occur to zoning, ADT, etc.

UIC Retrofit Plan

Overview

Currently, it is infeasible to provide structural retrofits to bring all UICs up to current water quality standards in the City of Spokane Valley. Planning cost estimates are in the $475 million dollar range to retrofit all structures to water quality standards. **See Graph 4**. This estimate does not include the additional costs to acquire property which could cost as much as the structural improvements. Current capital expenditure for UIC retrofit is approximately $2 million dollars annually. These expenditures are budgeted from the stormwater utility and aquifer protection fees. State grants are also available and can typically assist with a greater amount of the funding, up to 75 cents for every dollar spent on the project. However, the availability of grant funds is not reliable and very competitive amongst other local governments. At the current budget levels, it could take approximately 250 years to complete a full structural retrofit program (to water quality standards) city-wide.



GRAPH 4 – ESTIMATED COST TO RETROFIT CITY UICS BY UIC ASSESSMENT SCORE FOR HIGH, MEDIUM, AND LOW POLLUTANT LOADING CLASSIFICATIONS

Existing UIC Retrofit Strategy

To reduce pollutant loading within reasonable budget limits, this plan recommends the strategy **shown in Figure 8.**

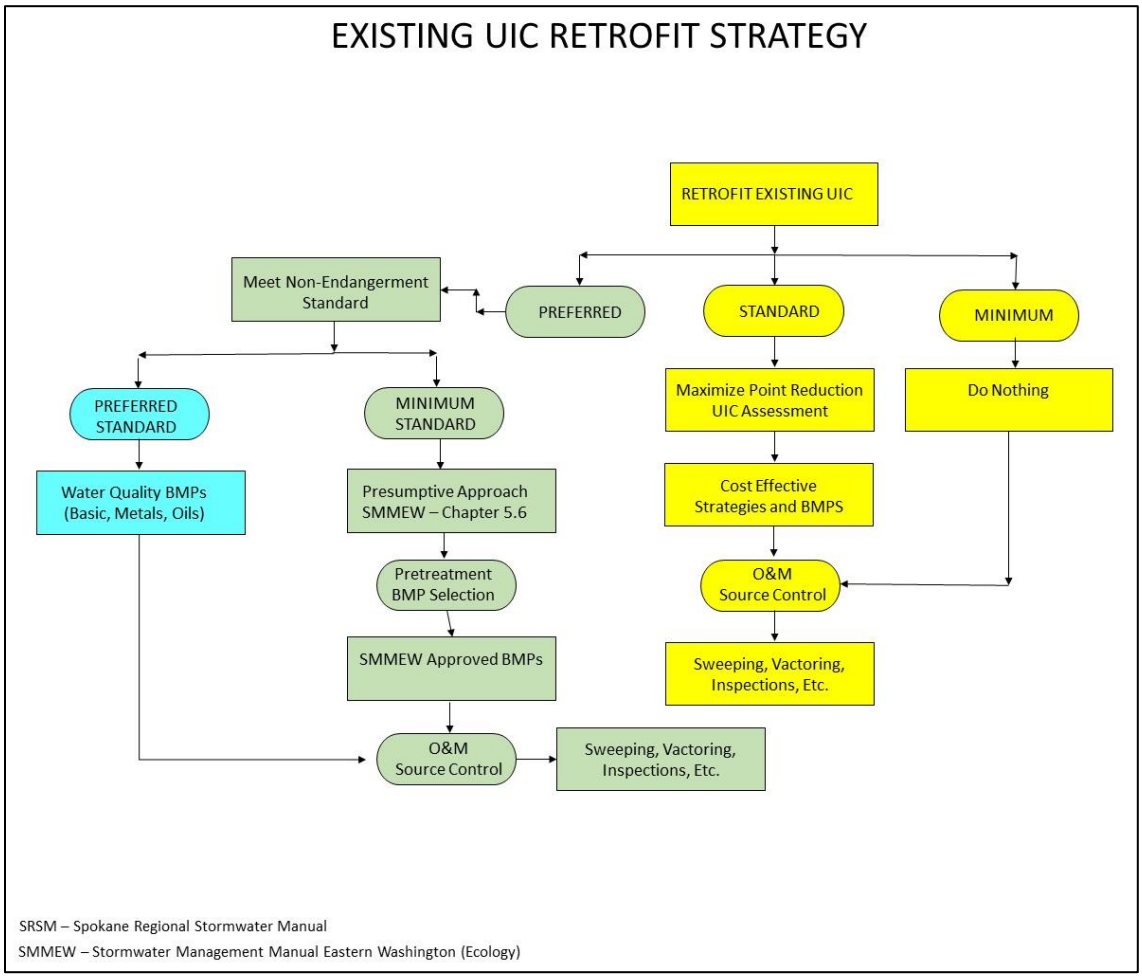


FIGURE 8 – EXISTING UIC RETROFIT STRATEGY

The recommended retrofit level targets existing UICs assessed as high pollutant loading. **Graph 3** shows approximately 235 UICs are classified as high pollutant loading. The City's strategy is to retrofit these UICs to meet the UIC non-endangerment standard. The non-endangerment standard shall be met by implementing water quality standard BMP's (Preferred standard) or implementing BMPs (Minimum standard) through the presumptive approach. For high-scoring UICs, both standards typically require similar BMPs. Retrofits will be executed through Stormwater Utility or Capital Improvement projects.

The standard strategy recommends reducing the UIC point assessment of moderate and low (Medium and Low respectively **as shown in Graph 3**) threat to groundwater UICs by applying cost effective BMPs and strategies. Cost effective BMPs may include pretreatment structures such as CDS units, catch basins and spill control separators. Cost effective strategies (operational BMPs) may include: street sweeping, storm drain cleaning and maintenance, public education and outreach, investigating and providing adequate response and education for spills and illicit discharges. **See UIC Operation and Maintenance Plan and Source Control section below** for additional information.

The minimum strategy allows for "do nothing" or no retrofit considered. This minimum element is considered when the retrofit valuation is not favorable, project constraints are present, or the UIC Risk point reduction strategy has been met.

The second element of the plan is the UIC point reduction strategy. Currently the total city-wide average point value per UIC is 1.8. The average point value for those UICs scoring greater or equal than 4 is 5.25. The long-term strategy of the City is to reduce the 5.25 average point value to a 3.0 average point value. Further evaluation of cost and budget impact is recommended to verify the long term strategy. To implement the long-term strategy, the recommended practice is to provide a sufficient level of retrofit(s) to total number of UICs within capital improvement project limits to an average point value of 3.0. This strategy would bring the City to or near a low pollutant loading rating, on-average, city-wide. The reduction to a 3.0 value, would currently require a UIC Risk point reduction of 2,619 points. Considering an available annual budget of $500,000 to $3,000,000/year, and a 25 to 200 per year point reduction, at an estimated cost of $15,000 per point reduction, this strategy is expected to take approximately 10 to 100 years. To accommodate this element of the strategy, projects should target a UIC Risk point reduction that results in a post-project 3.0 point average. **See Table 17.**

Target Points Per Year and Cost to Reach an Average 3.0 UIC Score				
	Target – Points per Year			
	200	**100**	**50**	**25**
# of years to reach avg. – 4	7	15	29	58
Budget/yr – Avg. $15,000/Pt.	$3,000,000	$1,500,000	$750,000	$375,000

TABLE 17 – TARGET POINTS PER YEAR AND COST TO REACH AN AVERAGE 3.0 UIC SCORE

To further evaluate the long term strategy a value ranking exercise is completed with each proposed project that evaluates the total cost and divide it by the total number of points reduced for the UICs on that project. This allows the to evaluate what projects provide greater value in protecting groundwater. Currently, and with minimal data available, it appears that a reasonable cost/benefit value for retrofit consideration is approximately $15,000/point. **See Table 18**.

Facility	PRICE PER POINT REDUCTION - RECOMMENDED POINT REDUCTION TARGETS									
	10	9	8	7	6	5	4	3	2	1
silva cells	$10,000	$12,500	$15,000	$17,500	$20,000	$22,500	$25,000			
bio-infiltration/bioretention	$8,000	$10,000	$12,000	$14,000	$16,000	$18,000	$20,000			
filtera			$5,000	$6,700	$8,400	$10,100	$11,800	$13,500		
contech			$5,000	$6,700	$8,400	$10,100	$11,800	$13,500		
CDS unit						$5,000	$10,000	$15,000	$20,000	$25,000
Catch Basin Type 2 w spc								$4,000	$8,000	$12,000
Catch Basin Type 1 w spc									$5,000	$10,000

TABLE 18 – PRICE PER POINT REDUCTION – RECOMMENDED POINT REDUCTION TARGETS BY FACILITY TYPE

The final element of the plan/strategy is measurement of the water quality (WQ) ratio increase. The WQ ratio is highly representative of the level of benefit provided because this strategy element is associated with basin area. The WQ ratio is formatted like the Department of Ecology standardized method in quantifying water quality benefit of retrofit projects. By comparing the levels of pre-project pretreatment to the proposed retrofit pretreatment, the water quality ratio demonstrates the level of water quality benefit obtained. The comparison is done by applying the pretreatment factors discussed previous. This benefit can be evaluated per UIC or the sum total of the project.

Source Control

Overview

This chapter identifies additional source control BMPs that are implemented to enhance the removal and/or minimize the level of pollutants storm runoff directs to the City's UICs. Source control discussed in this chapter includes the following:

- Control loading of pollutants that are difficult to remove from stormwater by filtration, settlement, or other treatment technologies.
- Protect pollutant loading from construction activities.
- Operational Source Control BMPs:
    - Street Sweeping
    - Storm Drain Cleaning
- Material reduction – Winter Maintenance Operation
- Spill response and illicit discharge and connections on City streets.
- Education, training, and collaboration.
- O&M plan

Control Loading of Difficult Pollutants

Public and private projects implementing "New" UICs require treatment for solids, metals, and oils, relative to the impervious areas contributing to the UIC. The required treatment is detailed in the above sections of this plan. Since soluble pollutants commonly found in stormwater are difficult to remove, source controls applicable to the land use and activities at the site are required to reduce contamination of stormwater from these pollutants.

These land use pollutants are most common in private development. Private new development is required to retain runoff on-site up to the 10-year event. The retainage requirement protects City facilities from runoff of these sites. City of Spokane Valley ordinance (21.40.062) requires that certain land-use sites adhere to performance standards to meet state and federal regulations. See **Table 19** below.

Land Use Activities with Pollution Generating Sources and Regulating Statutes	
Activity	**Statute – Or Other Regulatory**
Aboveground storage tanks	WAC 173-303-640
Chemical treatment, storage, and disposal facilities	WAC 173-303-300
Hazardous waste generator (boat repair shops, biological research facility, dry cleaners, furniture stripping, motor vehicle service garages, photographic processing, printing and publishing shops, etc.)	WAC 173-303-300; SRSM
Injection wells	40 CFR Parts 144 and 146; Chapter 173-218 WAC; SRSM
Junk yards and salvage yards	Vehicle and Metal Recyclers – A Guide for Implementing the Industrial Stormwater General NPDES Permit Requirements (94-146); SRSM
On-site sewage systems (< 14,500 gallons/day)	Chapter 246-272A WAC; local health ordinances
On-site sewage systems (large scale)	Chapter 246-272B WAC
Pesticide storage and use	Chapters 15.54 and 17.21 RCW
Solid waste handling and recycling facilities	Chapter 173-304 WAC
Surface mining	WAC 332-18-015
Underground storage tanks	Chapter 173-360 WAC
Vehicle repair and service uses, including automobile washers	Chapter 173-216 WAC; Best Management Practices Manual for Vehicle and Equipment Washwater Discharges (WQ-R-95-056); SRSM

TABLE 19 – LAND USE ACTIVITIES WITH POLLUTION GENERATING SOURCES AND REGULATING STATUTES

These state and federal regulations (per **Table 19**) typically require a NPDES general permit, a waste discharge permit, or other regulatory guidelines. These regulations and/or permits include provisions for source control mitigation.

Industrial sites covered by individual industrial stormwater permits must comply with the specific source control and runoff treatment BMPs listed in their permits.

Facilities under the Sand and Gravel General Permit must include source control BMPs as necessary in their Sand and Gravel SWPPP to achieve compliance with the stormwater discharge limits in their permit.

Other facilities that are not required by an NPDES Stormwater General Permit or the local jurisdiction to provide source control BMPs are encouraged to implement applicable and recommended BMPs per chapter 10 of the SRSM.

Other private land use activities that may impact public facilities, not captured by City Ordinance (above **Table 19**), should refer to the following regulatory resources for guidance on the following source control requirements. See **Table 20** below.

Other Private Land Use Activities with Pollution Generating Sources and Regulating Statutes	
Activity	**Statute – Or Other Regulatory**
Commercial composting	WAC 173-350-220; SRSM chapter 10; SWMMEW chapter 8 BMP S403E
Dust Control	SRSM chapter 10; SWMMEW chapter 8 BMP S407E; Spokane Regional Clean Air Agency
Pools, Spas, Hot Tubs, and Fountains	SRSM chapter 10; SWMMEW chapter 8 BMP S433E
Water Line flushing, hydrant testing	SRSM chapter 10; SWMMEW chapter 8 BMP S441E
Liquid, Food waste, or Dangerous Waste containers	WAC 173-350-300; Department of Health

TABLE 20 – OTHER PRIVATE LAND USE ACTIVITIES WITH POLLUTION GENERATING SOURCES AND REGULATING STATUTES

Land use pollutants associated with City of Spokane Valley facilities are primarily streets and roadways. Required treatment BMPs for "New UICs" are implemented as described in this plan. Primary pollutants mitigated by these facilities for streets and roadways are solids, metals, and oils.

Operational BMPs directed by service contracts "Street Sweeping" and "Storm Drain Cleaning" implement additional source control mitigation towards the removal of roadway pollutants. See the following sections "Street Sweeping" and "Storm Drain Cleaning" for more information on source control pertaining to these operations.

Additional source pollutants are generated through deicing/anti-icing of streets and roadways. See following section "Material reduction – Winter Maintenance Operation" for more information on source control pertaining to these operations.

Other soluble pollutants such as pesticides, fertilizers, and nutrients are minimal contributors to street and roadway facilities due to minimized runoff from landscape surfaces.

The City continues to review monitoring reports for any indication that pollutant loading at the aquifer is increasing. **See Appendix C** for monitoring data.

Protect Pollutant Loading from Construction Activities

Basic Requirement No. 6 – Erosion and Sediment Control (SRSM chapter 2.1.5) is required for both public and private projects that are new development and/or include greater than 1 acre of land disturbance. Projects disturbing greater than 1 acre require inspection by CESCL authorized personnel.

The Stormwater Utility Department reviews public project Erosion and Sediment Control plans to verify standards and specifications are met. During the construction of public projects, the City assigns one or more inspectors to each public project to verify construction of temporary and permanent drainage facilities are in conformance with all applicable plans and specifications.

The City's Development Engineering division reviews the Erosion and Sediment Control plans submitted by private proponents to verify standards are met. During construction, the City's Development Inspector oversees the private projects to verify construction of temporary and permanent drainage facilities are in conformance with all applicable plans and specifications.

Typically, Construction Stormwater General Permits are not required within the City's UIC areas.

Operational Source Control BMP – Street Sweeping

The Stormwater Utility funds 96% of street sweeping services contract. Street sweeping:

- Helps keep gutters and inlets clean and thereby minimizes local street flooding.
- Minimizes sediment that can clog underground drain fields including finer dust particles.
- Collects pollutants associated with street debris to protect water quality.
- Allows a 5 – 10 % TSS removal credit.

Debris waste is transported to a transfer station site within City limits and then transported by larger trucks and disposed of at the Waste Management, Inc. Graham Road Landfill west of Fairchild Air Force Base near U.S. Highway 2.

PICTURED: CONTRACTED SWEEPER TIPPING LOAD AT TRANSFER STATION NEXT TO COLLECTED DEBRIS PILE.

Since 2007, the City has competitively bid street sweeping services and awarded to a local contractor to perform the work. In 2011, the City utilized Ecology grant funding to evaluate and to provide suggestions to improve the street sweeping program. Three distinct action plans were created, one for Spring, one for Fall, and one for Arterial Maintenance. Maps were created to help guide operational decisions on priority areas and streets for each plan. The emphasis of each plan is as follows:

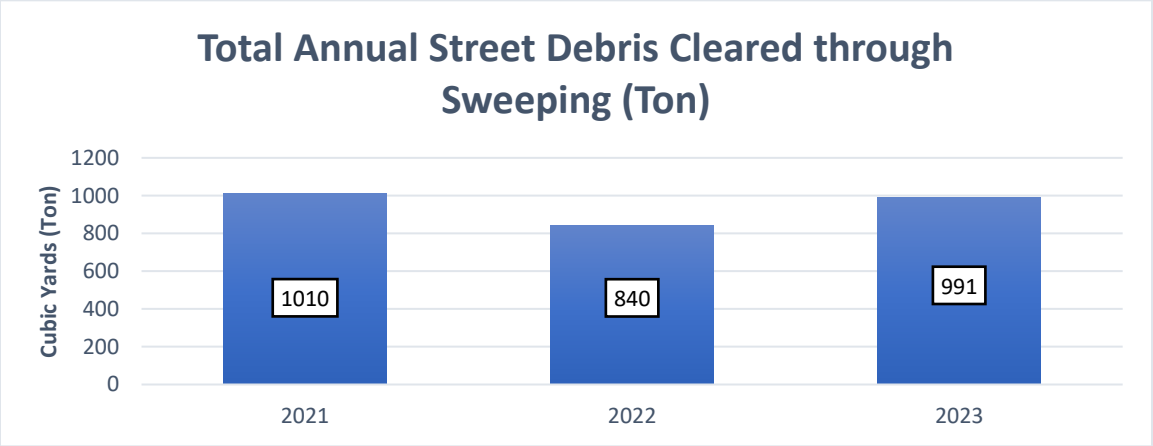
- The Spring sweeping emphasis focuses on debris pickup on all City streets at least once a year.
- The Fall sweeping emphasis is to pick up as much needle and leaf litter as possible prior to winter weather to keep storm drain inlets open and clear during the wet season from October through Spring.
- The Arterial Maintenance sweeping emphasis is to remove as much of the fine particulate that clogs drain fields and carries pollutants that may downgrade water quality. It also benefits local air quality and makes frontages to business areas cleaner and presentable.

The plans are available on the City's website under the Street Maintenance webpage that can be found: http://www.spokanevalley.org/streetmaintenance

It is important to note that the plans do not include emergency response work, such as the additional clean-up work created after the November 2015 windstorm event. It's also important to note that each year the amount of street debris cleared from streets varies. This is due to how much pine trees drop in

needles and if there is enough time in the fall to collect dropped leaves from deciduous trees before freezing conditions make it impossible to sweep.

Graph 5 shows the total tons of street debris cleared from City streets over the last two years. Prior to 2021 street debris was measured in cubic yards. Approximately 15,000 cubic yards were collected over the last decade, debris that would eventually get to storm drains and would clog existing drain fields, causing premature failue.



GRAPH 5: TOTAL ANNUAL STREET DEBRIS COLLECTED IN TONS

Street sweeping activities assist the City in meeting the following regulatory requirements:

- Ecology's Underground Injection Control Rule, Operation BMP Source Control
- Spokane Regional Clean Air Agency, Maintenance Area Requirements

Future Potential Improvements:

- Implement GPS tracking tools to begin collecting data to help meet future needs as stated below.
- Evaluate travel costs from field to transfer station. Review if constructing an additional transfer & water station closer to the bulk pickup areas would lower overall costs. If so, what would the rate of return be on an investment of this type? Also look at: if the sweepers were required to have a larger haul capacity, would those lower annual costs?
- Look at options to increase competition for this work. Evaluate alternate contracting options, such as splitting the current contract into 3 separate contracts, one for Spring, one for Fall, and one for Arterial Maintenance Sweeping.
- Identify and evaluate alternate measurements for success besides cubic yards or tons removed such as curb miles swept, or total number of particles removed.
- Develop method for converting cubic yards of street debris removed to tons of street debris removed.
- Coordinate the operations of the sweeping and vactoring programs to improve service contract effectiveness.

Operational Source Control BMP – Storm Drain Cleaning

This program cleans storm drain drywells, catch basins, manholes, pump station vaults, sidewalk inlets, culverts and pipes. The waste is transported and tipped at a Decant facility that separates the liquids from the solids. After the solids are dried, they are recycled by the Washington State Department of Transportation employees as safety fill projects on I-90 interchanges. On occasion, loads with higher pollutant content are taken to the Waste Management, Inc. Graham Road Landfill.

PICTURED: CONTRACTED STORM DRAIN CLEANING SERVICE OF A DRYWELL ON A RESIDENTIAL STREET

The Decant Facility, an "Eductor Waste Decant Facility", has been in use since the spring of 2015. This facility is owned and operated by the Washington Department of Transportation (WSDOT). The location is at the Pines and I-90 WSDOT maintenance yard. The City has negotiated a 30-year intergovernmental agreement to allow the City to tip storm drain debris at the facility.

See the UIC Operational and Maintenance plan for more detail regarding this program.

Storm Drain Cleaning activities assist the City in meeting the following regulatory requirements:

- Ecology's Underground Injection Control Rule, Operation BMP Source Control

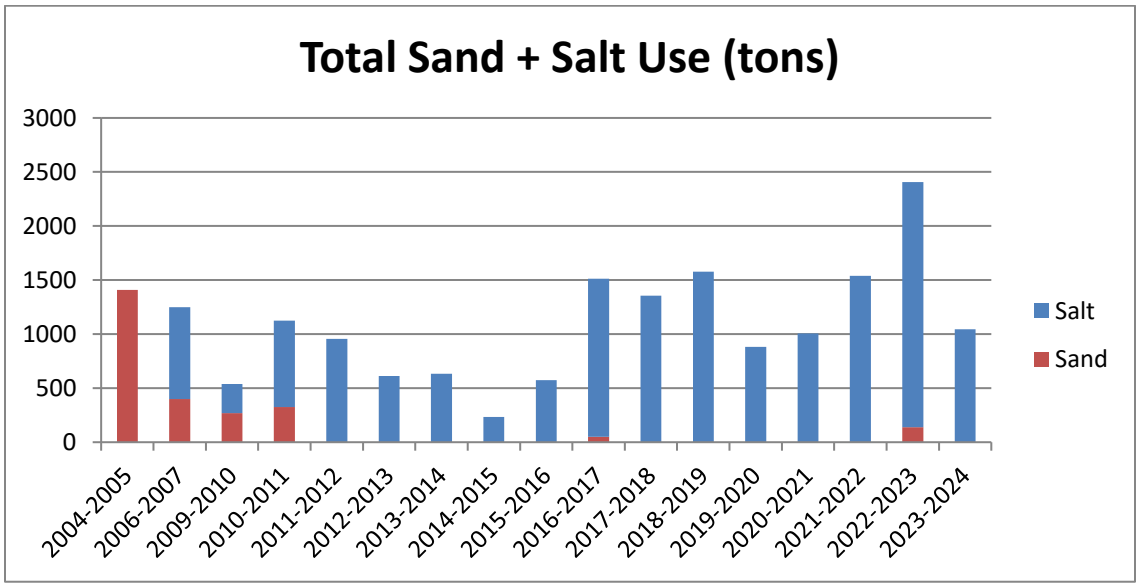
Material Reductions – Winter Maintenance Operations

Reducing the amounts of materials used to maintain traction and usage during winter months is important to the City for stormwater benefits of improving water quality and decreasing drain field clogging. The City also wishes to decrease costs associated with purchase of materials while still maintaining services.

PICTURED: WINTER OPERATIONS IN SPOKANE VALLEY

Sand Use Reduction:

The use of sand has dramatically decreased over the last 3 decades due mainly to air quality requirements and better controls through contracted work. Prior to City incorporation in 2003, it is estimated that Spokane County applied well over 1,000 tons of sand to City streets each year. Since 2009, the City has decreased its sand usage dramatically to almost 0, only using sand when absolutely needed.



GRAPH 6: CITY SAND AND SALT USE – WINTER OPERATIONS

Rock Salt:

The City has found that a mined mineral rock salt is more effective than typical rock salts that are processed using evaporation methods. The mined rock salt is harder, lasts longer, and is more effective at lower temperatures than typical rock salt or liquid salts, thereby applying less salt to the roadway. In addition, the City implemented only using rock salt at high-traffic locations and in being less wasteful in application rates in recent years.

Liquid Salt and Surfactants:

The average amount of liquid salt or magnesium chloride (mgCl) usage has not changed much since City incorporation. Surfactants are added to help the liquid salt stick on the road better. City staff checks that vendors supply eco-friendly blends of liquid salt and surfactants that have lower levels of chemicals of concern to the aquifer, including phosphorous.

Spills and Illicit Discharges/Connections on City Streets

Spills are a very common form of illicit discharge in Spokane Valley. Spills are unplanned releases of materials on or along City of Spokane Valley roadways. Reporting procedures are determined by the type of spill and relationship to the City.

The city has developed a IDDE Program Plan which covers how the city responds to illicit discharges, illicit connections, and spills within the city. **See the IDDE Program Plan here:** Illicit Discharge Detection and Elimination (IDDE) Program Plan

PICTURED: FUEL SPILL ON BROADWAY AVENUE CONTAINED BY SPOKANE VALLEY FIRE DEPARTMENT

Education, Training, and Collaboration Subprogram – "Only Rain in the Drain"

The City Utility staff works to collaborate and provide education and training opportunities to reduce debris and associated pollutants to stormwater structures (UICs) and facilities. Staff works internally with coworkers, externally with staff of other organizations, and directly with the public. Historically and actively the Stormwater Utility staff collaborates and trains with:

> External: City of Spokane, Spokane County, Spokane Aquifer Joint Board (SAJB), Idaho-Washington Aquifer Collaborative (IWAC), Ecology, EnviroStars, Spokane Regional Health District, University of Idaho Extension, Washington State Extension, Eastern Washington Stormwater Group, and area School Districts, among others
>
> Internal: Management, Front Desk personnel, Code Enforcement, Development Review & Inspection, Maintenance Inspection, and Capital Projects personnel

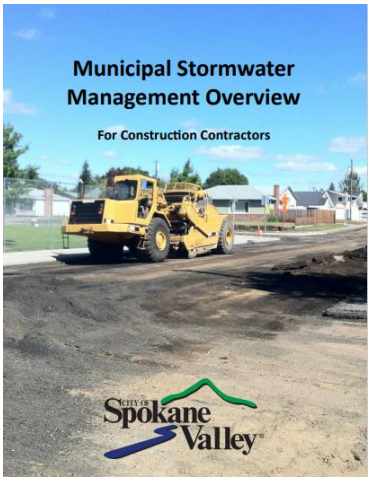
Utility staff acknowledges the leadership and work towards protection of the aquifer, streams, creeks, rivers, and lakes that has been happening for decades in Spokane Valley. Programs such as SAJB's "Aqua Duck", Spokane County Water Resources work on the development of bio-infiltration swales, and Central Valley School District's 5th Grade Environmental Field trips were already underway when the City was incorporated. City staff therefore works to build upon what is already known in the community, to help to fill in gaps, and serve as a resource to its citizens and ratepayers.

City Staff Training:

Utility staff developed and instituted internal training materials and review annually. Training informs staff on information and procedures to minimize pollutants entering the storm drain system and how to respond to illicit discharges and connections. Administrative staff that answer calls regarding stormwater problems are trained one-on-one with Utility staff on what questions to ask and how to refer a call or complaint utilizing the City's QAlert system. Also, Utility staff annually attends conferences, workshops, and trainings specific to assisting with the City's Stormwater Program to maintain professional standards and understand trends in the water quality and quantity profession.

Developers, Design & Construction Professionals:

City staff, on a continual basis, educate property owners, developers, engineers, and contractors on requirements of the SRSM, communicate upcoming training events, notify applicants of the need to obtain Washington State Construction Stormwater General Permits, and notify applicants of the 60-day registration requirement for new Underground Injection Control (UIC) drywells. City staff also hand out stormwater educational materials during preconstruction meetings that specifically apply to new/redevelopment and construction stormwater BMPs.



STORMWATER MANAGEMENT REQUIREMENTS OVERVIEW BROCHURE FOR ENGINEERS, DEVELOPMENT REVIEW STAFF, AND LAND USE PLANNERS AND MUNICIPAL STORMWATER MANAGEMENT OVERVIEW BOOKLET FOR CONSTRUCTION CONTRACTORS.

Collaboration with Jurisdictions and Entities:

City Utility staff has consistently maintained a presence in the community discussion regarding storm and runoff quality and the connections of systems to drinking water, creeks, streams, rivers, and lakes.

Utility staff continues to collaborate with professionals that deal with the State rules and regulations from other cities and counties in Eastern Washington. Since City incorporation, staff has coordinated in:

- the establishment and adoption of the SRSM
- permit negotiations with Ecology
- development of underground injection control program and low impact development guidelines
- work to meet current permit requirements, including monitoring and effectiveness studies.
- steering committee participation for the updated SWMMEW
- Manual equivalency – SRSM vs. revised 2019 SWMMEW. A noted collaboration within the community is the Spokane Valley-Rathdrum Prairie Aquifer Atlas. The atlas was the creative idea of several jurisdictions in Idaho and Washington that share the aquifer. Utility staff is participating in the 5th Edition update, to be published in 2020, with contributions to the new stormwater pages. Check out the current atlas online: http://www.spokaneaquifer.org/2015-aquifer-atlas/2015AquiferAtlas.html

After the Spill – One on One Education:

After a spill is reported and inspected, Utility staff educates (i.e. “Only Rain in the Drain” door hangers, letters, one-on-one conversation) property owners, mobile contractors, companies transporting material waste, and others about how to keep pollutants out of the flow of runoff and best practices to protect ground and surface waters. Those individuals or businesses that do not respond to specific clean up requirements as indicated by City Code have their case referred to the City’s Code enforcement for further action.

Operation and Maintenance

Overview

The City currently conducts operation and maintenance per the Underground Injection Control (UIC) Operation and Maintenance (O&M) Plan developed for the City's UIC areas regulated by WAC 173-218 Underground Injection Control Program.

The UIC O&M plan serves as a resource for City departments that are responsible for implementing the plan. The UIC O&M plan provides documentation and scheduling of stormwater Best Management Practices (BMPs) that, when applied to those activities and facilities, will protect water quality, promote the long-term infiltration capacity, reduce the long-term accumulation of contaminants, and satisfy state all known available and reasonable methods of prevention control and treatment (AKART) requirements.

See Underground Injection Control (UIC) Operation and Maintenance Plan for complete details.

Contacts

Questions about the City of Spokane Valley's UIC Stormwater Management Program can be directed to:

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Spokane Valley, WA 99206
(509) 720-5013
cphillips@spokanevalleywa.gov

Cory Olson
Stormwater Program Coordinator
City of Spokane Valley
10210 E. Sprague Avenue
Spokane Valley, WA 99206
(509) 720-5079
colson@spokanevalleywa.gov

References

Washington State Department of Ecology. August 2019. *Stormwater Management Manual for Eastern Washington.*

City of Spokane Valley. April 2008. *Spokane Regional Stormwater Manual.*

Washington Administrative Code (WAC) 173-218. June 2008. *Underground Injection Control Program.*

Spokane County Water Resources. *Monitoring Data.*

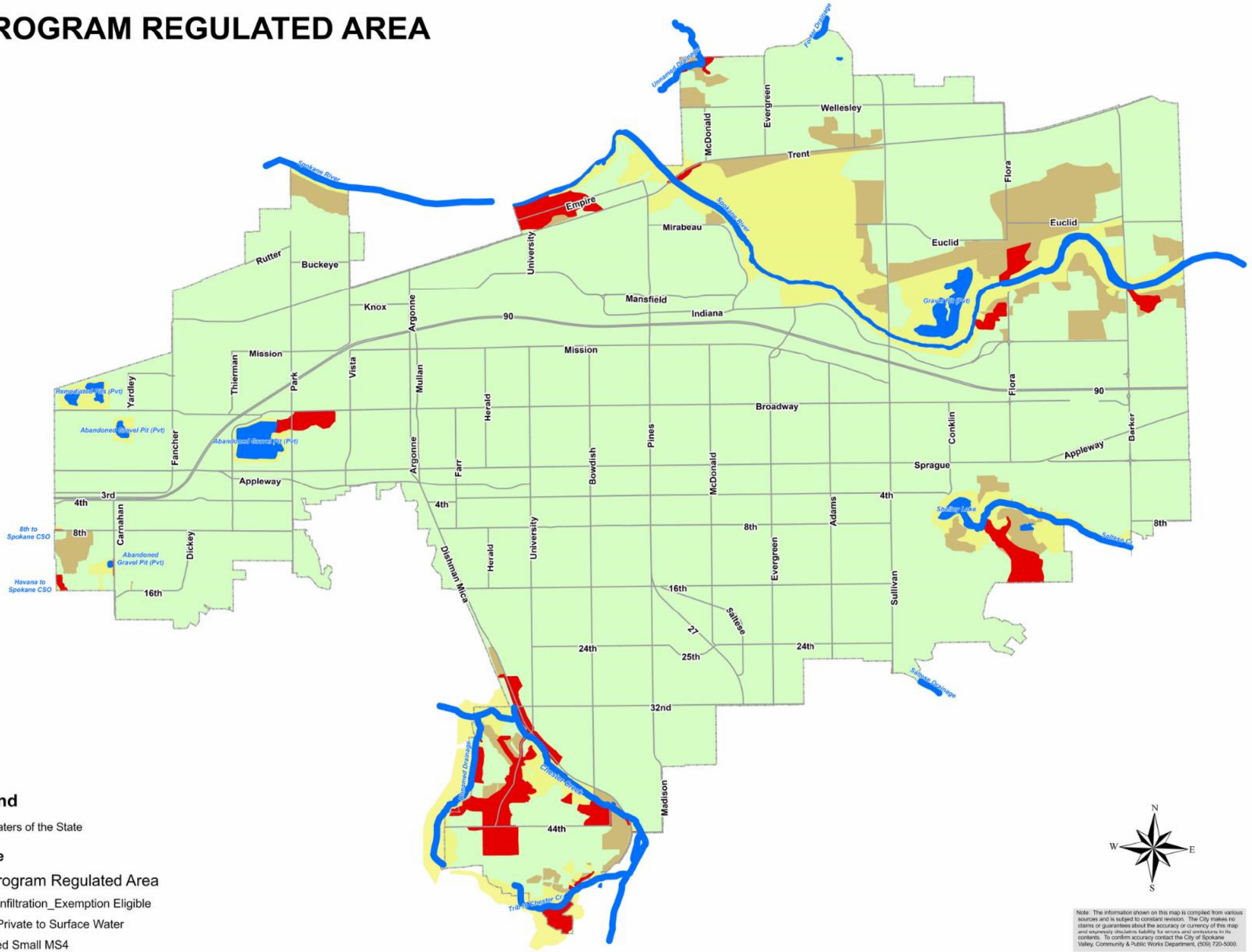
Appendix A – Informational Plan Sheets

UIC Program Regulated Area

Type A and B Drinking Well Location Plan – City-Wide

2025 UIC Assessment Plan

UIC PROGRAM REGULATED AREA



Legend

Surface Waters of the State

Subbasin Type

- UIC Program Regulated Area
- Ground infiltration_Exemption Eligible
- Natural/Private to Surface Water
- Regulated Small MS4

N W E S

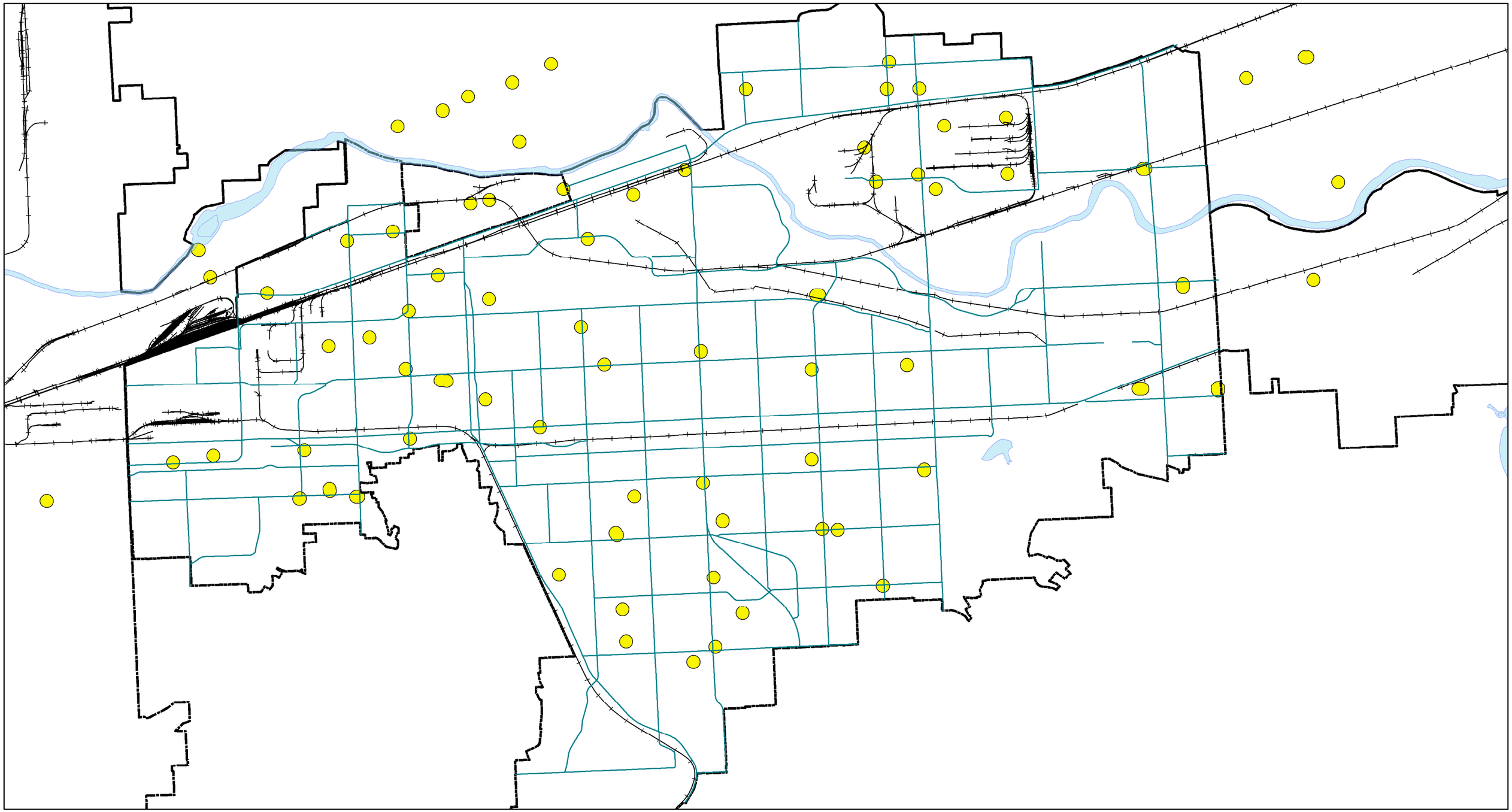
Note: The information shown on this map is compiled from various sources and is subject to constant revision. The City makes no claims or guarantees about the accuracy or currency of this map and expressly disclaims liability for errors and omissions in its contents. To confirm accuracy contact the City of Spokane Valley, Community & Public Works Department, (509) 720-5000.

Date: 5/18/2023

CITY OF Spokane Valley

P:\Public Works\Stormwater Management\Regulatory\UIC\UIC Program Regulated Area Map.aprx

Type A and B Drinking Wells



Type A and B Drinking Wells

2025 UIC Assessment Plan

Date: 5/1/2025
- Includes 2024 CN improvements
Revisions include:
-
Notes:
-Many UICs were moved from City to Private

Wellesley
McDonald
Evergreen
Flora
Barker
Euclid
Mirabeau
Empire
Trent
Cement
Pines
Indiana
Mansfield
Montgomery
Mission
Rutter
Buckeye
Knox
Vista
Argonne
Sharp
Fancher
Tilirman
Heacox
Park
Mullan
University
Herald
Broadway
Conklin
Appleway
Sprague
4th
3rd
8th
Carnahan
Dickey
16th
Farr
Bowdish
Dishman Mica
Salfese
Adams
Sullivan
24th
25th
Blake
32nd
Schafer
Sands
Thorpe
Madison
44th

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UIC Assessment Plan

Score	Count	Total Score	Pollutant Loading
7 - 10	235	1,751	High
4 - 6	1,002	4,865	Medium
1 - 3	4,518	7,603	Low
0	1,887	0	Meets Standards
	7,642	14,219	

Appendix B – Evaluation and Analysis Support Data

Categorized Subbasin Analysis Map – Ponderosa Vicinity

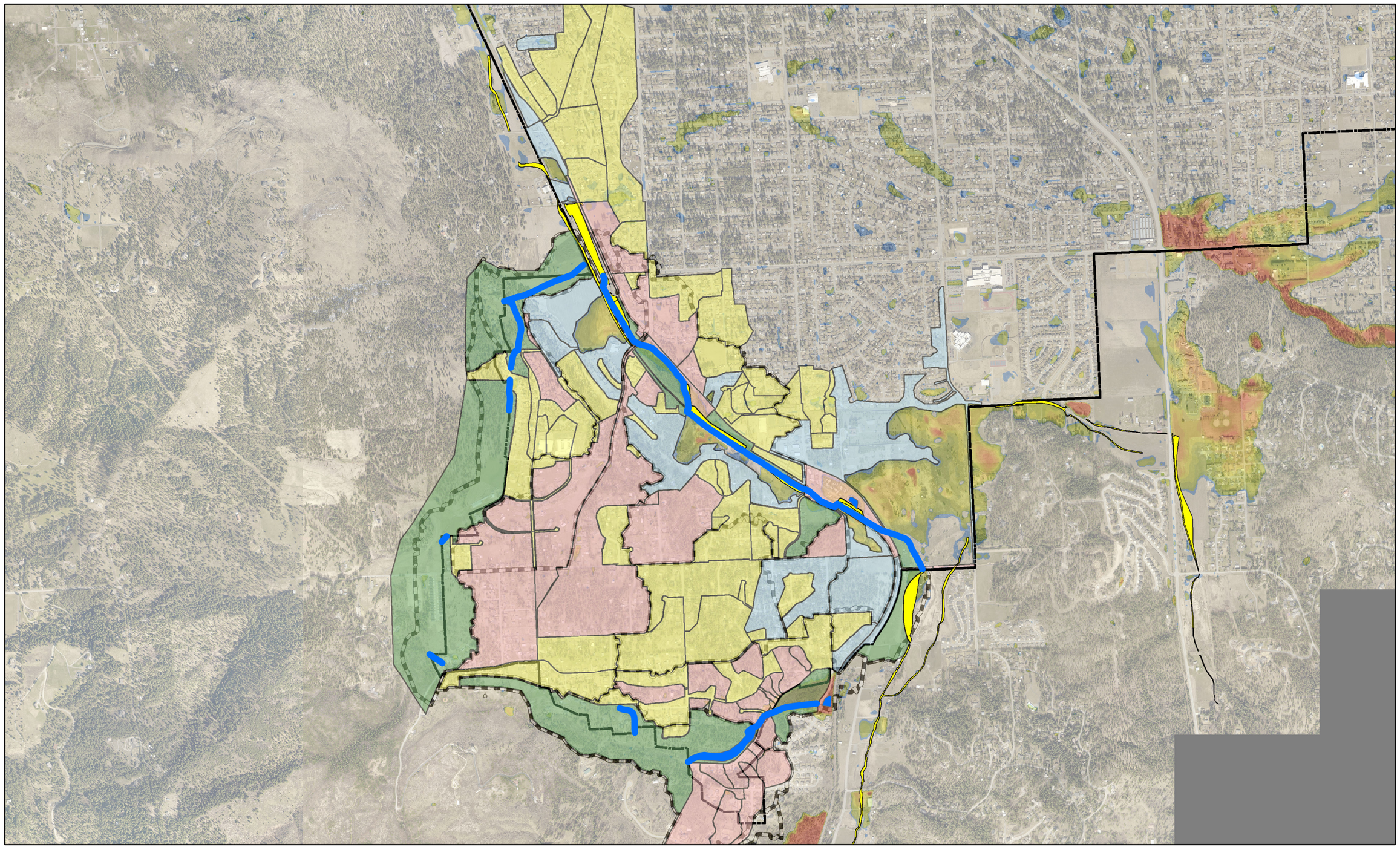
City Wide Subbasin Map

5’ Contour Map – City Wide

Roadway Sags and Crests – City Wide

Natural Sink Locations – City Wide

SUB-BASIN ANALYSIS - PONDEROSA VICINITY



UIC_MS4 Exemption Eligible

Outflow to Surface Water_Regulated MS4

Nonpoint Ground Infiltration_Non-Regulated

Natural/Private to Surface Water_Non MS4

Surface Waters

Floodway

Citywide Sub-Basins

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N

Sub-Basins

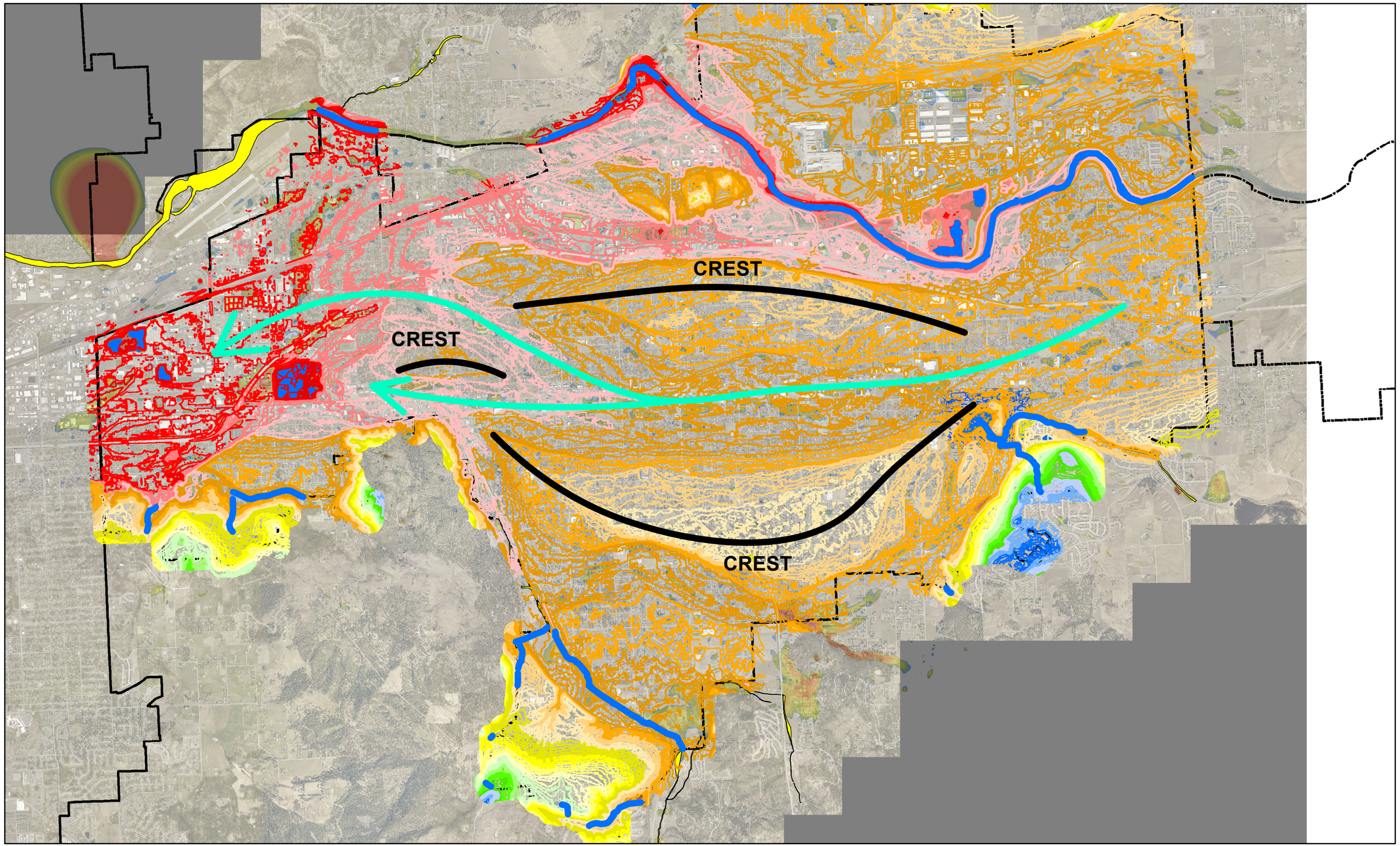
Major Flowpaths

Waters of the State

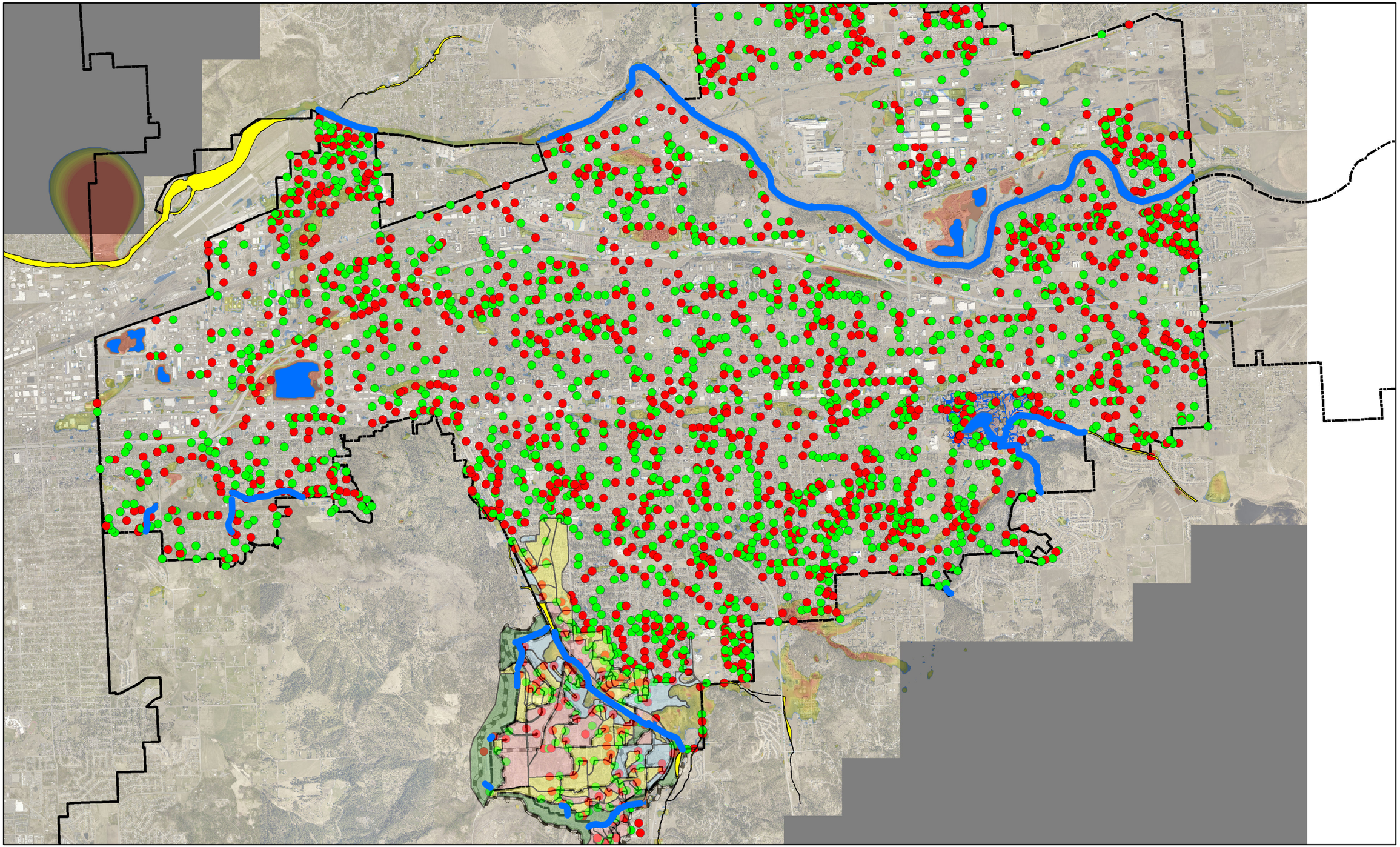
Source: Esri, Maxar, GeoEye, Earthstar G...

CITY OF Spokane Valley

5 FOOT CONTOUR MAP

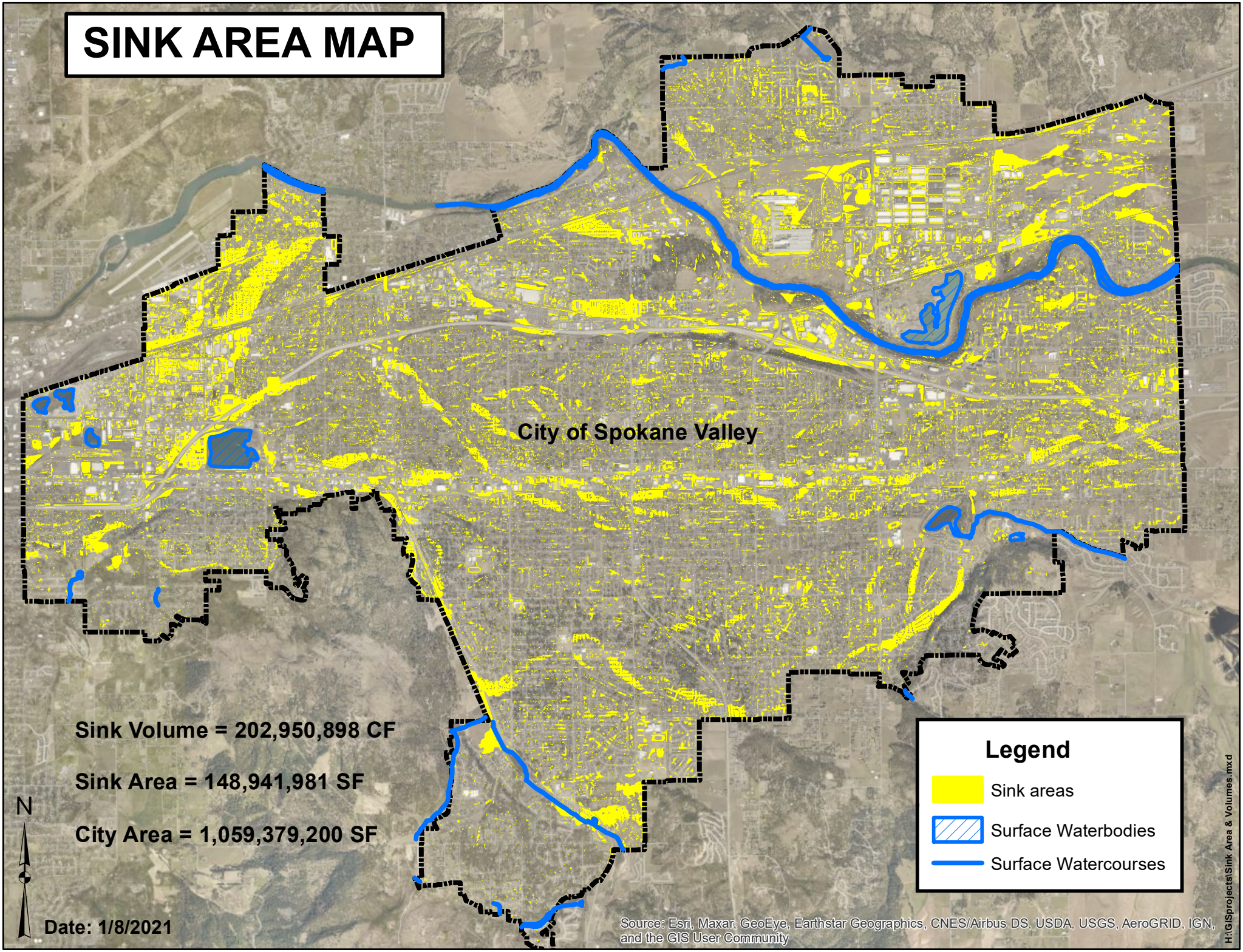


ROADWAY SAGS AND CRESTS



Roadway Crests
Roadway Sags
Surface Waters
Floodway

SINK AREA MAP



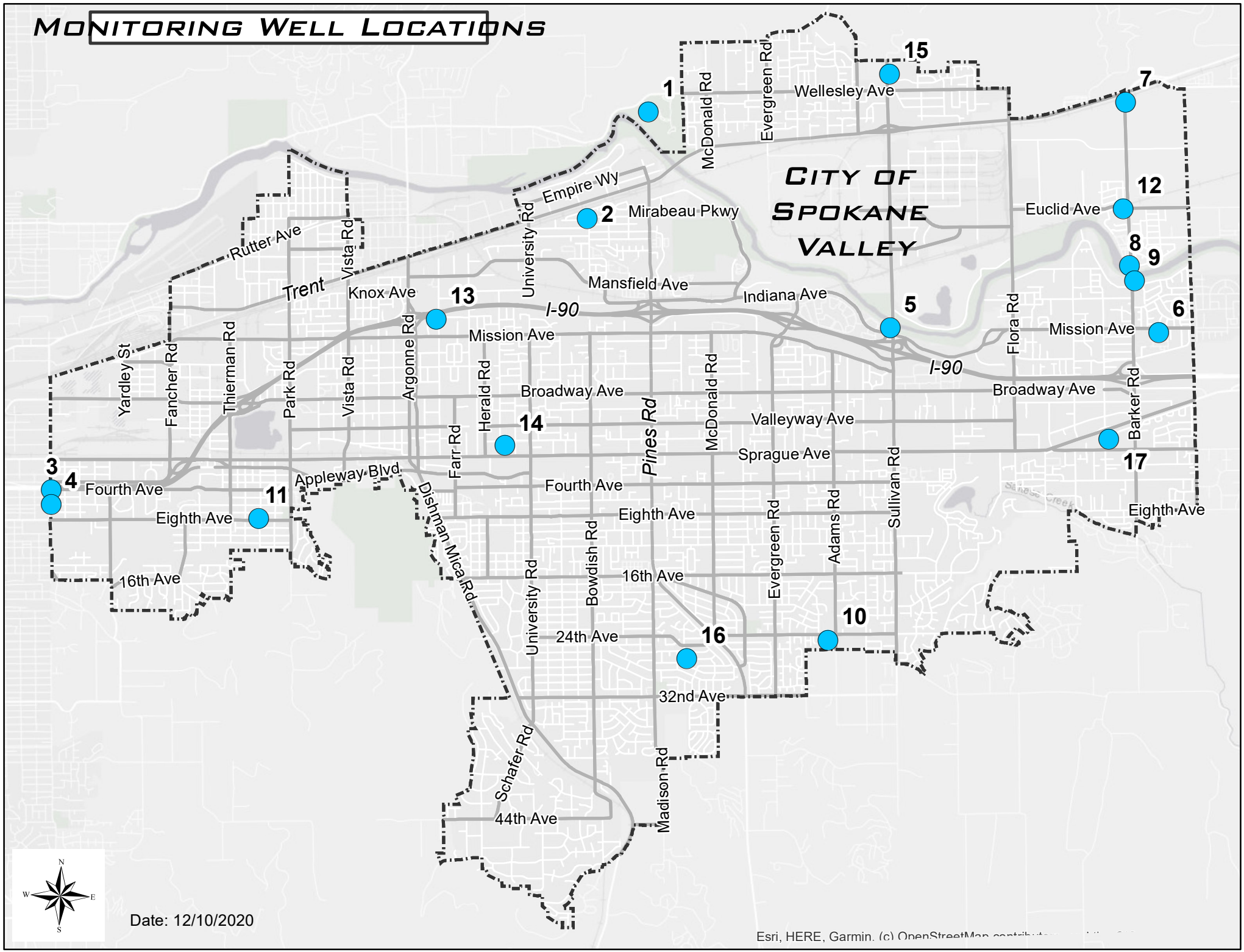
Appendix C – Groundwater Monitoring Data

Monitoring Well Location Plan – City Wide

1. Monitoring Well Locations Map
2. Monitoring Well Locations List

Monitoring Well Data

1. Cadmium Levels
2. Chloride Levels
3. Chromium Levels
4. Copper Levels
5. Lead Levels
6. Magnesium Levels
7. Cadmium Levels
8. Nitrate and Nitrite Levels
9. Phosphorus Levels
10. Sodium Levels
11. Soluble Reactive Phosphorus Levels
12. Zinc Levels


Monitoring Well Locations
City of Spokane Valley
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Wellesley Ave
McDonald Rd
Evergreen Rd
Empire Wy
Mirabeau Pkwy
University Rd
Euclid Ave
Rutter Ave
Trent
Vista Rd
Knox Ave
Mansfield Ave
Indiana Ave
I-90
Flora Rd
Mission Ave
Yardley St
Fancher Rd
Thierman Rd
Park Rd
Argonne Rd
Herald Rd
Broadway Ave
Pines Rd
Valleyway Ave
Barker Rd
Sprague Ave
Appleway Blvd
Fourth Ave
Farr Rd
Eighth Ave
Adams Rd
Sullivan Rd
Dishman Mica Rd
Bowdish Rd
16th Ave
24th Ave
32nd Ave
Schafer Rd
Madison Rd
44th Ave
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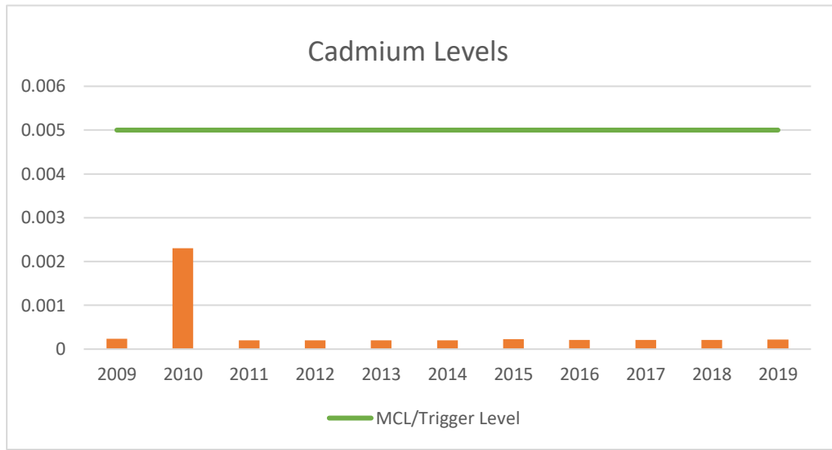
S
Date: 12/10/2020
Esri, HERE, Garmin, (c) OpenStreetMap contributors

Well No.	Well Name	Site ID
1	Plantes Ferry Park Monitoring Well	5404A01
2	Frederick and Bowdish Monitoring Well	5409C02
3	3rd and Havana Nested Site, East	5322A01
4	6th and Havana Monitoring Well (MW-2)	5323E01
5	Sullivan Rd. and Krispy Kreme Monitoring Well	5411R06
6	Missing and Barker Monitoring Well at CID 4	5517D05
7	Trent and Barker Rd. Monitoring Well	5505D01
8	Barker Rd. North of River Monitoring Well	5507H01
9	Barker Rd. Centennial Trail North Monitoring Well	5508M01
10	Vera Water and Power, New Well 4	5426L03
11	E. Spkn WD, Site 1	5324G01
12	Euclid and Barker Monitoring Well at CID5	5507A04
13	Modern Electric Water Site 6	5408N01
14	New Balfour Park Monitoring Well	5417R02
15	East Valley Highschool Monitoring Well	6436N01
16	Spokane Co. Water Dist. #3, Site 2-5, 26th and Vercler	5427L01
17	Consolidated Irr. Dist. 19, Site 2A	5518R01

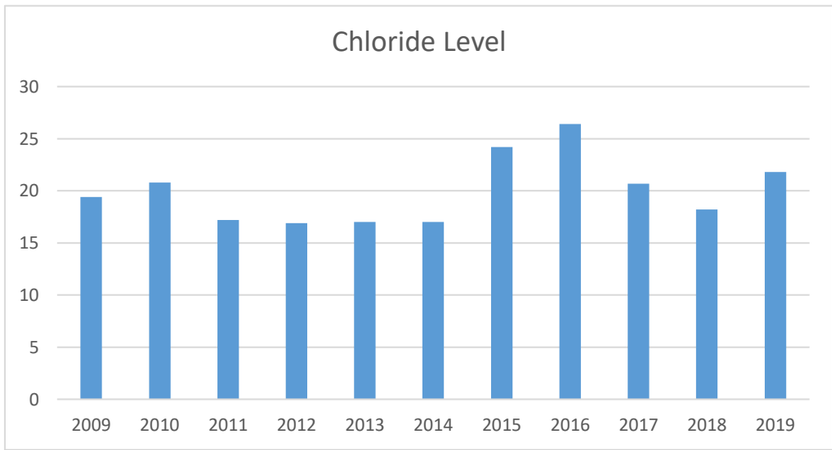
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
1	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
2	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
4	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
6	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
7	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
8	0.0002	0.0002	0.0002	0.0002	0.00023	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
9	0.00022	0.00021	0.00021	0.00021	0.00021	0.0002	0.0002	0.0002	0.0002	0.0002	0.00024
10	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
11	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
12	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
13	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
14	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
15	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0023	0.0002
16	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
17	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Cadmium L	0.00024	0.0023	0.0002	0.0002	0.0002	0.0002	0.00023	0.00021	0.00021	0.00021	0.00022
MCL/Trigge	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005



	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
1	1.89	1.84	1.93	2.47	2.41	2.17	2	2.13	2.42	2.39	1.94
2	5.86	4.68	5.92	3.82	0	3.36	3.01	3.31	3.92	3.05	3.47
3	12.7	16.7	8.38	12.9	11.4	8.68	7.65	9.18	9.99	9.76	8.06
4	19.1	18.2	18.2	16.2	14.6	12.4	12.7	12.9	13.6	12.1	13
5	3.12	2.92	4.41	0	3.27	0	0	0	0	0	0
6	2.68	2.04	1.88	1.83	1.77	1.69	1.69	1.69	2.1	1.87	2.56
7	6.9	7.01	7.56	7.3	7.68	6.88	6.88	6.05	6.85	5.32	5.55
8	2.76	2.28	1.94	2	2.08	1.47	1.47	1.12	2.44	1.67	3.08
9	2.52	1.76	1.72	1.88	1.88	1.38	1.38	1.12	1.43	1.51	2.07
10	11.6	11.5	12.2	20	10.2	9.87	9.87	0	0	0	0
11	21.8	19.8	20.7	17.2	18.4	17	17	16.9	17.2	14.9	19.4
12	2.73	2.91	4.85	2.56	2.61	2.32	2.32	2.38	2.37	2.48	2.22
13	4.48	4.53	4.41	3.62	3.56	3.55	3.48	3.45	3.6	3.65	4.66
14	6.63	4.76	5.5	8.46	3.56	4.07	3.57	3.48	3.79	4.03	3.61
15	19.5	12.9	14	26.4	24.2	10	10.6	10.8	12	20.8	11.6
16	12	11.9	10.6	9.01	10	9.64	10.3	10	9.78	9.4	8.3
17	18.8	5.37	5.71	3.19	3.21	3.14	3.31	2.39	4.15	3.01	3.77

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Chloride Le	19.4	20.8	17.2	16.9	17	17	24.2	26.4	20.7	18.2	21.8



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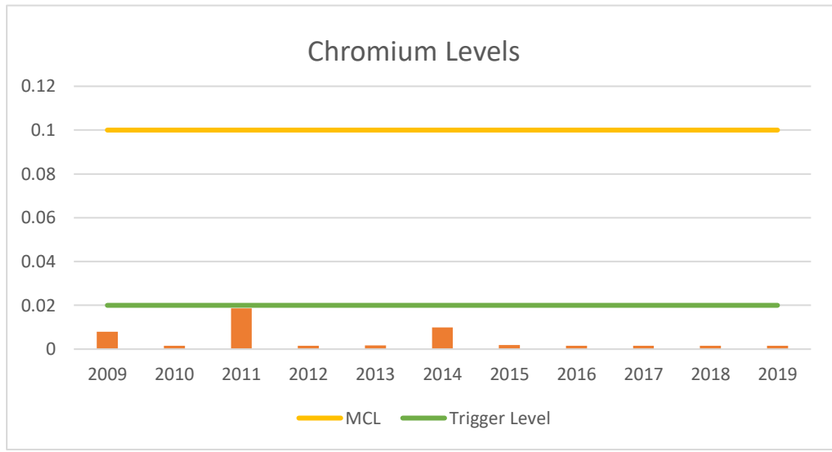
2	0.0015	0.0015	0.0015	0.0015	0.0015	0.00516	0.0015	0.0015	0.0015	0.0015	0.0015
3	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.00151	0.0015	0.0015	0.0015
4	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
5	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
6	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0	0.0015	0.0015
7	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
8	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0186	0.0015	0.0015
9	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0	0.0015	0.0015
10	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
11	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
12	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
13	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
14	0.0015	0.0015	0.0015	0.0015	0.0015	0.00984	0.0015	0.0015	0.0015	0.0015	0.0016
15	0.0015	0.0015	0.0015	0.0015	0.0019	0.0015	0.00165	0.0015	0.00237	0.0015	0.00795
16	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
17	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Chromium	0.00795	0.0015	0.0186	0.0015	0.00165	0.00984	0.0019	0.0015	0.0015	0.0015	0.0015
MCL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Trigger Lev	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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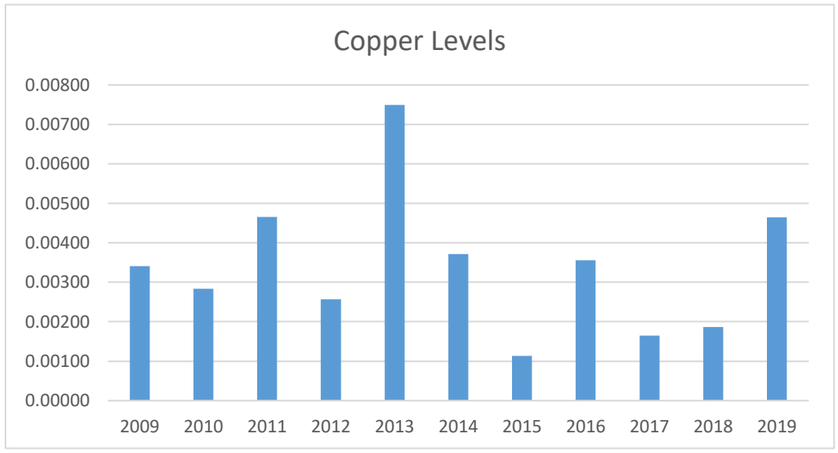
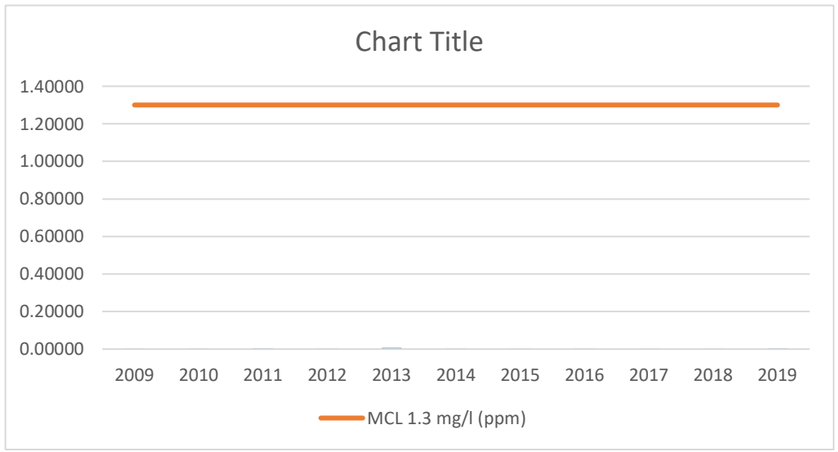
2	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00000	0.00100	0.00100	0.00100	0.00100
3	0.00100	0.00100	0.00100	0.01000	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
4	0.00100	0.00100	0.00100	0.00100	0.00112	0.01000	0.00100	0.00100	0.00100	0.00100	0.00100
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00100	0.00100	0.00100
6	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.01000	0.00100	0.00100	0.00100
7	0.00100	0.00100	0.00100	0.00100	0.00122	0.00100	0.00100	0.01000	0.00100	0.00100	0.00100
8	0.00100	0.00100	0.00133	0.00102	0.00140	0.00175	0.00100	0.01000	0.00100	0.00100	0.00288
9	0.00100	0.00100	0.00100	0.00100	0.00100	0.00000	0.00100	0.01000	0.00100	0.00157	0.00100
10	0.00100	0.00100	0.00100	0.00000	0.00000	0.00100	0.00100	0.00106	0.00100	0.00100	0.00128
11	0.00215	0.00190	0.00425	0.00187	0.00211	0.00117	0.00107	0.00176	0.00146	0.00141	0.00197
12	0.00158	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
13	0.00100	0.00107	0.00130	0.01000	0.00100	0.00100	0.00100	0.00100	0.00101	0.00187	0.00100
14	0.00100	0.00100	0.00100	0.01000	0.00100	0.00372	0.00100	0.00100	0.00100	0.00100	0.00100
15	0.00174	0.01010	0.00156	0.01000	0.00100	0.00100	0.00113	0.00100	0.00100	0.00100	0.00100
16	0.00341	0.00284	0.00465	0.00107	0.00356	0.00134	0.00104	0.00100	0.00100	0.00100	0.00179
17	0.00100	0.00100	0.00100	0.00100	0.01000	0.00100	0.00100	0.00100	0.00100	0.01000	0.00131

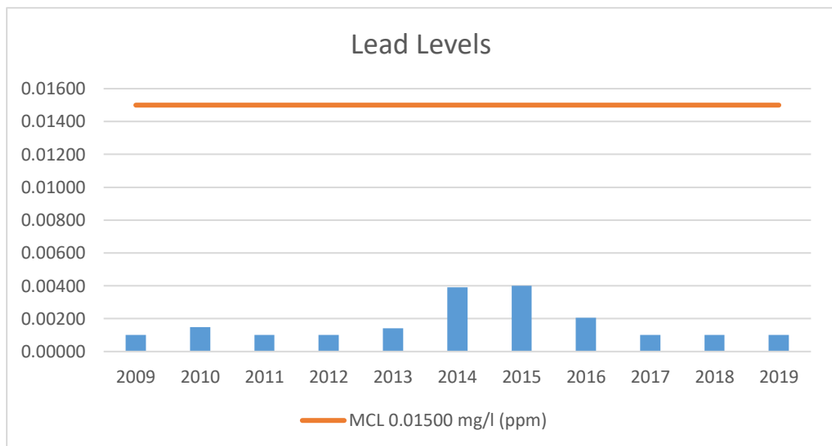
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.00341	0.00284	0.00465	0.00257	0.00749	0.00372	0.00113	0.00356	0.00165	0.00187	0.00464
ng/l (ppm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3





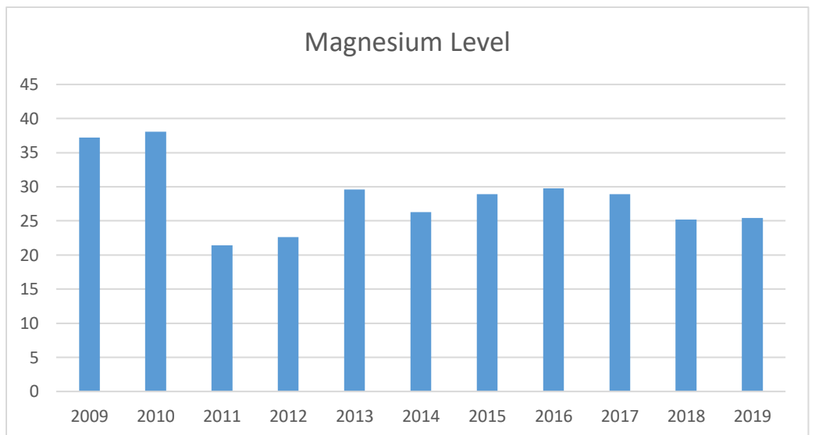
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
2	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00000	0.00100	0.00100	0.00100	0.00100
3	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
4	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00100	0.00100	0.00100
6	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
7	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
8	0.00100	0.00100	0.00100	0.00100	0.00141	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
9	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
10	0.00100	0.00100	0.00100	0.00100	0.00000	0.00100	0.00400	0.00100	0.00100	0.00100	0.00100
11	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00205	0.00100	0.00100	0.00100
12	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
13	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
14	0.00100	0.00100	0.00100	0.00100	0.00100	0.00390	0.00100	0.00100	0.00100	0.00100	0.00100
15	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
16	0.00100	0.00149	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100
17	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100	0.00100

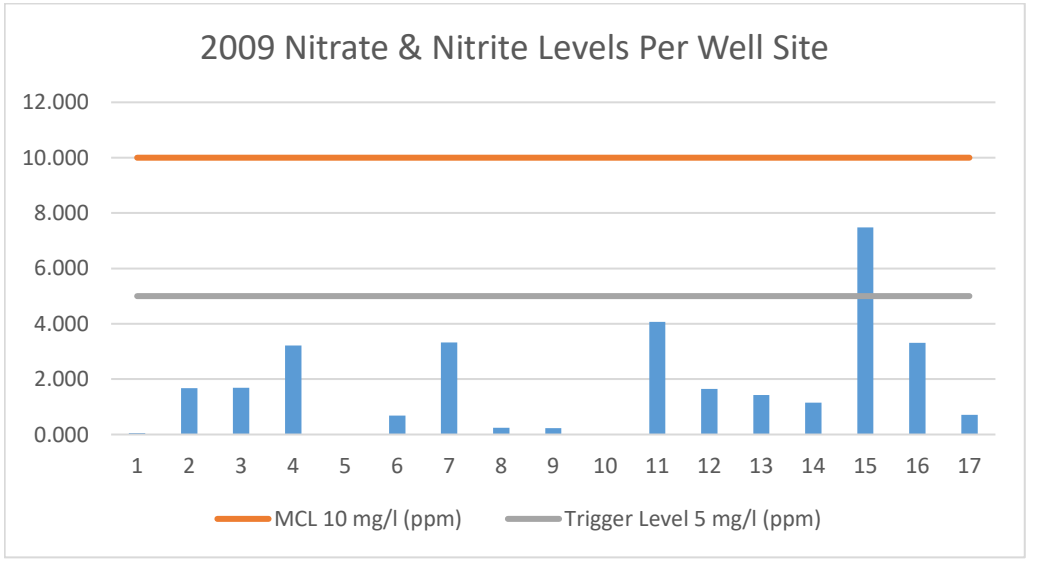
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.00100	0.00149	0.00100	0.00100	0.00141	0.00390	0.00400	0.00205	0.00100	0.00100	0.00100
ng/l (ppm)	0.01500	0.01500	0.01500	0.01500	0.01500	0.01500	0.01500	0.01500	0.01500	0.01500	0.01500

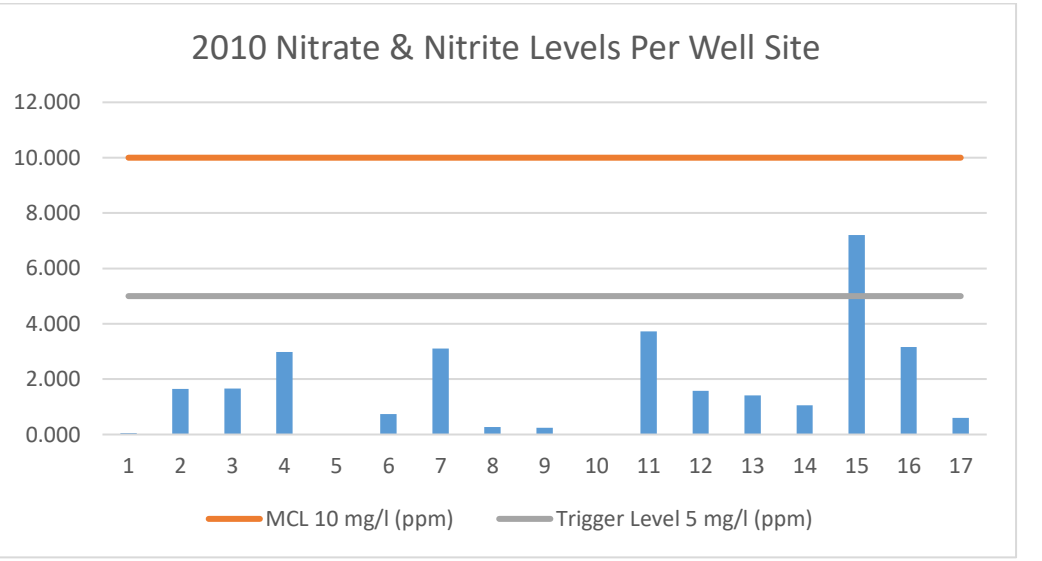


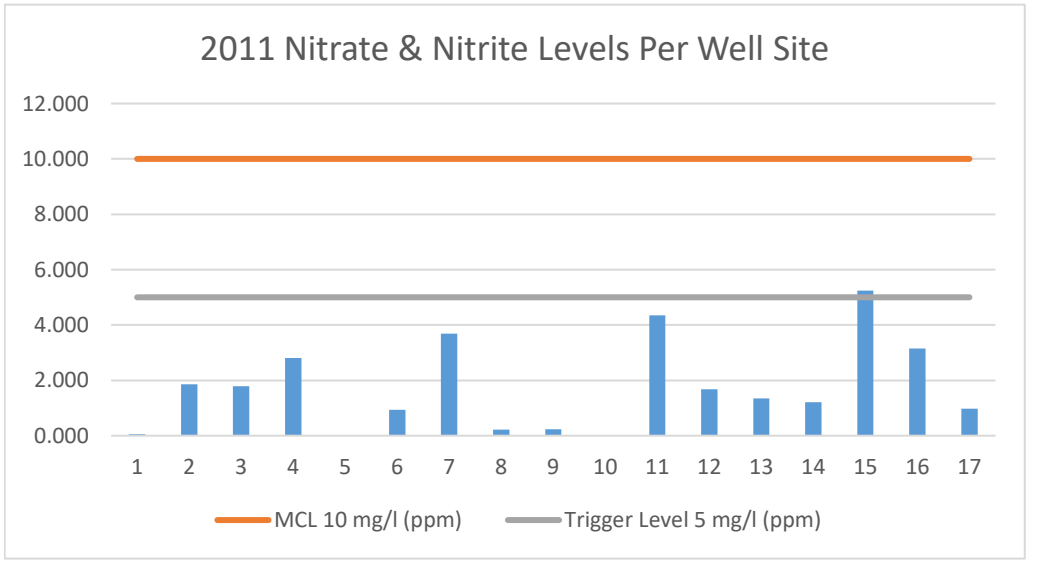
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
1	12.4	13.5	14.3	13.4	13.4	13.1	13.7	13.2	13.9	13.9	13.2
2	12.7	13.7	14.1	13.3	0	12.9	13.5	12.7	13.4	14	13.2
3	10.7	10.3	10.8	10.6	11.7	11.2	10.3	10.7	10.8	11.1	11.2
4	16.9	17.2	17.2	16.8	17.2	15.8	15.2	15.5	15.2	15.8	16.2
5	12.6	13.3	14.1	0	0	0	0	0	0	0	0
6	3.96	3.74	3.65	3.38	3.68	3.88	4.18	3.98	4.65	3.87	3.93
7	13.8	12.7	12.2	14	14.5	14.2	14.2	13.9	14.7	13.8	13.8
8	1.76	1.74	1.87	1.74	1.86	1.53	1.78	1.62	1.91	1.9	2.08
9	1.77	1.69	1.86	1.69	1.9	1.58	1.71	1.58	1.74	1.8	1.64
10	14.4	14.3	16	15.8	14.8	14.2	0	0	0	0	0
11	19.3	19.4	20	18.7	18.6	18.6	20.3	18.8	17.9	18.6	18.9
12	18	17.9	19.8	17.8	19.2	18.8	18.7	18.2	18.6	18.8	18.7
13	12.1	12.8	13.4	12.6	12.7	12.4	13.2	12.7	13.2	13.2	13.9
14	6.93	7.39	7.95	7.92	7.94	8.73	8.04	7.73	7.97	8.74	8.04
15	25.4	25.2	28.9	29.8	28.9	26.3	29.6	22.6	21.4	38.1	37.2
16	19.3	19.6	18.7	17.3	17.1	16.9	19.1	19.1	18.3	18.7	17.8
17	4.9	5.65	6.3	4.72	4.7	5.26	5.67	5.87	5.42	4.99	5.04

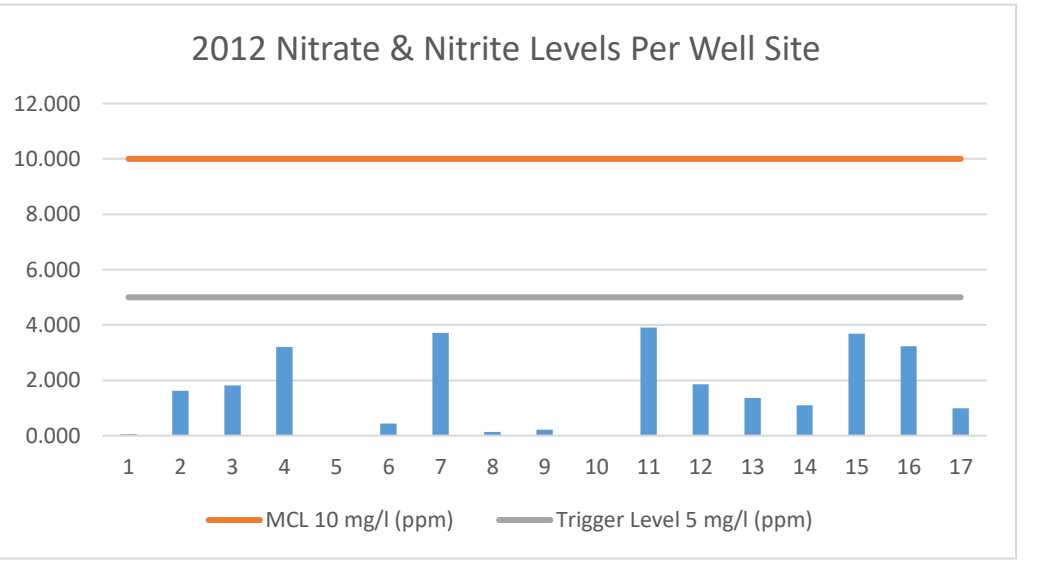
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Magnesiun	37.2	38.1	21.4	22.6	29.6	26.3	28.9	29.8	28.9	25.2	25.4

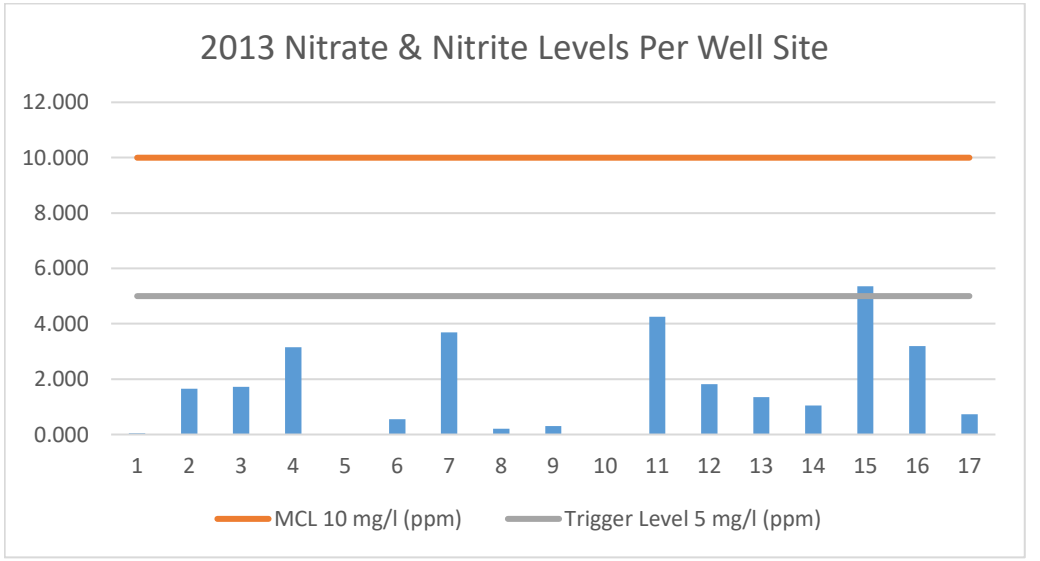


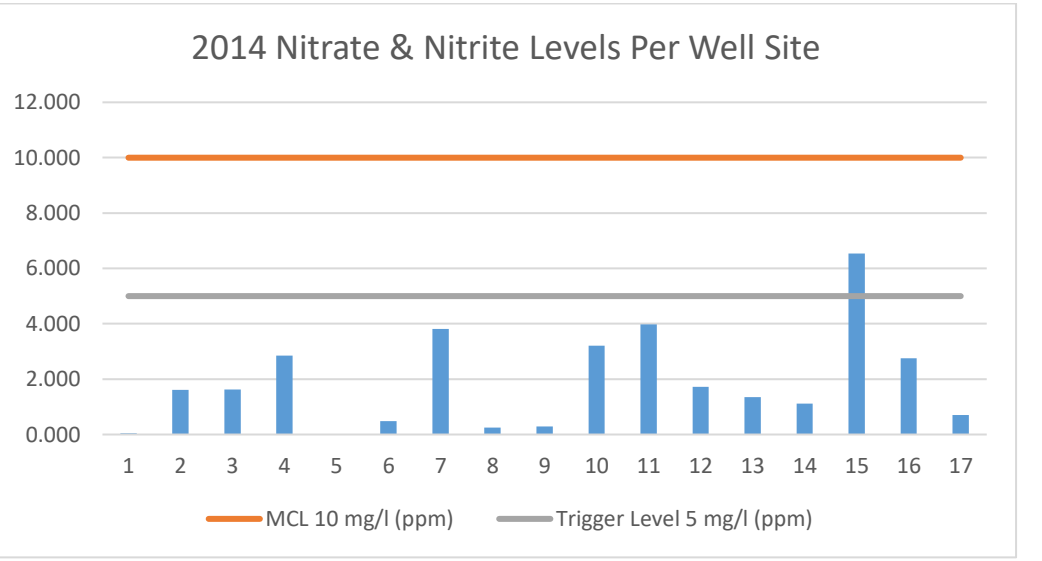

2009 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

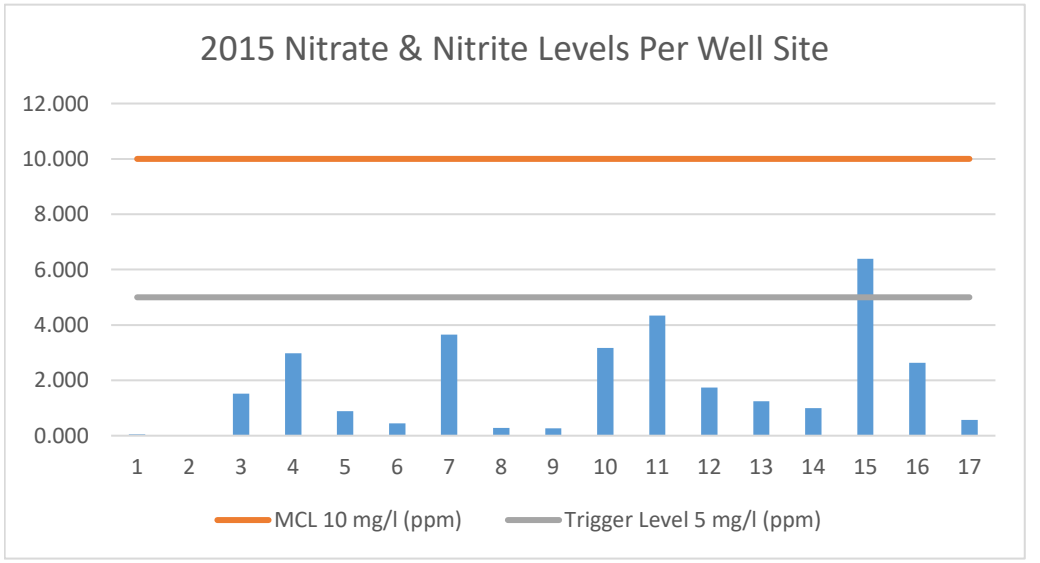

2010 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

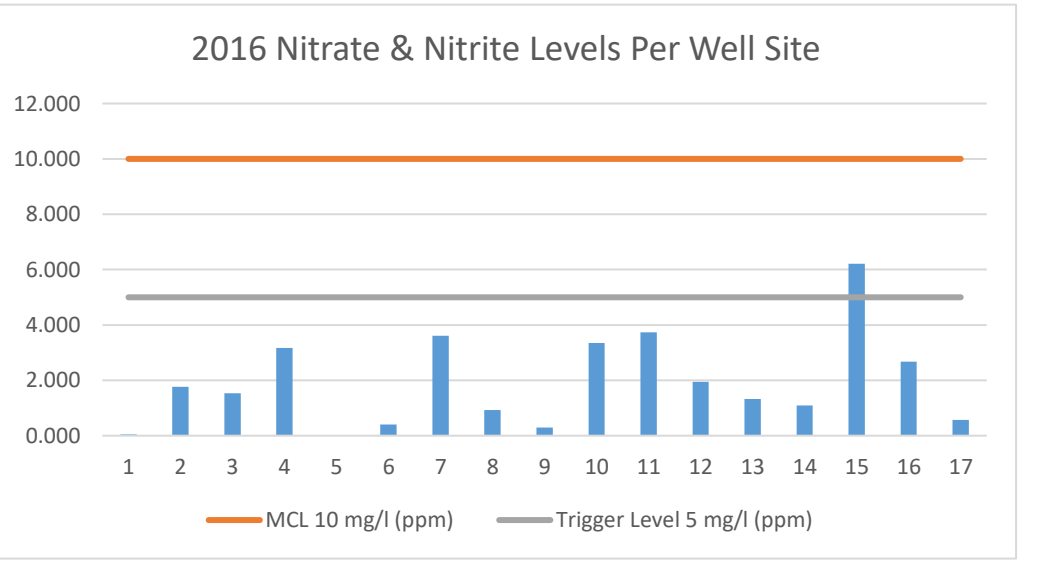

2011 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

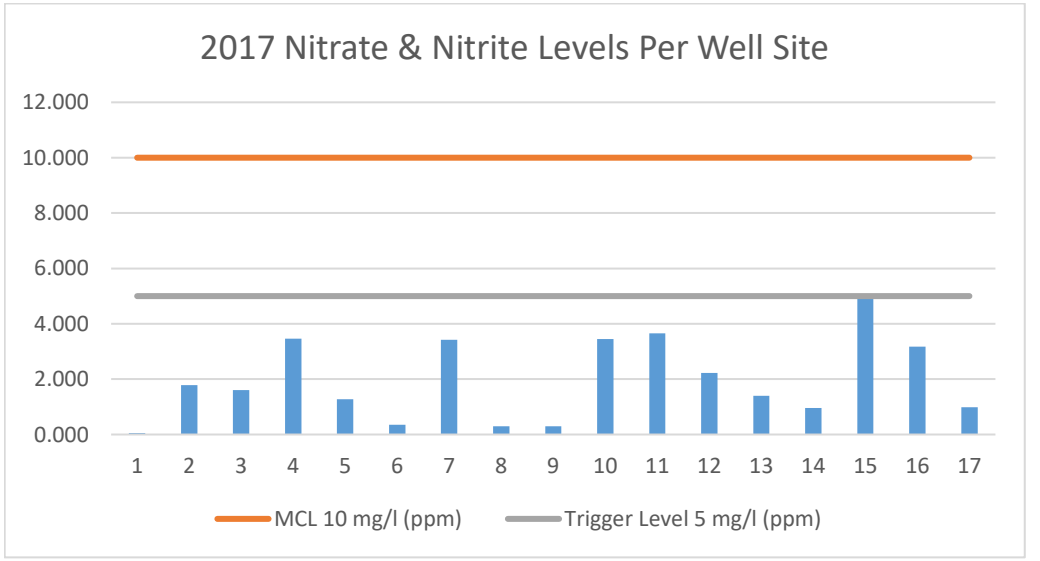

2012 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

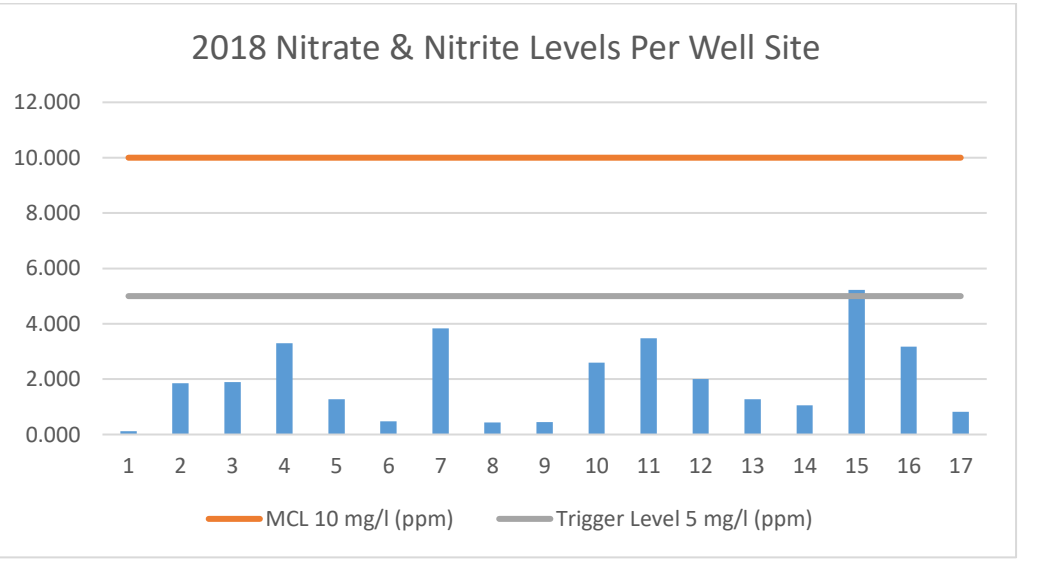

2013 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

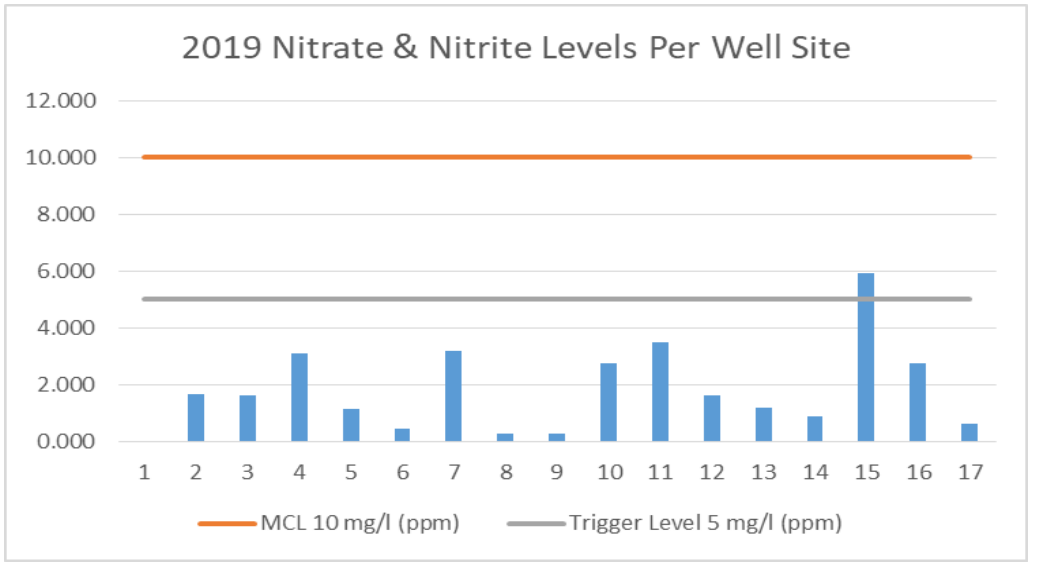

2014 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)


2015 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

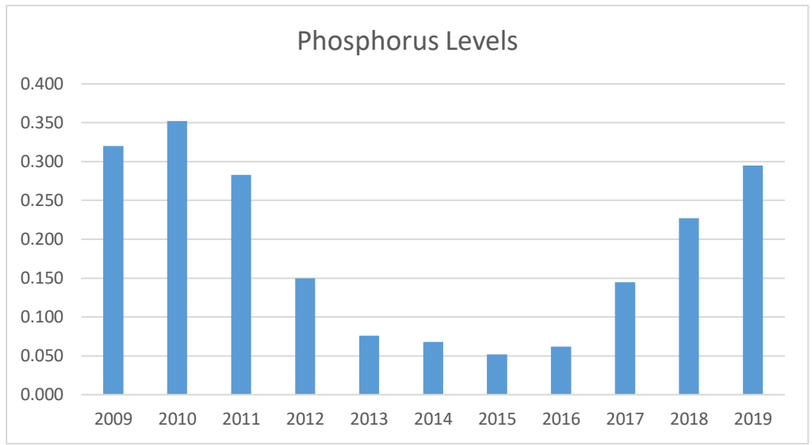

2016 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)


2017 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)


2018 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

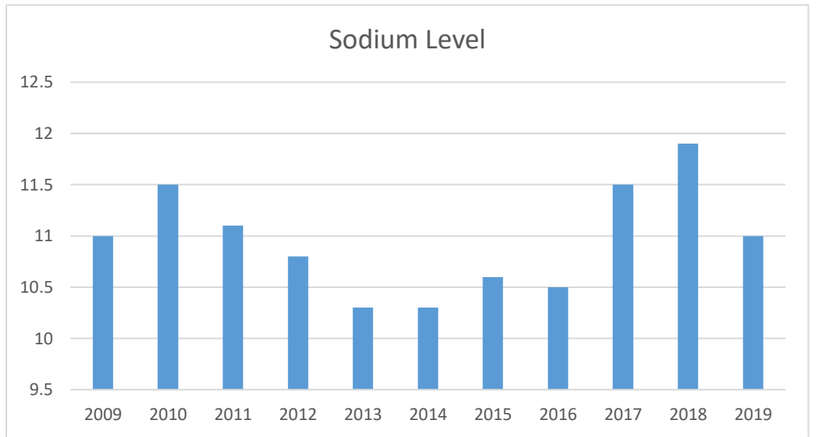

2019 Nitrate & Nitrite Levels Per Well Site
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
MCL 10 mg/l (ppm)
Trigger Level 5 mg/l (ppm)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.320	0.352	0.283	0.150	0.076	0.068	0.052	0.062	0.145	0.227	0.295
2	0.009	0.007	0.012	0.007	0.008	0.005	0.000	0.005	0.006	0.005	0.008
3	0.013	0.010	0.013	0.017	0.012	0.012	0.008	0.012	0.010	0.013	0.010
4	0.013	0.012	0.016	0.021	0.015	0.014	0.013	0.014	0.011	0.015	0.017
5	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.005	0.013	0.007
6	0.005	0.005	0.006	0.005	0.034	0.003	0.004	0.003	0.004	0.003	0.013
7	0.013	0.012	0.013	0.014	0.013	0.013	0.015	0.016	0.011	0.014	0.011
8	0.032	0.020	0.025	0.023	0.020	0.019	0.013	0.014	0.018	0.016	0.012
9	0.012	0.012	0.013	0.012	0.013	0.011	0.011	0.011	0.012	0.010	0.012
10	0.000	0.000	0.000	0.000	0.000	0.009	0.017	0.008	0.010	0.011	0.008
11	0.031	0.021	0.022	0.022	0.021	0.023	0.019	0.020	0.020	0.020	0.020
12	0.004	0.007	0.005	0.005	0.004	0.005	0.004	0.006	0.007	0.007	0.006
13	0.005	0.006	0.005	0.004	0.004	0.004	0.003	0.002	0.004	0.004	0.002
14	0.011	0.009	0.011	0.028	0.010	0.012	0.013	0.022	0.013	0.013	0.017
15	0.071	0.060	0.064	0.052	0.053	0.052	0.049	0.059	0.044	0.044	0.049
16	0.007	0.008	0.007	0.007	0.008	0.007	0.008	0.008	0.006	0.009	0.008
17	0.005	0.004	0.003	0.007	0.003	0.004	0.002	0.002	0.003	0.003	0.004



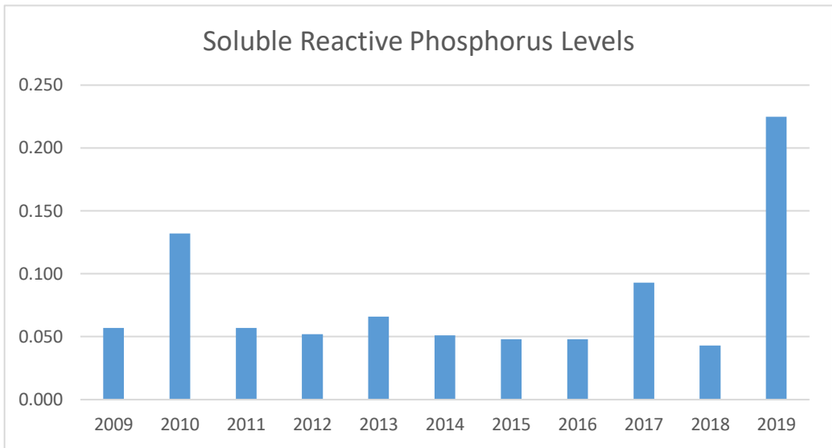
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
1	10.5	10.7	10.8	10.5	10.6	10.3	10.3	10.8	11.1	11.5	11
2	4.31	4.3	7.07	3.77	0	3.67	3.7	3.82	3.88	3.93	3.79
3	4.46	4.39	4.35	4.1	4.42	4.53	4.24	4.25	5.56	4.58	4.88
4	8.74	9.08	8.33	7.82	7.44	7.28	7.65	7.16	7.22	8.09	8.07
5	3.02	3.41	3.11	0	0	0	0	0	0	0	0
6	2.29	2.2	2.1	2.06	2.02	1.73	0.12	1.93	2.27	2.38	2.01
7	6.11	6.15	6.32	6.21	6.2	5.91	5.99	6.2	6.36	5.74	6
8	2.74	2.57	2.67	2.46	2.62	1.72	1.97	2	2.08	2.17	2.78
9	2.72	2.51	2.67	2.45	2.65	1.8	2.06	1.96	1.81	2.08	1.94
10	8.51	7.83	7.96	7.78	7.51	7.62	0	0	0	0	0
11	11	10.6	10.3	9.77	9.3	9.39	10.2	9.08	9.81	9.44	9.9
12	3.19	3.29	3.46	3.22	3.2	3.05	3.12	3.17	2.37	3.13	3.26
13	3.07	3.17	3.01	2.79	2.81	2.77	2.98	2.72	2.92	2.98	3.17
14	2.71	2.73	2.97	2.71	2.74	2.68	2.46	2.59	2.51	3.15	2.81
15	9.14	11.9	11.5	8.7	9.64	9.55	8.87	11.5	10.4	9.57	10.5
16	7.98	8.04	7.24	6.47	6.4	6.54	7.12	6.71	6.65	6.49	6.66
17	2.71	2.83	2.68	2.22	2.17	2.4	2.49	2.39	2.25	2.15	2.12

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Level	11	11.5	11.1	10.8	10.3	10.3	10.6	10.5	11.5	11.9	11

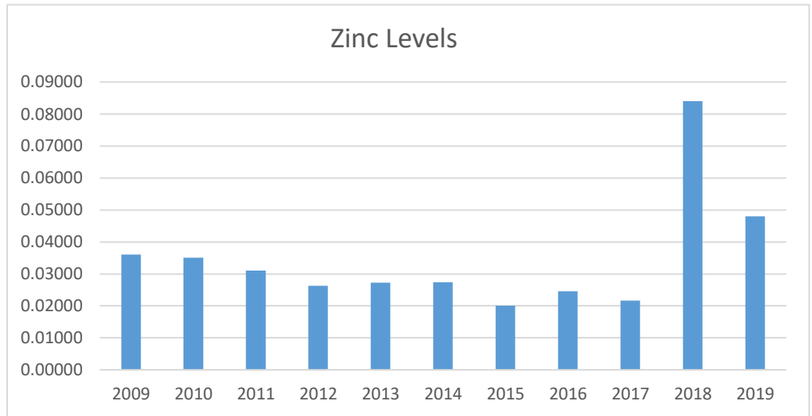


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.040	0.132	0.052	0.038	0.066	0.040	0.038	0.025	0.093	0.040	0.225
2	0.006	0.006	0.006	0.005	0.005	0.005	0.000	0.003	0.003	0.004	0.005
3	0.013	0.009	0.012	0.012	0.009	0.008	0.008	0.010	0.009	0.009	0.008
4	0.013	0.012	0.012	0.020	0.012	0.012	0.012	0.013	0.010	0.012	0.010
5	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004	0.003	0.005
6	0.003	0.003	0.003	0.002	0.001	0.002	0.002	0.001	0.001	0.002	0.003
7	0.010	0.011	0.012	0.012	0.011	0.012	0.011	0.014	0.010	0.011	0.011
8	0.025	0.020	0.019	0.021	0.015	0.016	0.012	0.011	0.017	0.015	0.012
9	0.010	0.012	0.010	0.009	0.010	0.011	0.010	0.009	0.010	0.010	0.011
10	0.000	0.000	0.000	0.000	0.000	0.008	0.008	0.006	0.006	0.007	0.007
11	0.028	0.020	0.020	0.021	0.021	0.021	0.019	0.019	0.018	0.018	0.018
12	0.002	0.003	0.002	0.003	0.002	0.002	0.001	0.003	0.003	0.001	0.002
13	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.001	0.002	0.001	0.002
14	0.007	0.008	0.008	0.010	0.009	0.008	0.007	0.009	0.007	0.007	0.007
15	0.057	0.051	0.057	0.052	0.049	0.051	0.048	0.048	0.044	0.043	0.040
16	0.006	0.006	0.006	0.012	0.006	0.006	0.007	0.006	0.005	0.004	0.005
17	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.057	0.132	0.057	0.052	0.066	0.051	0.048	0.048	0.093	0.043	0.225



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.00500	0.00500	0.00500	0.00500	0.01000	0.00500	0.00500	0.05000	0.02000	0.08400	0.04800
2	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00000	0.00500	0.00500	0.00500	0.00500
3	0.00500	0.00500	0.01000	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
4	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
5	0.00500	0.00500	0.00500	0.00500	0.00000	0.00000	0.00000	0.00000	0.00000	0.01000	0.00500
6	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
7	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
8	0.03580	0.02540	0.00640	0.00730	0.01880	0.01400	0.02000	0.01540	0.01220	0.00600	0.01600
9	0.03610	0.03510	0.03110	0.02630	0.02730	0.02740	0.02000	0.02460	0.02160	0.02800	0.02600
10	0.00000	0.00000	0.00000	0.00000	0.00000	0.01000	0.01000	0.00770	0.00500	0.00500	0.01500
11	0.00581	0.00691	0.01980	0.01020	0.01410	0.01340	0.01000	0.00920	0.01060	0.00800	0.01000
12	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
13	0.00500	0.00759	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.01900	0.00500
14	0.00500	0.00500	0.00500	0.00500	0.00500	0.01000	0.00500	0.00500	0.00500	0.00500	0.00500
15	0.00500	0.00534	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
16	0.00729	0.00500	0.01000	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500
17	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500	0.00500



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	0.03610	0.03510	0.03110	0.02630	0.02730	0.02740	0.02000	0.0246	0.02160	0.08400	0.04800
Level 5 mg/l (ppm)	5	5	5	5	5	5	5	5	5	5	5