ARUP

County of Sonoma

OWTS Mapping and Analysis Study

Mapping Study Report

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Lower Russian River Trail, Sonoma County Regional Parks © County of Sonoma

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Contents

Tables

Figures

Appendices

1. Executive Summary

This report provides a comprehensive high-level analysis of Onsite Wastewater Treatment Systems (OWTS), also known as septic systems, across Sonoma County. The purpose of this report and the study which it summarizes is to provide a better understanding of the distribution of OWTS countywide to identify the challenges and opportunities relating to wastewater treatment.

The study explored the countywide landscape of wastewater treatment in detail, including mapping existing wastewater treatment plant locations and distributions of OWTS. The study identified the presence of **36,246 parcels with OWTS** across the county, with the highest concentrations in larger rural settlements, including the areas surrounding Sebastopol, Forestville, and Monte Rio.

OWTS permit data was processed to remove duplicates and overlaid on County parcels, resulting in **12,504 known OWTS** parcels. However, more than half of OWTS were found not to be recorded in the permit database. These 'suspected' OWTS were identified by modeling parcels outside of cities and sanitation districts which contained a building and land uses which indicated wastewater production. This led to the identification of **23,742 parcels with suspected OWTS**, nearly double the number of known OWTS parcels. Variations were identified in the relative distributions of known and suspected OWTS across Sonoma County, with higher proportions of suspected OWTS in the western and central parts of the county, and higher proportions of known OWTS in eastern areas.

Land ownership and use patterns were explored by the study. The presence of OWTS was not found to be significant on publicly owned parcels. The study specifically reviewed OWTS in relation to vacation properties considering the different patterns of water use compared to permanent residential properties. While the overall number of permitted vacation properties was found to be small, the likely higher and more seasonal wastewater loads mean that these properties provide opportunities to consider alternative wastewater treatment approaches.

Based on the evaluation of relative densities of parcels containing OWTS, areas within the county were identified as high, medium, and low OWTS density. Countywide, 9% of single-family homes, 3% of multi-family homes, and 1% of commercial properties currently contain high density parcels which use OWTS. This density analysis enabled the evaluation of potential wastewater treatment alternatives at a community level, as areas with higher density parcels represent greater opportunities for consideration of alternatives. For more detail about the existing wastewater treatment systems across the county, refer to Section 3.

Through a comprehensive and detailed mapping and analysis methodology, described in detail in Section 6, the study explores various opportunities and challenges relating to OWTS. These opportunities and challenges are described in Section 4 and include governance considerations such as the creation of community services districts, merging community clusters with an existing governance entity or creating a new special district, and technical considerations such as distances and elevations relative to existing wastewater treatment plants, measures of parcel density, land uses, slopes, soil types, and proximity to environmental and water receptors.

Settlements and communities across Sonoma County each demonstrate unique characteristics that mean that a single countywide intervention would not be appropriate. Therefore, a community characterization analysis, described in Section 5, was carried out to identify areas with shared characteristics within the study area to identify potential interventions. The community clusters described by this study are not designed to reflect settlement boundaries, and they are also not intended to be a final determination of community wastewater collection and treatment boundaries. The data and maps developed by this study could be used at county or local scales to identify additional community clusters.

Based on the clustering analysis, the study identified and proposed 47 community clusters across Sonoma County. This report presents the detailed examination of a set of nine prioritized community clusters considering higher parcel density to identify more concentrated settlements, greater technical potential for alternative

interventions, and potential Disadvantaged Community status to identify locations which may be eligible for grant funding. For these nine clusters, the report explores the potential for implementing alternative and community-based wastewater treatment technologies in different locations. For each of these areas and more broadly, the report also describes the feasibility of modifying existing governance structures and boundaries to manage and support community wastewater needs. Based on the literature review completed as part of this study, community involvement was identified as a key factor in successful implementation of wastewater treatment alternatives.

The report concludes by suggesting next steps to continue identifying wastewater treatment alternatives in Sonoma County. In summary, these include community and stakeholder engagement, further detailed reviews of the prioritized community clusters, evaluation of funding opportunities, surveys and pilot programs and potentially integrate this work into other planning, policy, and regulatory initiatives.

2. Introduction and Background

The purpose of this report is to help the County and communities understand the current landscape of Onsite Wastewater Treatment Systems (OWTS) across Sonoma County. It describes the extent and density of OWTS across Sonoma County, examine possible wastewater solutions for existing OWTS, and explores how existing governance structures can be transformed, expanded, or otherwise used to address properties that currently have no governance support to address potential issues arising from the use of OWTS.

This study aims to provide more clarity around the challenges and opportunities pertaining to septic systems and wastewater solutions in Sonoma County. It reviews existing wastewater collection and treatment countywide and explores the feasibility of creating or modifying existing governance boundaries to manage and support community wastewater needs.

An improved understanding of the OWTS locations and context across the county will enable organizations and individuals to identify alternatives that can reduce the potential impacts of OWTS, including pathogen pollution, in turn aiding in maintaining clean surface water and fulfilling environmental responsibilities. The collective impact of OWTS on communities and the environment can be reduced by taking a community-driven approach to manage wastewater needs effectively.

This study was developed to be scientific and deeply technical and was reviewed by staff representing the County of Sonoma and the North Coast Regional Water Quality Control Board[1]. The outcomes of the study are presented in this report.

- This section describes OWTS and the study area and design criteria.
- Section 3 describes the landscape of existing wastewater treatment systems across the county, including wastewater treatment plants and observations on the distribution of OWTS.
- Section 4 describes the high-level opportunities and challenges relating to OWTS in Sonoma County.
- Section 5 presents a detailed analysis of nine prioritized locations for potential alternative wastewater treatment solutions.
- Section 6 describes the technical processes and methodologies used by the analysis, including the datasets used.

[1] Note that the North Coast Regional Water Quality Control Board and San Francisco Bay Regional Water Quality Control Board, both mentioned periodically by this report, form two regions of the California State Water Resources Control Board.

2.1 Onsite Wastewater Treatment Systems

OWTS are often referred to as septic systems. They serve an essential function in a range of different types of location. As the California OWTS Policy [1] states, they "are useful and necessary structures that allow habitation at locations that are removed from centralized wastewater treatment systems. When properly sited, designed, operated, and maintained, OWTS treat domestic wastewater to reduce its polluting impact on the environment and most importantly protect public health."

Elevated levels of pollutants can have severe impacts on the surface water quality and overall ecosystem of a watercourse. Even when treated, wastewater pollution can increase the levels of pathogens, harmful bacteria, nutrients, algae, and sewage fungus in rivers. An excess of nutrients, such as phosphorus or nitrogen, can lead to algal blooms, reducing oxygen levels in the water which can suffocate fish, plants, and invertebrates.

The State Water Resources Control Board has sought to implement Total Maximum Daily Load (TMDL) thresholds to protect waterways from elevated levels of pollutants. Livestock, sanitary sewer overflows, and OWTS, among others, have all been cited as potential sources of pathogen or bacteria pollutant discharge into waterways. When the threshold is exceeded for a pollutant, an action plan to address the exceedance is implemented by the State Water Resource Control Board. Two major watersheds in Sonoma County have TMDL Action Plans for pathogens or bacteria, Sonoma Creek, and Petaluma River, with Russian River under development.

OWTS, like any infrastructure, have a defined design life. All wastewater collection and treatment systems will eventually fail and will need maintenance, repairs, and ultimately, replacement. Systems which are failing or in need of maintenance may be harmful for water quality and human health, as pollutants may escape into surface water systems and watercourses. In spite of this, OWTS form an essential part of the wastewater infrastructure in Sonoma County and many of the issues relate to failing OWTS. As this report will describe, insufficient data was available to this study describing the condition and maintenance history of specific OWTS, so it is not possible to report solely on failing OWTS. This report therefore focuses more broadly on OWTS countywide.

2.2 Study Area

This study examines the whole of Sonoma County, but with a particular focus on the three rivers covered by existing or anticipated TMDL restrictions. These three rivers are:

- Sonoma Creek, where the Basin Plan amendment incorporating a TMDL was adopted by the San Francisco Bay Regional Water Quality Control Board in June 2006 and approved by the U.S. Environmental Protection Agency in February 2008[2]; and
- Petaluma River, where the Basin Plan amendment to establish a TMDL was adopted by the San Francisco Bay Regional Water Quality Control Board in June 2020[3].
- Russian River, where the North Coast Regional Water Quality Control Board is currently considering approval of amendments to the Basin Plan which would incorporate a TMDL[4];

The areas of land adjacent to these rivers and their tributaries which are impacted by the TMDL restrictions are described by three Advanced Protection Management Program (APMP) documents. The definition of each of these varies slightly[5], and all three are shown in Figure 1:

[2] See Sonoma Creek Pathogens TMDL.

[3] See Petaluma River Bacteria TMDL.

[4] See Russian River | California Northcoast Regional Water Quality Control Board.

[5] Geographic Information System (GIS) datasets for all three APMP zones and the Pathogen Impaired Stretches of Russian River were provided to this study by the State Water Resources Control Board. The datasets for the previously anticipated Russian River APMP and Pathogen Impaired Stretches of

- Sonoma Creek APMP is defined as the entire creek watershed.
- Petaluma River APMP is defined as a 200-foot buffer from the river edge.
- Russian River APMP is currently under development. The previously anticipated Russian River APMP was developed using water quality data and is defined based on the parcel boundaries within the previously anticipated APMP. At the time of writing, the updated anticipated APMP has not yet been finalized. When complete, it is expected to cover a smaller geographical extent formed around the centerlines of the pathogen impaired stretches of Russian River, shown in Figure 2. This study has continued to use the previously anticipated APMP to enable the analysis and discussion to cover a broader area of Sonoma County.

Since cities and sanitation districts already have wastewater collection and treatment facilities available, these do not form a heavy focus of this report, however this study does note that some OWTS are located within city boundaries. This is discussed more in Section 3.2.

Russian River were provided to this study by the North Coast Regional Water Quality Control Board. The GIS datasets for Sonoma Creek APMP and Petaluma River APMP were provided by the San Francisco Bay Regional Water Quality Control Board.

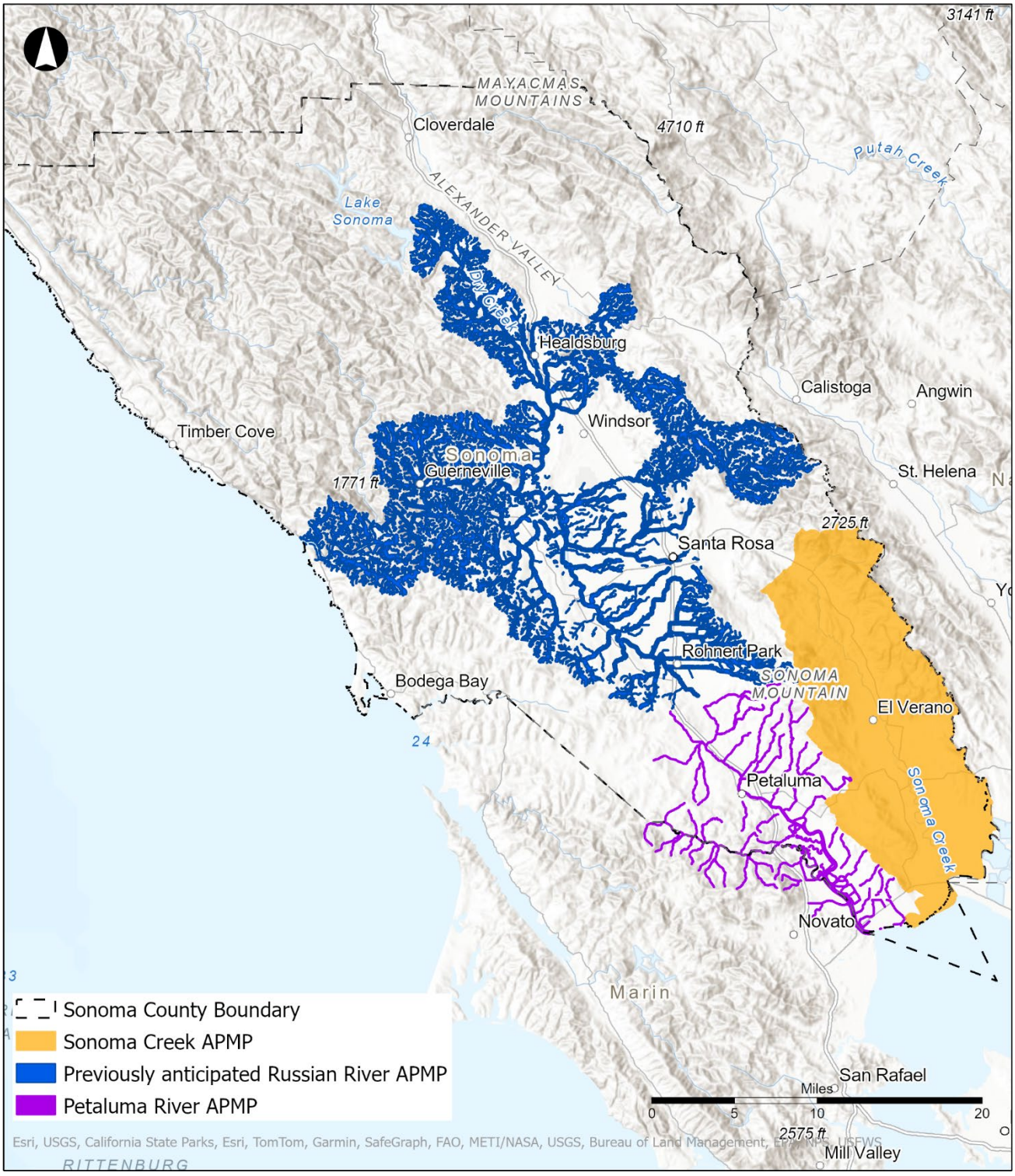

Figure 1 Existing and previously anticipated APMP zones with TMDL restrictions within Sonoma County.[6]

[6] Note that each APMP boundary is defined by slightly different criteria, depending on the local requirements of the watershed. These are described in detail in Section 2.2.

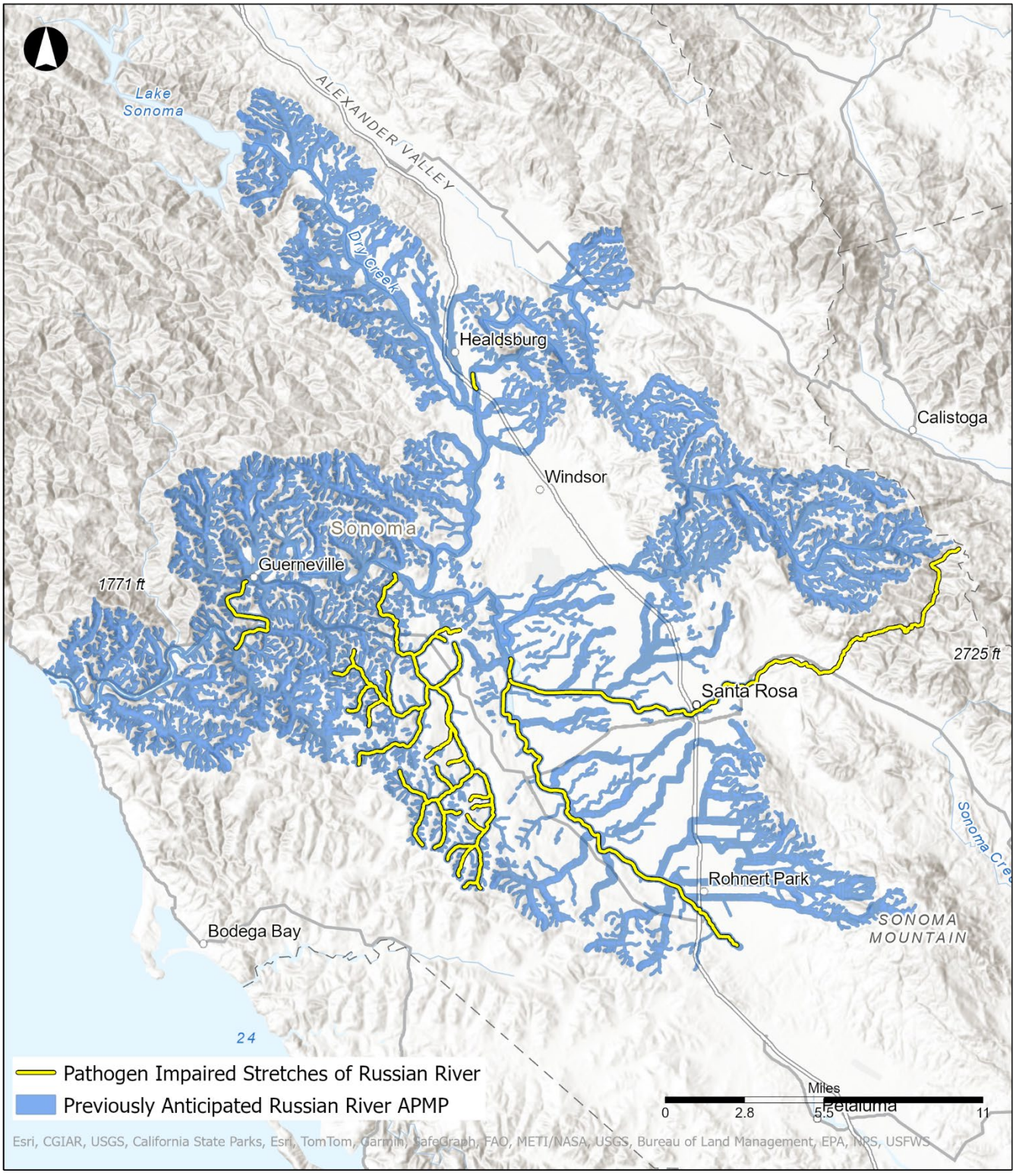

Figure 2 Previously anticipated Russian River APMP and pathogen impaired stretches of Russian River

The Sonoma County Board of Supervisors serves as the governing body of Sonoma County and of various special jurisdictions such as the Sonoma County Water Agency and County Sanitation Districts[7]. It contains five Districts, each of which elects one supervisor to the board. These Districts are used by this study to describe areas of focus within the county throughout this report and are illustrated in Figure 3.

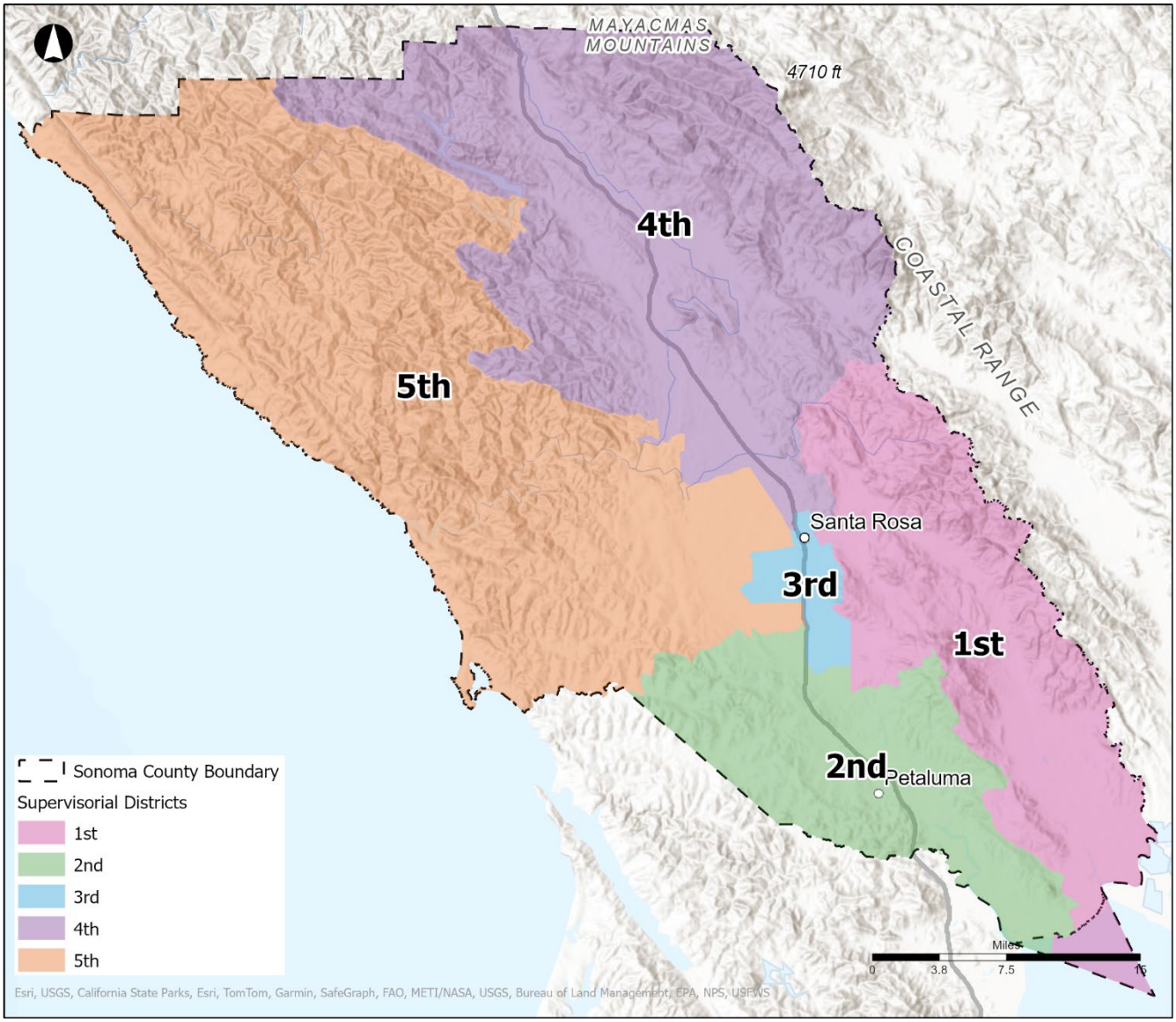

Figure 3 Supervisorial Districts in Sonoma County

[7] Refer to About the Board for more information about the Board of Supervisors.

2.3 Study Design Criteria

This sub-section describes the key parameters and criteria used by this study. It demonstrates how the study design was informed by a literature review and an understanding of existing conditions and outlines the community characterization analysis which is then described in subsequent sections of this document. For the purposes of this study, it was necessary to define design criteria which were informed by the challenges and opportunities presented by wastewater treatment alternatives. These required a mixture of quantitative and qualitative analysis based on a core understanding of the distribution of OWTS, infrastructure, governance structures, and other items across Sonoma County.

2.3.1 Existing Wastewater Treatment Systems

As an initial step, this study was required to describe the existing distribution of OWTS and other wastewater infrastructure across Sonoma County. To achieve this, Section 3 of this document will describe the current use of wastewater treatment systems, including OWTS, countywide, with discussion of the distribution patterns and trends. Existing locations of wastewater treatment plants are described, followed by known and suspected OWTS locations and density measures, and patterns by ownership and property type. The methodologies used to identify OWTS locations and visualize density are described in Section 6.1.

2.3.2 Opportunities and Challenges

The high-level opportunities and challenges relating to wastewater treatment alternatives form a core part of this study. The initial questions which were used to form this approach and frame subsequent parts of the study are listed in Appendix A. To address these to the greatest extent possible, this study performed a literature review investigating existing documentation and prior studies. This is summarized in Section 4 to provide information about opportunities to increase access to wastewater infrastructure, community solutions, or support. This includes exploring community-based wastewater alternatives to OWTS, such as connections to sewer, community or shared OWTS, or other alternative wastewater treatment technologies[8]. This review separates potential interventions as governance or technical considerations, forming a core design criterion for this study.

2.3.3 Community Characterization Analysis

This study uses small geographic units to describe the locations, densities, and governance structures affecting OWTS across Sonoma County. These groups of parcels are referred to as community clusters and are explored in more detail by Section 5. To better understand opportunities for grant funding, it was key for this study to help provide a description of the distribution of community clusters relative to Disadvantaged Communities[9].

Governance considerations for each community cluster include understanding available options, opportunities to provide ongoing management and support services, to combine areas into neighboring management districts and create new governance, and the impacts of parcel ownership on potential solutions[10]. The methodologies used to develop community clusters based on governance criteria are described in Section 6.2.1.

Technical considerations for each cluster include understanding opportunities to utilize shared or community OWTS, the impacts of wells on opportunities, locations of utility corridors and roads, impacts of population density, geographic boundaries, economic factors, and opportunities of recycling OWTS wastewater[11]. The methodologies used to evaluate clusters' technical scoring are described in Section 6.2.2.

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[8] This section covers question 1 in Appendix A.

[9] This study uses the definition for Disadvantaged Communities which is provided by the State Water Resources Control Board's Division of Financial Assistance. See https://www.waterboards.ca.gov/water_issues/programs/grants_loans/

[10] This section covers questions 2, 3, 4, 5, and 9 in Appendix A.

[11] This section covers questions 6, 7, 8, 10, 12, and 13 in Appendix A.

3. Existing Wastewater Treatment Systems

This section describes the existing wastewater treatment systems and their usage across Sonoma County. The first part describes the locations of wastewater treatment plants, while subsequent parts describe locations and patterns of OWTS.

This study identified 36,246 parcels with known or suspected OWTS across Sonoma County, with highest concentrations in the areas surrounding Sebastopol, Forestville, and Monte Rio, as illustrated in Figure 4. This section describes existing wastewater treatment plant locations, locations of known and suspected OWTS, patterns of OWTS by parcel ownership and vacation property status, and parcel density.

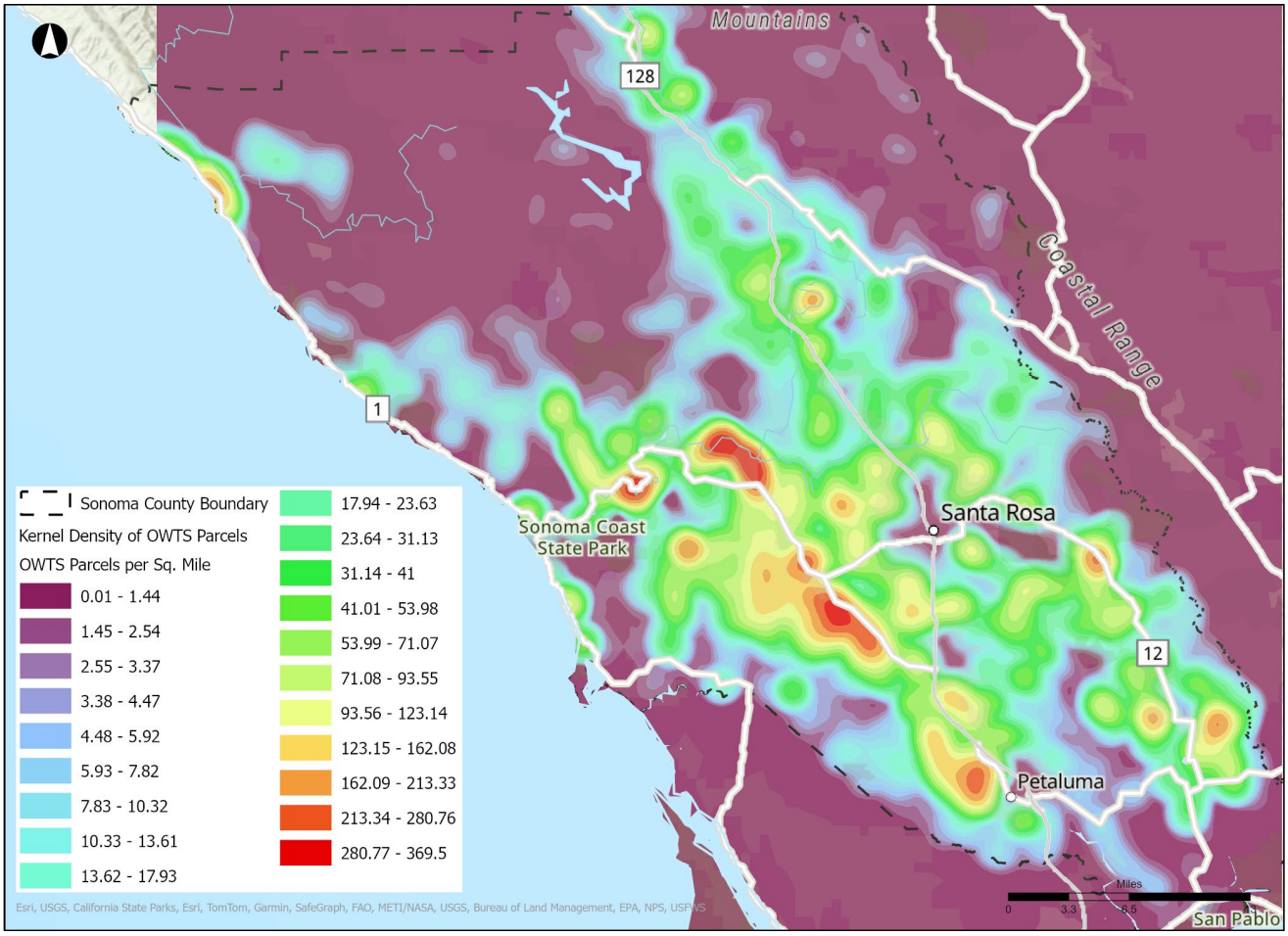

Figure 4 Map showing density of known and suspected OWTS parcels across Sonoma County

3.1 Wastewater Treatment Plants

Mapping the locations of existing wastewater collection and treatment plants is important to understand opportunities to connect communities to existing treatment facilities. This study reviewed public data sources and permit data and identified 15 existing wastewater treatment plants in Sonoma County. These are primarily distributed close to the areas of higher population in the county and are illustrated in Figure 5.

Figure 5 Locations of wastewater treatment plants in Sonoma County

3.2 OWTS Permits

The State Water Resources Control Board regulates OWTS and delegates permitting authority to local agencies. In Sonoma County, the agency responsible for issuing OWTS permits is Permit Sonoma. Their database contains 17,198 OWTS permits, categorized as residential, commercial, both residential and commercial, community, or other, with some uncategorized. The countywide counts of each dataset are described by Table 1.

Permits are also categorized as either standard or non-standard[12]. The standard category is used for OWTS consisting of a septic tank for primary treatment of sewage, followed by a system of drainfield trenches for subsurface dispersal of effluent into the soil. The non-standard category is used for other types, such as those which may not include a conventional septic tank, or methods of wastewater dispersal other than conventional drainfields. Non-standard systems may include alternative or experimental systems but, like standard systems, are approved under normal operating conditions for the protection of water quality and human health.

OWTS permit data may include records of multiple systems per parcel and multiple permits for the same system, including removal of systems. This study filtered the permit locations to remove duplicates and overlaid on County parcels, resulting in 12,504 known OWTS parcels.

[12] The numbers of standard and non-standard permits provided in subsequent tables refer to the total counts of each type within each dataset provided, however some standard OWTS were found to have been misclassified as non-standard and vice-versa. Where these numbers are reported separately for each category, they should therefore be regarded as indicative rather than precise indications of relative numbers of system types.

Table 1 Numbers of standard and non-standard OWTS permits by service type

Service Type	Number of Standard Permits[12]	Number of Non-Standard OWTS Permits[12]	Total
Residential	7,114	3,866	10,980
Residential and Commercial	4	3	7
Commercial	1,868	294	2,162
Community	2	6	8
Other or uncategorized	4,009	32	4,041
Total	12,997	4,201	17,198

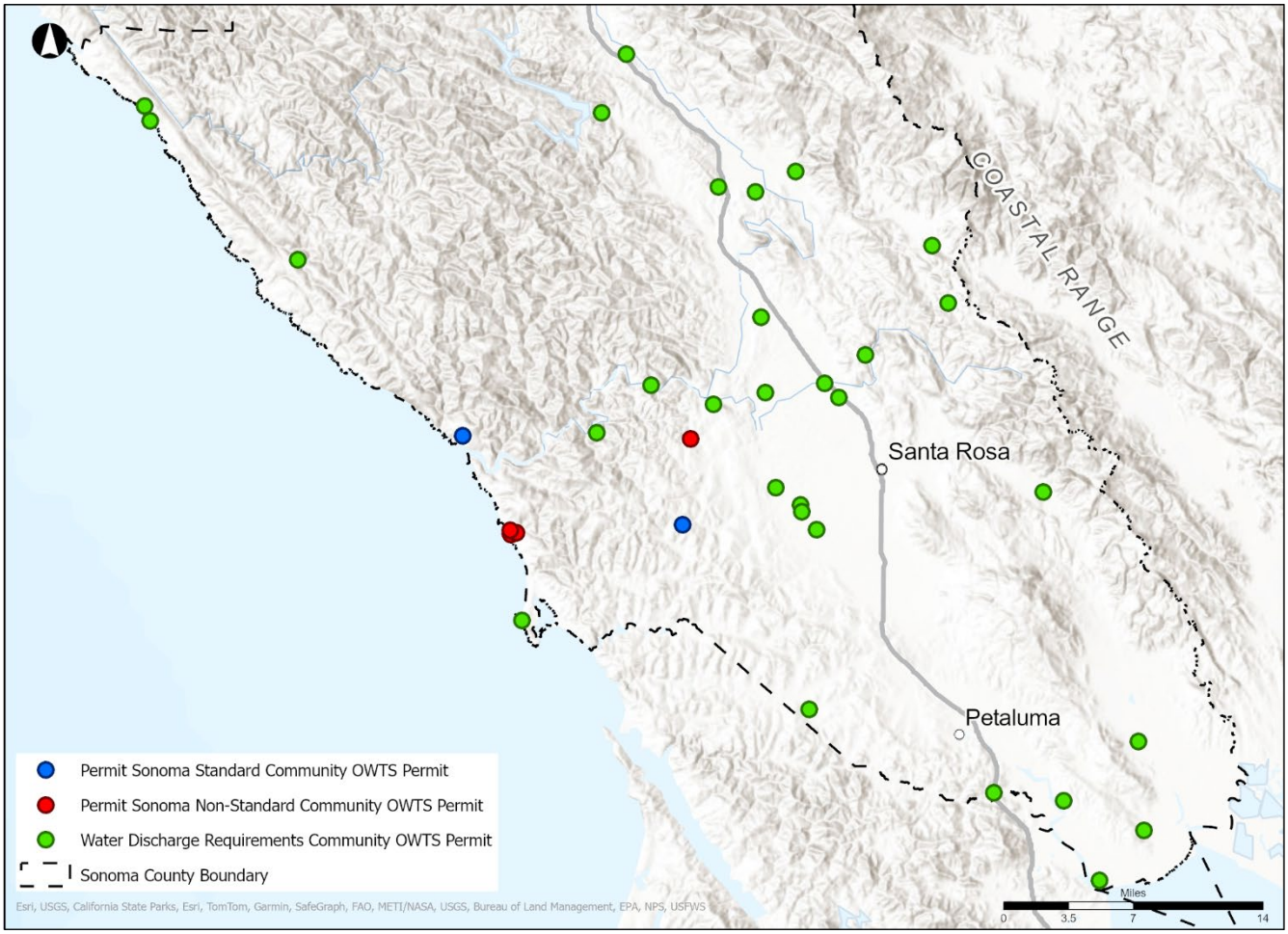

Figure 6 Shared or community OWTS locations

Community OWTS, also known as decentralized wastewater systems, are systems that treat wastewater from multiple buildings and dispose of the treated wastewater onsite. These systems are typically used in areas where centralized sewer systems are not available or are impractical. They can serve a variety of locations, from small clusters of homes in rural areas to large subdivisions or commercial developments.

In Sonoma County, existing community OWTS are split between two permitting agencies. Eight permits have been identified as having been issued by Permit Sonoma with a further 30 permits which have been issued by the

State Water Resources Control Board[13] through the Water Discharge Requirements program. These are shown in Figure 6.

Permit Sonoma also records a small number of permits which have been issued for locations within city boundaries, unincorporated County exclaves (areas which fall outside a city but are completely surrounded by its boundary[14] as illustrated in Figure 7), and sanitation districts. In total, 195 permits fall within cities and 103 in County exclaves, as presented in Table 2. An additional 446 OWTS permits fall within sanitation district boundaries. Since these locations are adjacent to existing centralized wastewater collection and treatment systems, there may be opportunities to connect them to nearby governance structures and treatment systems.

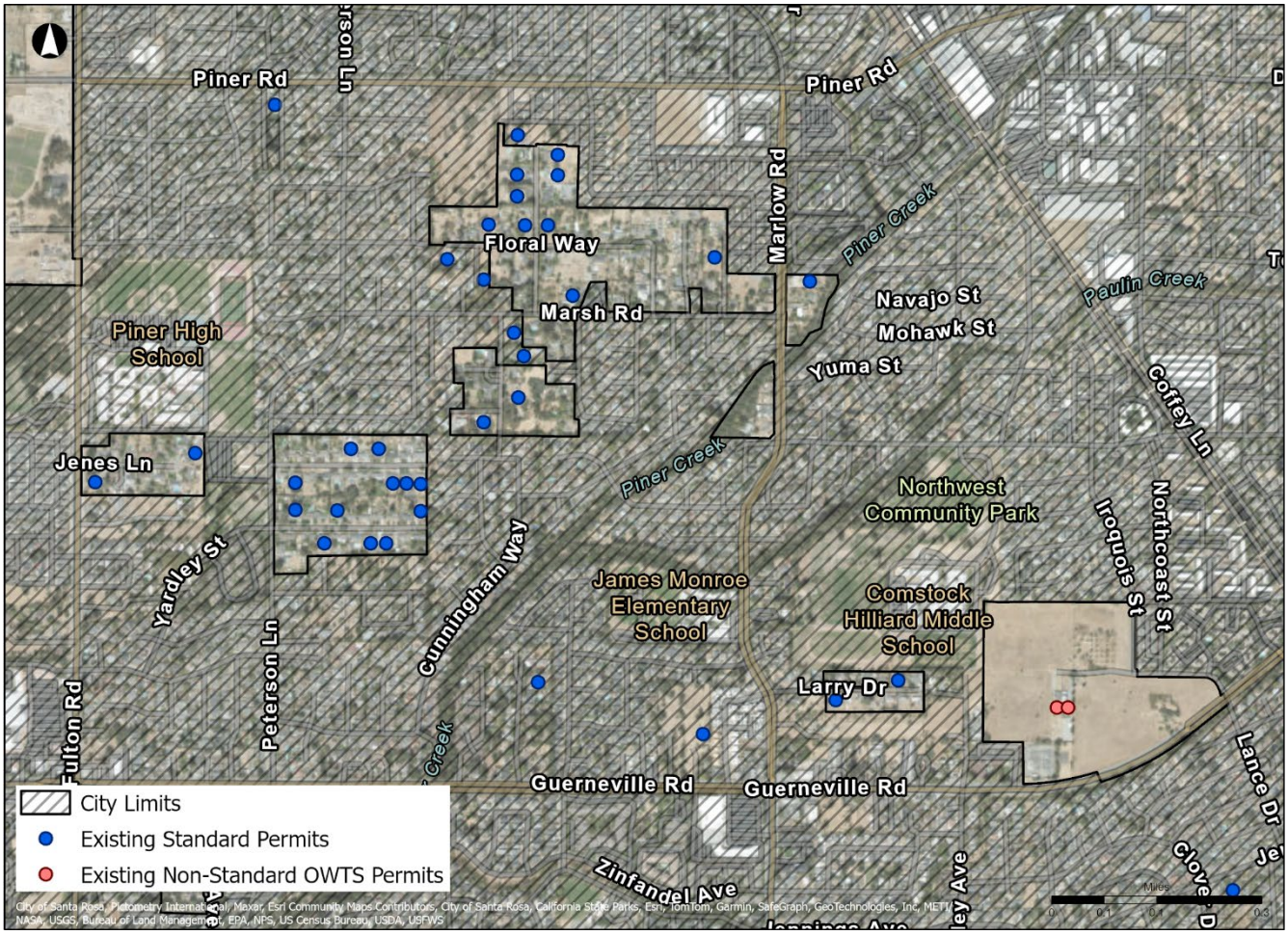

Figure 7 Examples of exclaves of unincorporated County within the City of Santa Rosa containing known OWTS parcels

The OWTS Policy [1] describes that while the vast majority of OWTS across the state are operating as intended, some have been found not to be adequately protecting water quality or public health. This includes instances of poor design, improper site conditions, or cumulative effects from multiple neighboring systems. These system failures are important to understand, however, permits are issued for installations, repairs, and removals of OWTS, so they do not provide sufficient information to describe the condition and current maintenance status of systems.

[13] State Water Resources Control Board permit data was sourced by this study from the California Integrated Water Quality System Project database under the Water Discharge Requirements program.

[14] Within Sonoma County, these "donuts" or "islands" only exist in the cities of Santa Rosa and Sonoma. Santa Rosa contains 48 exclaves, and Sonoma contains 3. These are relevant to this study since they frequently contain properties with OWTS permits.

Table 2 Numbers of standard and non-standard OWTS within cities by service type

City	Number of Septic Permits within City[12]	Number of Non-Standard OWTS within City[12]	Number of Septic Permits within County Exclaves[12]	Number of Non-Standard OWTS Permits within County Exclaves[12]	Total
Cloverdale	2	0	0	0	2
Cotati	7	2	0	0	9
Healdsburg	12	1	0	0	13
Petaluma	3	0	0	0	3
Rohnert Park	3	0	0	0	3
Santa Rosa	111	20	86	11	228
Sebastopol	7	0	0	0	7
Sonoma	9	3	4	2	18
Windsor	9	6	0	0	15
Total	163	32	90	13	298

3.3 Suspected OWTS

Permit Sonoma maintains a database of OWTS permits which dates back to 1991. Older records dating back to the 1960s are also held in non-digital formats, and prior to that, permits were not required for OWTS. Because of the complexity of scanning and interpreting the non-digital information, the scope of this study only allowed for compiling of digital OWTS records from the database. Therefore, the OWTS permits used only date from 1991 onwards. In order to include data prior to this date, an additional dataset of suspected OWTS parcels was developed. For each parcel outside of a city or sanitation district which was not already associated with an OWTS permit, this considered minimum building size, land uses, coverage by a sanitation district, and recorded localized soil nitrate levels. Full details of the process used to create this dataset are provided in Section 6.1.2.

The dataset of suspected OWTS parcels includes parcels with OWTS permits which predate 1991, parcels which had OWTS installed prior to the 1960s, and parcels which have OWTS but do not have a permit. Since it is based on modeled information, this dataset should not be expected to be a perfect representation of all parcels meeting these criteria, however it serves as a good indicator of the presence of OWTS where known OWTS data is not available. The completed dataset was checked and reviewed by staff from the County of Sonoma (including Permit Sonoma), and the North Coast Regional Water Quality Control Board.

The dataset of suspected OWTS parcels contains 23,742 parcels, nearly double the number of known OWTS parcels. There was some variation in distribution of known and suspected OWTS across the county. The western and central parts of the county have higher proportions of suspected OWTS, with 69% identified as suspected in the 2nd Supervisorial District and 68% in the 3rd and 5th Districts. The eastern parts of the county have lower proportions, with 61% in the 4th District and 59% in the 1st District. Numbers of known and suspected OWTS per Supervisorial District are shown in Figure 8.

As an illustration of localized patterns, known and suspected OWTS parcels in the area south of Sebastopol are shown in Figure 9.

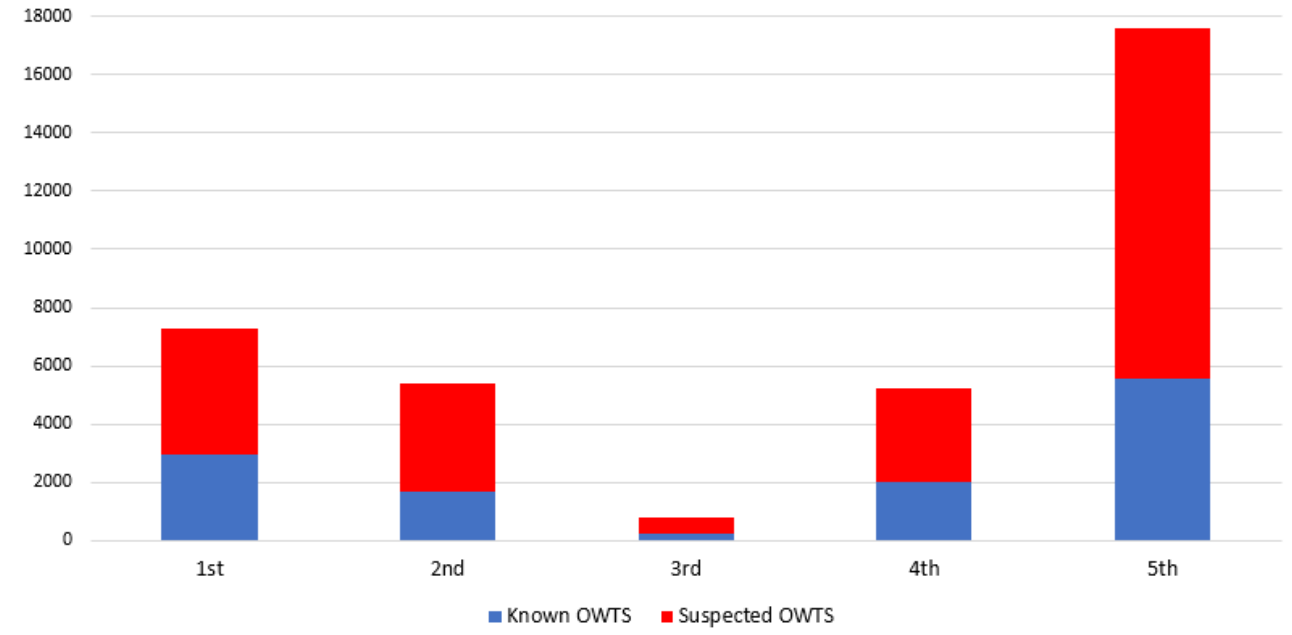

Figure 8 Numbers of known and suspected OWTS per Supervisorial District

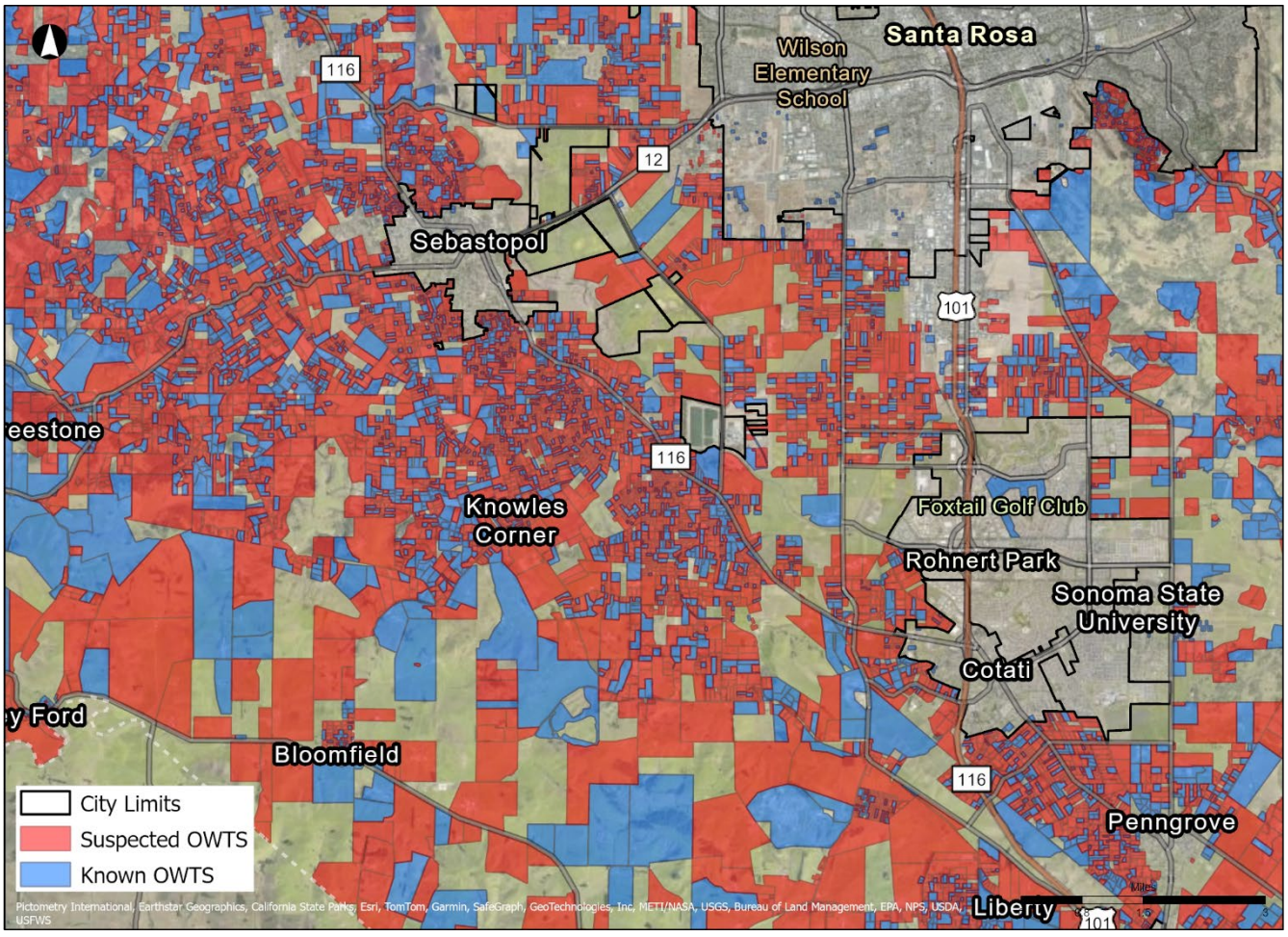

Figure 9 Examples of known and suspected OWTS Parcels south of Sebastopol

3.4 Publicly Owned Parcels

OWTS can be found on both publicly and privately owned parcels across Sonoma County. Understanding the amount of OWTS on public parcels is important in order to consider the impact of wastewater treatment from County and other agency properties.

This study analyzed privately and publicly owned parcels against both known and suspected OWTS locations and found that the numbers of public parcels with OWTS were extremely low. While 5,933 parcels across the county were identified by this dataset as publicly owned, only 63 were found to have known OWTS and a further 86 to have suspected OWTS. Table 3 shows that the percentage of public parcels with OWTS is considerably lower than the percentage of private parcels with OWTS.

These parcels may present an opportunity to develop alternatives to OWTS if they neighbor other properties with OWTS. However, since the numbers are so small, this study does not evaluate publicly owned parcels with OWTS in more detail.

Table 3 Known and suspected OWTS by parcel ownership in Sonoma County

Category	Private Parcels	Public Parcels	Total
Known OWTS	12,431 (6.8%)	63 (1.1%)	12,494 (6.7%)
Suspected OWTS	23,648 (13.0%)	86 (1.4%)	23,734 (12.6%)
Non-OWTS.[15]	145,822 (80.2%)	5,784 (97.5%)	151,606 (80.7%)
Total	181,901	5,933	187,834

3.5 Vacation Properties

Vacation properties likely present different patterns of water use compared to permanent residential properties. Fluctuations in usage due to intermittent and seasonal occupancy, potential additional usage due to outdoor amenities such as swimming pools or hot tubs, and differing guest behaviors could all be potential factors which could lead to higher wastewater volumes from vacation properties.

This study reviewed permit data for 2,030 vacation rental properties across Sonoma County, which translated to 2,026 parcels. Of these properties, 760 also have OWTS permits and 653 are suspected to have OWTS, representing 69.7% of all permitted vacation properties. By comparison, only 18.7% of other residential properties are known or suspected to have OWTS, so the proportion of vacation properties with OWTS is considerably higher.

Vacation properties present the same opportunities and challenges as other privately owned properties. These are described in Table 4. As with the previous section, the numbers of permitted vacation properties are relatively small, this study does not examine them in more detail, however, if detailed studies are carried out, it may be appropriate to consider areas with high proportions of vacation properties as special cases due to the likely higher and more seasonal wastewater loads.

[15] Non-OWTS parcels include any parcels which contain no building footprint and can therefore be considered unlikely to have OWTS, as well as parcels within city boundaries, sanitation districts, or sewer districts, which would typically be expected to be connected to wastewater treatment systems. Non-OWTS parcels may also include some inactive or destroyed OWTS.

Table 4 Known and suspected OWTS by vacation rental permit

	Permitted Vacation Rental Parcels – Transient Vacation Rentals	Permitted Vacation Rental Parcels – Zoning Permit	Permitted Vacation Rental Parcels – Use Permit	Other Parcels	Total
Known OWTS	399 (42.1%)	361 (33.6%)	0 (0.0%)	11,734 (6.3%)	12,494 (6.7%)
Suspected OWTS	326 (34.4%)	327 (30.4%)	2 (66.7%)	23,079 (12.4%)	23,734 (12.6%)
Non-OWTS[15]	223 (23.5%)	387 (36.0%)	1 (33.3%)	150,995 (81.3%)	151,606 (80.7%)
Total	948	1,075	3	185,808	187,834

3.6 OWTS Parcel Density and Distribution

In order to understand potential improvements to the availability of community or central wastewater treatment alternatives, it is first necessary to understand the relative densities of OWTS parcels across Sonoma County. Groups of higher density parcels typically indicate established settlements. Therefore, locations with higher density parcels and other governance and technical indicators may be more appropriate for consideration of community interventions.

The following categories were used by this study to classify OWTS parcel density[16]:

- Very low density (over 100 acres per parcel)
- Low density (over 10 acres per parcel)
- Medium density (over 1.25 acres per parcel)
- High density (1.25 acres per parcel or less)

The majority of Sonoma County contains low density, very low density, or no OWTS. Significant areas of medium and high density exist surrounding the urban centers of El Verano, Petaluma, Kenwood, and Sebastopol, with some larger rural settlements such as Monte Rio, Camp Meeker, Fitch Mountain, Camp Thayer, Preston, Asti, and some other small, isolated pockets, illustrated in Figure 10 and Figure 11. In total across the county, 830 parcels were found to have very low density OWTS, 4,859 had low density, 15,230 had medium density, and 15,327 had high density.

Furthermore, a total of 9,877 existing parcels[17] were identified which exceeded the maximum density threshold which is required by the State OWTS Policy [1] for OWTS installations in new properties, and while this threshold is not intended for existing properties, it still indicates that locations exist with levels of OWTS density which may be of concern. Information about parcel density was used by this study to develop the community characterization analysis described in Section 5 and these values are described in more detail in subsequent sections of his document.

Figure 12 shows the percentage of parcel area in each Supervisorial District covered by OWTS parcels within each density range. Notably, of all the Districts, the 2nd, which largely coincides with the Petaluma River APMP, contains the highest proportion of overall OWTS parcel area but the parcels are predominantly low density and

[16] This study used two methodologies to calculate density, based on prior methodologies published by the Russian River TMDL Report and the North Coast Regional Water Quality Control Board. Both describe the density of each individual parcel, so this measure does not refer to the adjacency of OWTS in neighboring or nearby parcels. Both methodologies are described in Section 6.1.3.

[17] This maximum allowable density threshold is defined using rainfall, whereas the high, medium, low, and very low ranges are purely based on the parcel size. It is therefore theoretically possible for a parcel to fall in any density range while exceeding the maximum allowable. In this study's analysis, it was found that 9,867 high density parcels and 10 medium density parcels exceeded the maximum.

unlikely to have viable wastewater treatment alternatives. The 3rd District contains the lowest overall proportion of OWTS, however with higher proportions of multi-family residences, it also has the highest proportion of high and medium density OWTS parcels, so may have viable alternatives.

Figure 13 shows the percentage of OWTS parcel area within each density range separated by countywide parcel land use classifications. These five classifications cover agricultural, commercial (excluding wineries and vineyards), single-family residential, multi-family residential, and winery / vineyard parcels. Residential areas exhibit a high percentage of high density OWTS parcels, with 14,974 single-family residential parcels (9% of all single-family residential parcels countywide) and 90 multi-family residential parcels (3% of the countywide total) identified as high density. Commercial parcels included 158 high density OWTS parcels (1% of the countywide total). Agricultural and winery parcels do contain OWTS as shown in Figure 13, but their density is low, reflecting the rural nature of these locations.

This information about OWTS parcel density and distribution informs subsequent sections of this study and is highlighted to provide important background on the existing wastewater treatment systems across Sonoma County and an overview of parts of the county which exhibit higher levels of OWTS.

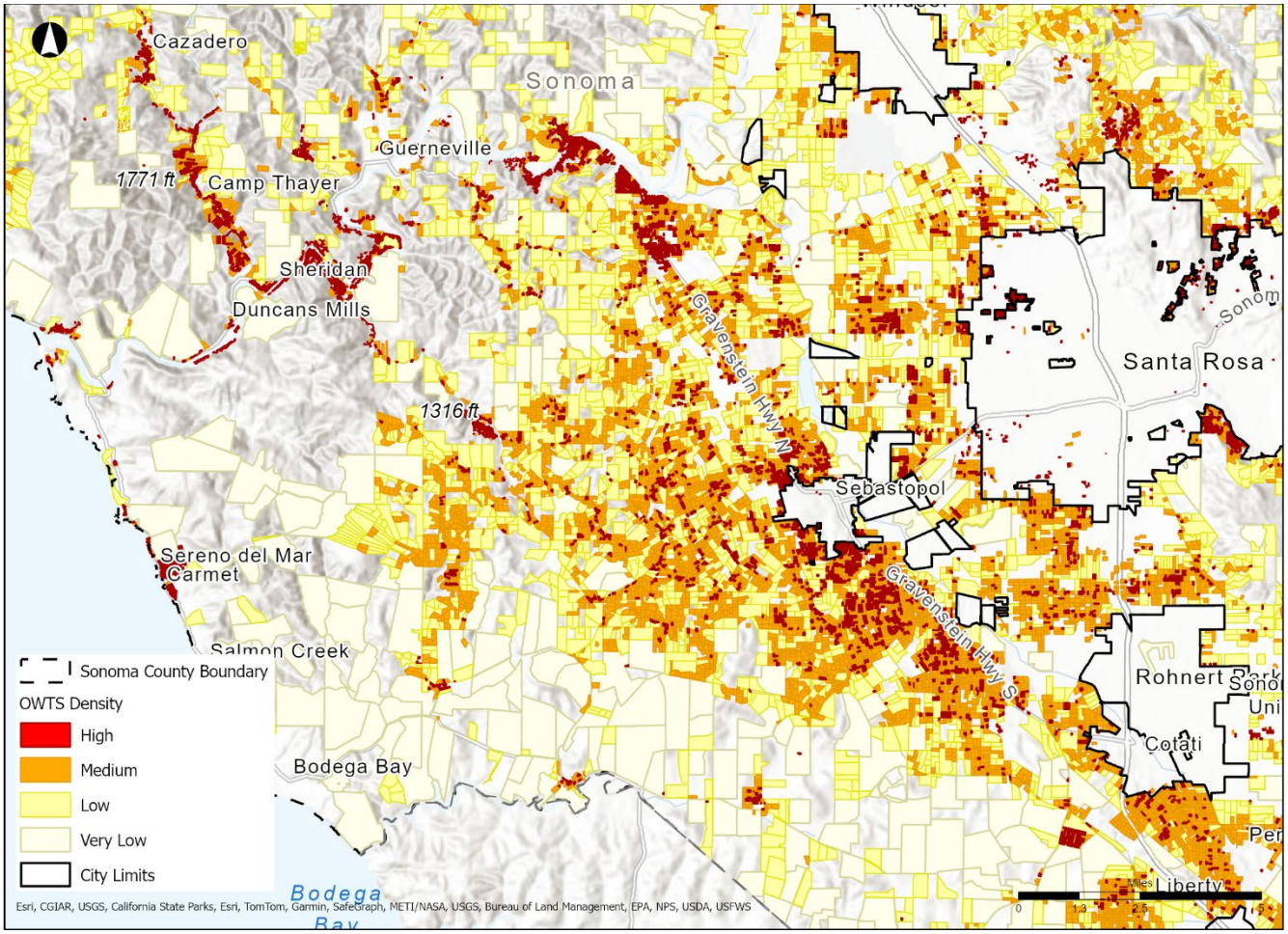

Figure 10 OWTS parcel density to the west of Santa Rosa

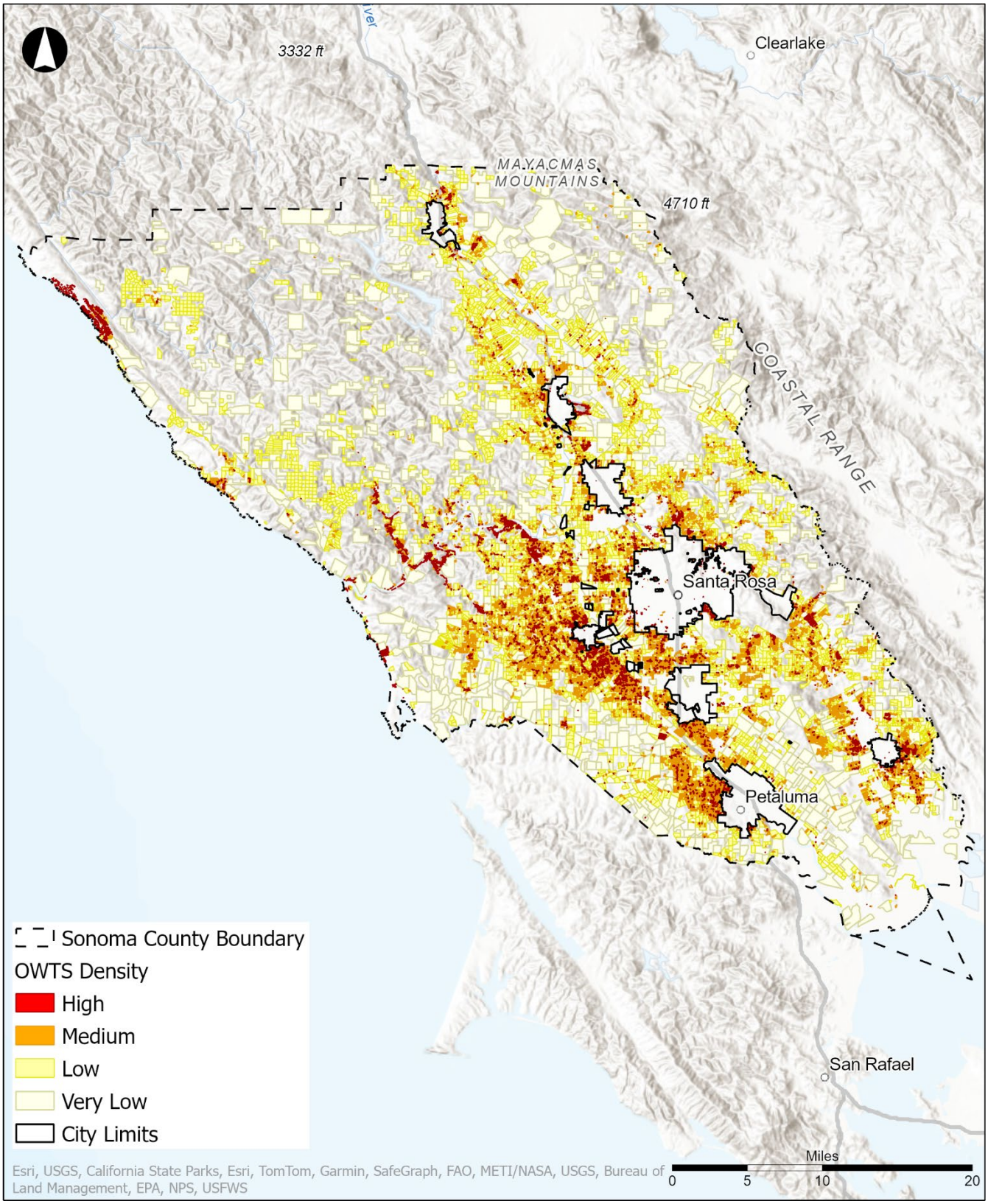

Figure 11 OWTS parcel density across Sonoma County

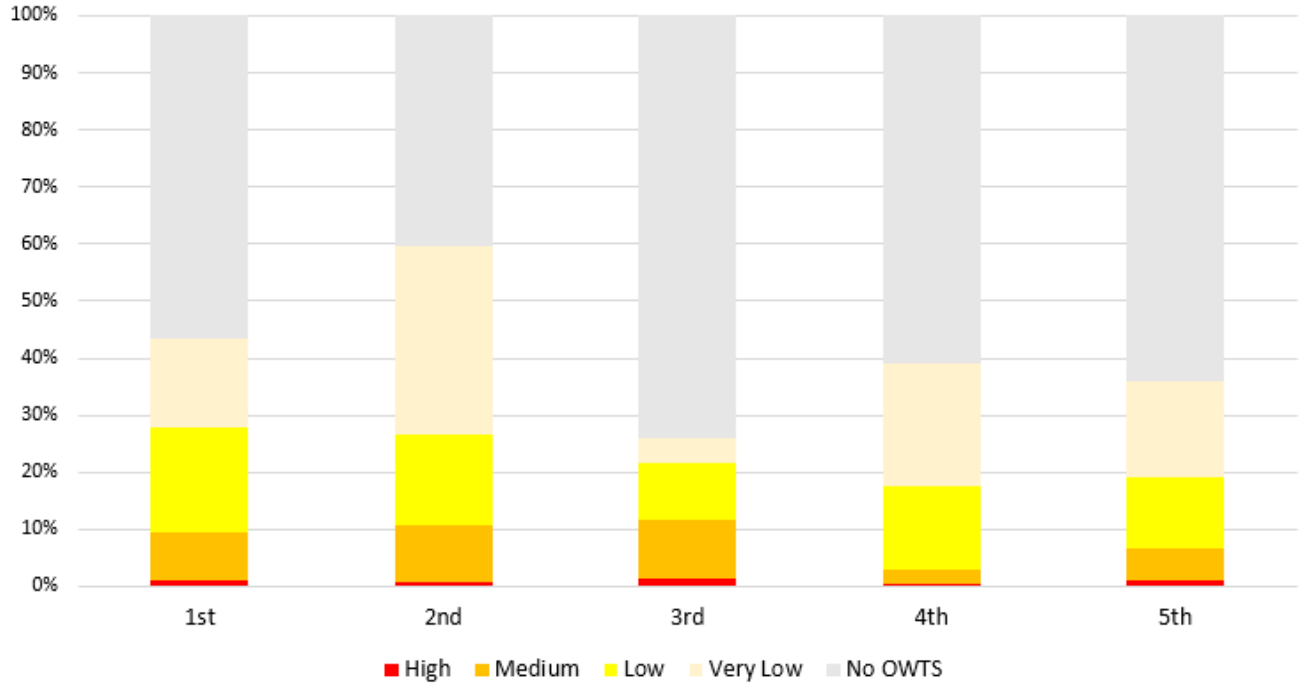

Figure 12 Percentage of parcel area by Supervisorial District covered by high, medium, low, and very low density OWTS parcels, or no OWTS[15]

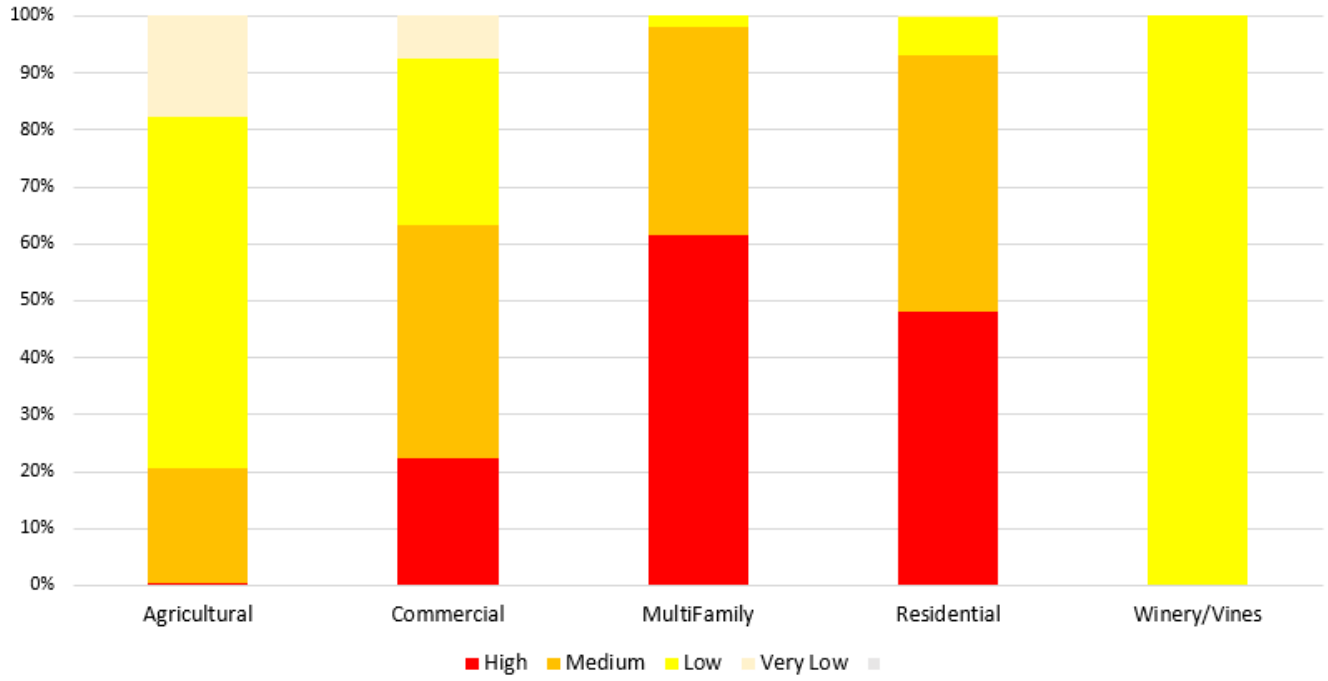

Figure 13 Percentage of parcel area by land use covered by high, medium, low, and very low density OWTS parcels

4. Opportunities and Challenges

In order to address the opportunities and challenges relating to the wastewater alternatives explored by the study, this section returns to the Study Design Criteria as described in Section 2.3. This section is informed by the literature review conducted as part of this study and a wealth of domain expertise and quantitative and qualitative analysis performed as part of the study. While many of these criteria have been discussed in previous sections, a summary of each criterion with reference to relevant content in this report is provided below.

The literature review conducted as part of this study examined a wide range of documents which have explored community-based alternatives to on-site OWTS, including greywater reuse or packaged treatment systems, constructed wetlands or spray field lagoons, shared standard or non-standard OWTS community systems, and connections to centralized wastewater treatment plants.

As described in Section 5 of this report, the feasibility of each of these systems is impacted by governance and technical factors. From a technical and geographical perspective, factors such as watershed boundaries, topography, parcel size and density, and the presence of one or more parcels with sufficient area to site the proposed alternative should be considered.

4.1 Governance Considerations

Different wastewater treatment approaches bring different governance challenges. The literature review identified the following three high-level governance options for discussion:

- Creation of a new community services district for a community cluster;
- Merging a community cluster with an existing governance entity (wastewater district, community services district, and/or special district); or
- Creating a new special district (County sanitation zone, County sanitation district, and/or special district).

Each of these brings different considerations. Merging a community cluster or settlement with existing governance entities would provide the most local control over wastewater management, which would provide benefits such as increased community mobilization and involvement. Creating a new special district would provide the least local control but may also be appropriate to consider for some locations.

Section 5 of this report describes how the community clusters developed for this study are based on governance structures across the county and have been evaluated against technical criteria. It also evaluates each of the prioritized community clusters for potential connection to existing sanitation district service areas and wastewater collection and treatment plants. Where that is not possible, it explores the creation of a community system and service district. Further evaluation is also considered between non-standard OWTS, onsite recycled water, or waterless toilets, providing potential opportunities to develop septic districts and other structures for ongoing management and support of OWTS.

Community clusters with lower density and fewer technical challenges would be most appropriate for monitoring of existing OWTS and possible upgrades. This is a viable alternative for community clusters, however Section 5 focuses on a prioritized selection of community clusters with higher density and more technical challenges, so this is not discussed in detail by this section.

Opportunities for clusters to join existing management districts are explored in Section 5.10. In general, higher density clusters closer to existing wastewater or sanitation district boundaries are most appropriate. At a more granular level, elevation of parcels relative to the treatment plant, proximity to utility corridors, and higher density parcels are key considerations for this approach.

Locations which are more remote from existing management districts and have unsuitable technical conditions for OWTS with higher density parcels are more appropriate for new governance structures. Areas with flatter

topography and larger open spaces for siting of potential community systems are more suitable, as are communities which fall within a special district or existing governance structure. If an area contains many parcels owned by the same entity, implementation of a community solution would be more straightforward.

One governance opportunity is presented by Sonoma County Service Area (CSA) 41. CSA 41 is a dependent district, meaning that it is governed by the County of Sonoma. It can provide both water and wastewater treatment, and currently governs four water supply systems referred to as zones of benefit: Fitch Mountain, Freestone, Jenner, and Salmon Creek, as well as overseeing Sea Ranch septic district. Its services could be expanded to cover wastewater in more jurisdictions, and since this provides a framework to support community-led initiatives, it should generally be regarded as a favorable approach for governance.

In addition to those listed above, some community entities exist across the county with water governance responsibilities, such as in the Camp Meeker area, where, as in the CSA 41 zones of benefit, water supply is operated by Russian River Utility. While it may have provided some useful insight, precise data describing the boundaries and governance interests of each community entity was not available to this study.

4.2 Technical Considerations

Areas which are most appropriate for OWTS still require suitable technical conditions as described by the Sonoma County OWTS Manual [2] based on slope, distance from public wells, distance from water intakes, depth to groundwater, and soil types.

Opportunities for shared or community OWTS are typically found in areas with medium, low, or very low parcel density. These areas should have land available which is technically suitable for OWTS, based on factors such as slope, soil type, and proximity to receptors.

Ideal locations for shared or community OWTS are those on parcels that are close to clusters with high density OWTS parcels that could potentially connect to form an expanded system. Clusters with relatively flat topography, where wastewater conveyance and OWTS would be more feasible, present good opportunities. For example, a prime candidate would be an area with a dense concentration of OWTS that is near or at a higher elevation than a low-density open space parcel with sufficient land for shared OWTS. The community of Jenner, described by Section 5.1, is an example of a location which may demonstrate these characteristics.

The California OWTS Policy [1] states that OWTS should be located more than 100 feet away from water wells and monitoring wells and the Sonoma County OWTS Manual [2] states that OWTS sites should be located more than 200 feet away from public wells. While public well data was not available to this study, private well location data was considered as part of the community characterization analysis to prevent OWTS being recommended as an option in close proximity to wells.

Existing utility corridors and roads represent potential opportunities to add sewer lines to connect communities to wastewater treatment plants. This study sourced Geographic Information System (GIS) data representing these and each parcel in the community clusters dataset contains an attribute describing the distance to the nearest utility corridor. These are discussed for selected clusters in Section 5.

Higher population or parcel density provides an opportunity for an economy of scale for connections to existing wastewater treatment plants. Evaluating the potential to connect a cluster to an existing wastewater treatment plant requires consideration of:

- Distance from the community cluster to the existing wastewater treatment plant, ideally following existing roads or utility corridors;
- Elevation of the community cluster relative to the existing wastewater treatment plant, since a community cluster with lower elevation would require pump stations; and
- Capacity of the wastewater treatment plant.

While permits describe the permitted capacities of existing wastewater treatment plants, information about available operating capacities was not available from a single source, so it would be more appropriate for more localized studies to consider whether existing wastewater treatment plants can handle the additional wastewater volumes produced by communities. Distance and elevation difference are used by the methodology underlying Section 5.

For connection to an existing wastewater treatment plant, key factors include:

- Elevation: if the community cluster is at a lower elevation than the plant, pump stations would be required to transport the wastewater uphill.
- Pipe Routing: the further the cluster of homes or businesses is from the existing wastewater treatment plant, the more expensive it becomes to connect them, due to the cost of laying and maintaining pipes.
- Available wastewater treatment plant capacity: if the existing wastewater treatment plant is already operating near its capacity, it may need to be expanded to accommodate additional wastewater.

This study considered elevation and pipe routing opportunities, however, as stated above, information about available operating capacities was not available for wastewater treatment plants.

For community systems (e.g., shared community OWTS, individual treatment plants, or constructed wetlands), key factors include:

- Parcel density: communities with larger parcels reduce the opportunity for economies of scale.
- Cluster shape and extent: the more spread out the cluster, the more expensive it is to connect homes or businesses, due to the cost of laying and maintaining pipes.
- Land uses: the volumes and types of wastewater from different land uses can add to the complexity of the solution, for example, industrial wastewater might contain chemicals that require more expensive treatment processes.

For upgrades to existing OWTS, key factors include:

- Slopes: steeper slopes might require more extensive excavation and construction work.
- Soils: soil type (e.g., clay, sand, silt), depth to bedrock, and groundwater level can impact absorption of septic tank outflows.
- Proximity to environmental receptors: County and State regulations limit the installation of an OWTS close to streams, floodplains, or groundwater.
- Proximity to water wells: installation of an OWTS is not recommended in close proximity to a freshwater receptor.

All of these factors were considered by the methodology used in Section 5.

If there is a desire to turn OWTS wastewater into recycled water, this would be most feasible in areas with higher density parcels which also have compatible adjacent land uses for potential non-potable water uses, such as golf courses and parks. Since this would require the construction of a recycled water plant, it would also require connectivity to a utility corridor, or potentially solar power, which would potentially introduce operational and maintenance challenges.

5. Community Characterization Analysis

Settlements and communities across Sonoma County each demonstrate unique characteristics that mean that a single countywide intervention would not be appropriate. This section describes examples of these characteristics. It uses small geographic units based on the distribution of OWTS across Sonoma County to describe potential opportunities and challenges to improving wastewater treatment access. Of these groups of parcels, referred to as community clusters, it focuses on nine, which this study has used as detailed case studies.

It should be emphasized that the community clusters and the characterization presented by this section do not reflect needs based on failing and aging OWTS systems. The methods which are suggested for improving access to wastewater services on a community-wide scale are based purely on the presence of OWTS in communities coupled with the analysis of governance and technical criteria.

The intent of this section is to identify areas with shared characteristics within the study area which may be used to start discussions about improving access to wastewater services. The community clusters described by this section are not designed to reflect settlement boundaries, and they are also not intended to be a final determination of community wastewater collection and treatment boundaries. The data and maps developed by this study could be used at county or local scales to identify additional community clusters.

Using the information about patterns density of OWTS across Sonoma County, community clusters were developed by overlaying jurisdictional boundaries, including Supervisor Districts, Municipal Advisory Councils, unincorporated areas, sanitation districts, and resource conservation districts. These boundaries were overlaid to identify geographically discrete areas with unique combinations of jurisdictional characteristics and then simplified by merging nearby areas with shared characteristics. This process is described in more detail by Section 6.2.1.

Based on the clustering analysis, this study identifies and proposes 47 community clusters across Sonoma County. Proposed community clusters are distributed across all five Supervisorial Districts but cover a relatively small portion of District 2 and are fewest in number in District 4. They cover all three proposed and existing APMP zones, as illustrated in Figure 14, Figure 15, and Figure 16. Of the proposed community clusters, 39 are located within the previously anticipated Russian River APMP. Four proposed community clusters are located within each of the Petaluma River and Sonoma Creek APMP boundaries.

Each community cluster has unique characteristics which are explored for selected community clusters in the following sub-sections. The opportunities and challenges described in Section 4 form the basis of the discussion in each sub-section.

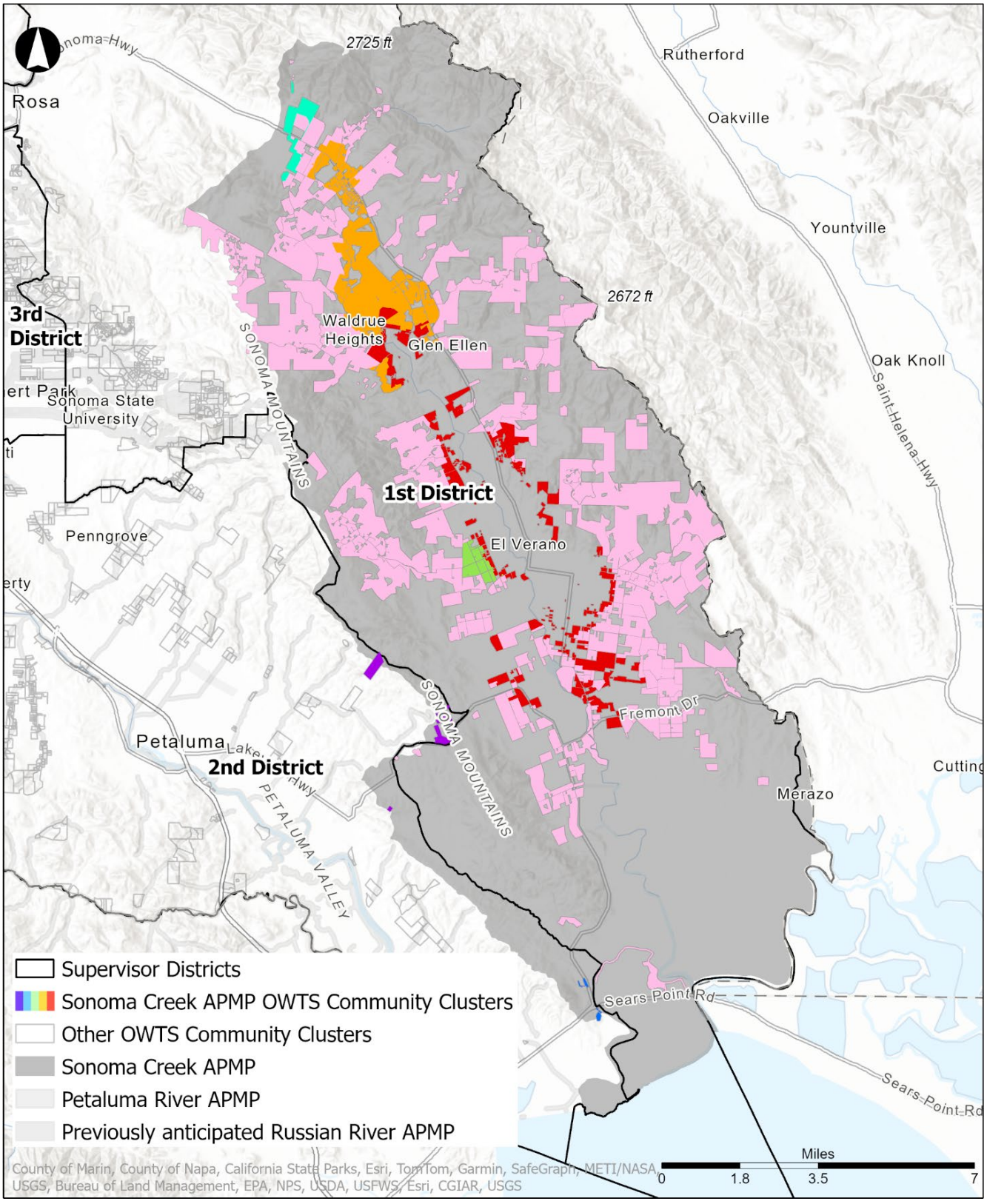

Figure 14 Map of community clusters in the Sonoma Creek APMP

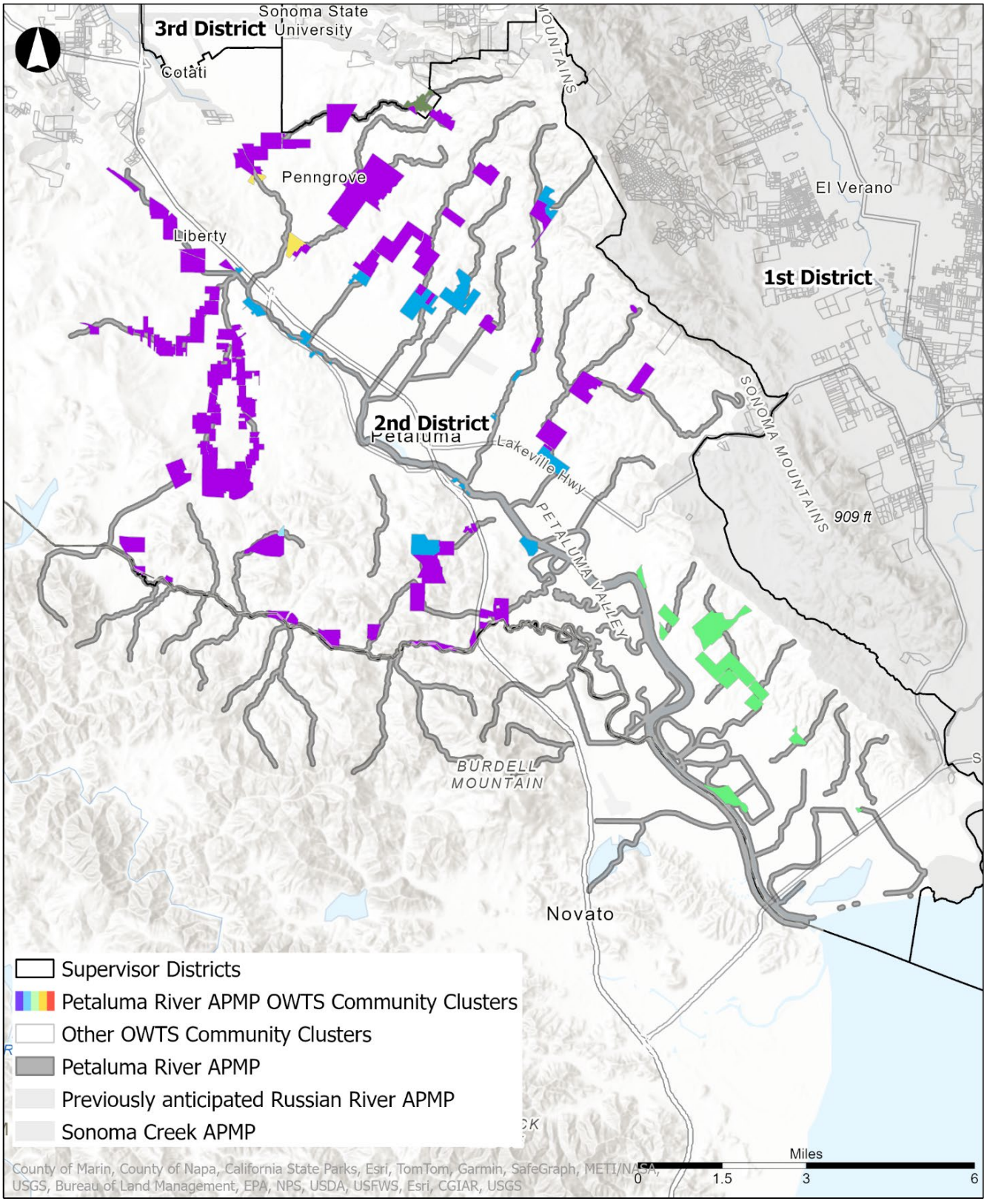

Figure 15 Map of community clusters in the Petaluma River APMP

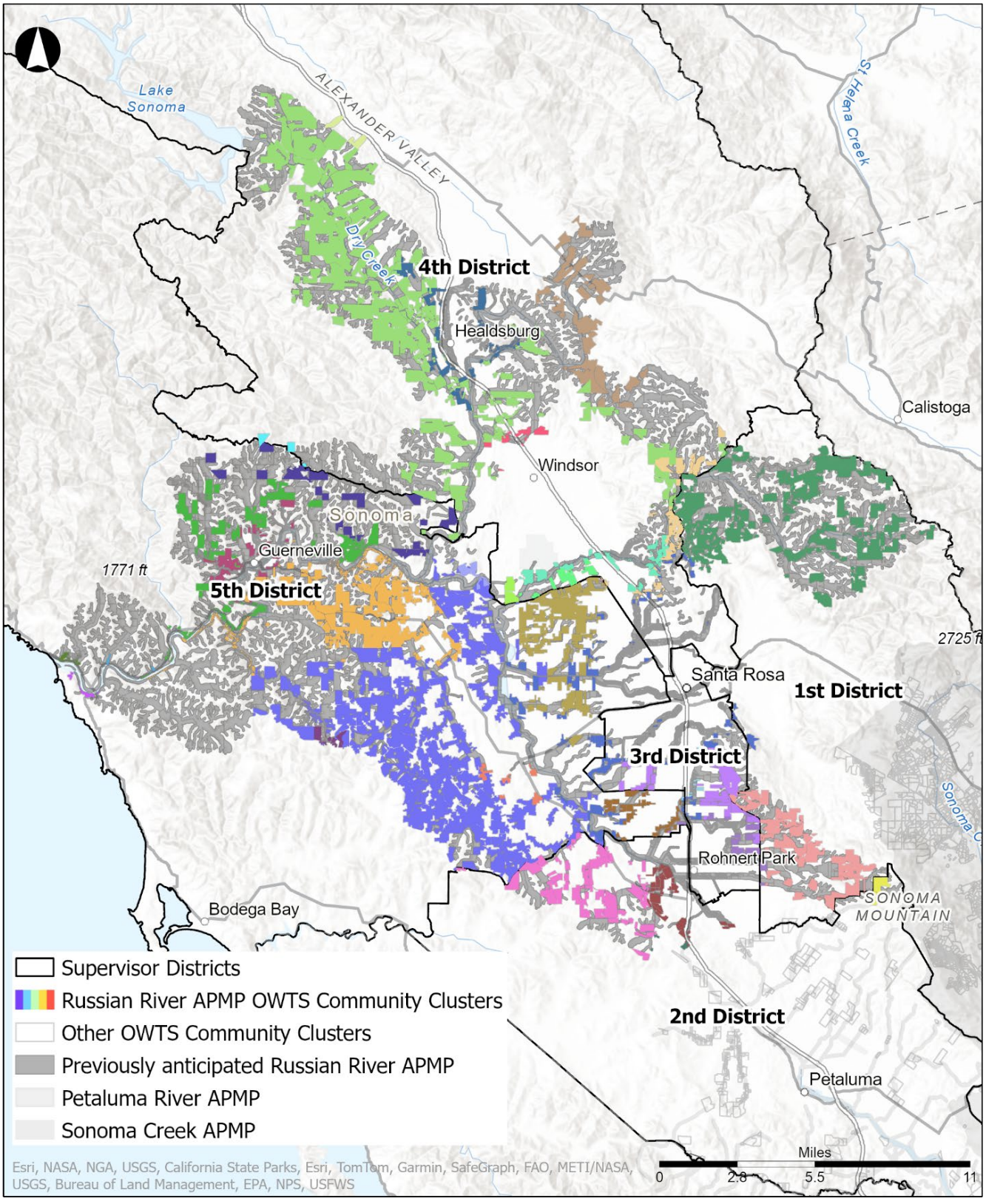

Figure 16 Map of community clusters in the previously anticipated Russian River APMP

Any changes to wastewater treatment approaches could affect communities directly, so the support and involvement of community groups is important. The primary driver for the development of the proposed community clusters was governance. In addition to the governance criteria, the proposed community clusters were also enriched with information about their potential Disadvantaged Community status[18] and technical data such as proximity to existing utility corridors, land uses, proximity to environmental receptors and sensitive sites, proximity to water and wastewater systems, slopes, soil types, and floodplains. These technical criteria are described in more detail by Section 6.2.2.

This report presents a prioritized selection of the 47 proposed community clusters across Sonoma County. The process to prioritize community clusters for discussion in this report was developed based on the governance and technical criteria described above and prioritizes based on higher parcel density to identify more concentrated settlements, greater technical potential for alternative interventions, and potential Disadvantaged Community status to identify locations which may be eligible for grant funding. It resulted in nine community clusters, shown in Table 5 and Figure 17, which provides a reasonable list for discussion in this report. The process was reviewed by staff from the County of Sonoma and the North Coast Regional Water Quality Control Board and is described in detail by Section 6.2.3.

Table 5 Prioritized community clusters

Community Cluster	APMP	Supervisorial District	Average Parcel Density [19]
Jenner	Russian River	5th	High
Northern Bank of Russian River	Russian River	5th	Medium
Southern Bank of Russian River	Russian River	5th	Medium
Russian River CSD Adjacent	Russian River	5th	Medium
West of Sebastopol	Russian River	5th	Medium
Mark West Springs and Meadow Vista Trail	Russian River	4th	Medium
Santa Rosa Adjacent	Russian River	1st / 3rd / 4th / 5th	Medium
Cotati Adjacent	Russian River	2nd	Medium
Rural Sonoma Creek Watershed	Sonoma Creek	1st	Medium

The prioritized community clusters will be described in detail by Sections 5.1 to 5.9, with descriptions of other situations in Sections 5.10 and 5.11. Each prioritized community cluster was evaluated for its suitability to connect to existing wastewater treatment plants, creation of community systems, upgrades to existing OWTS, and evaluation of site-specific upgrades (e.g., non-standard OWTS, waterless toilets, on-site water recycling).

[18] The methodology for calculating Disadvantaged Community (DAC) status allows it to be used for different geographic areas. In order to develop a countywide measure, this study calculated DAC status at the census tract and block group level and then assigned each parcel with a value stating whether it was within a DAC or not. The value shown for each community cluster is the count and percentage of OWTS parcels which are within DAC census tracts or block groups, because DAC calculation requires income data from census statistics. It does not describe the DAC status of the community cluster but provides a high-level indication of whether it is likely to be considered a DAC.

[19] Parcel Density is described in Section 3.6 and the methodology used to source the value is described in Section 6.1.3.

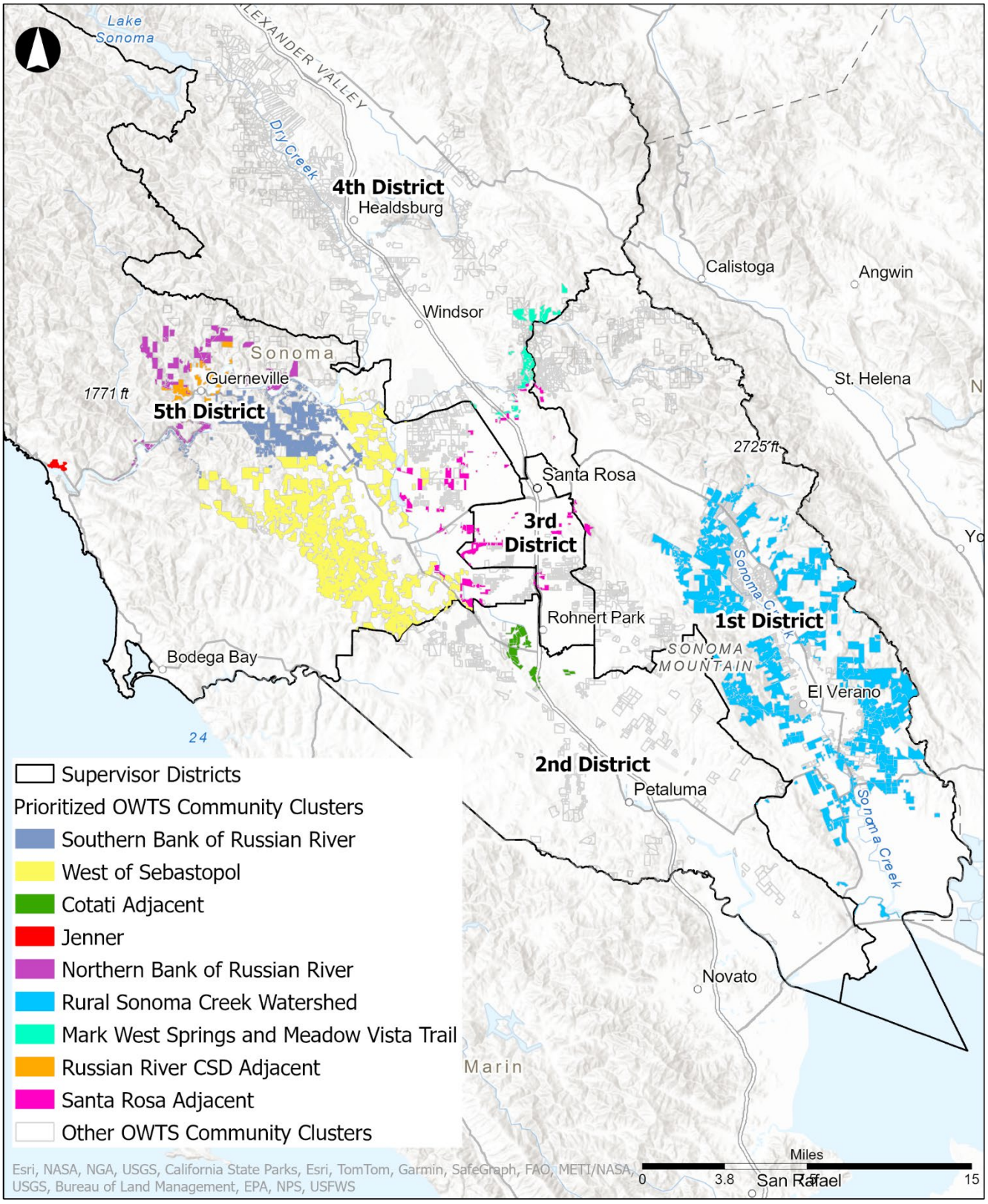

Figure 17 Prioritized community clusters

5.1 Jenner Community Cluster

Table 6 Jenner Community Cluster quick facts

Community Cluster ID	10
APMP Zone	Russian River
Supervisorial District	5th
Resource Conservation District	Sonoma
Municipal Advisory Council	Sonoma County Coast
Number of OWTS Parcels	110 (43 known and 67 suspected)
Number of DAC Parcels	110 (100.0%)
Average Parcel Density	High (0.56 acres per parcel)
Total Parcel Area	640 acres (1 square mile)
Approximate Width and Height	1 mile × 0.5 miles

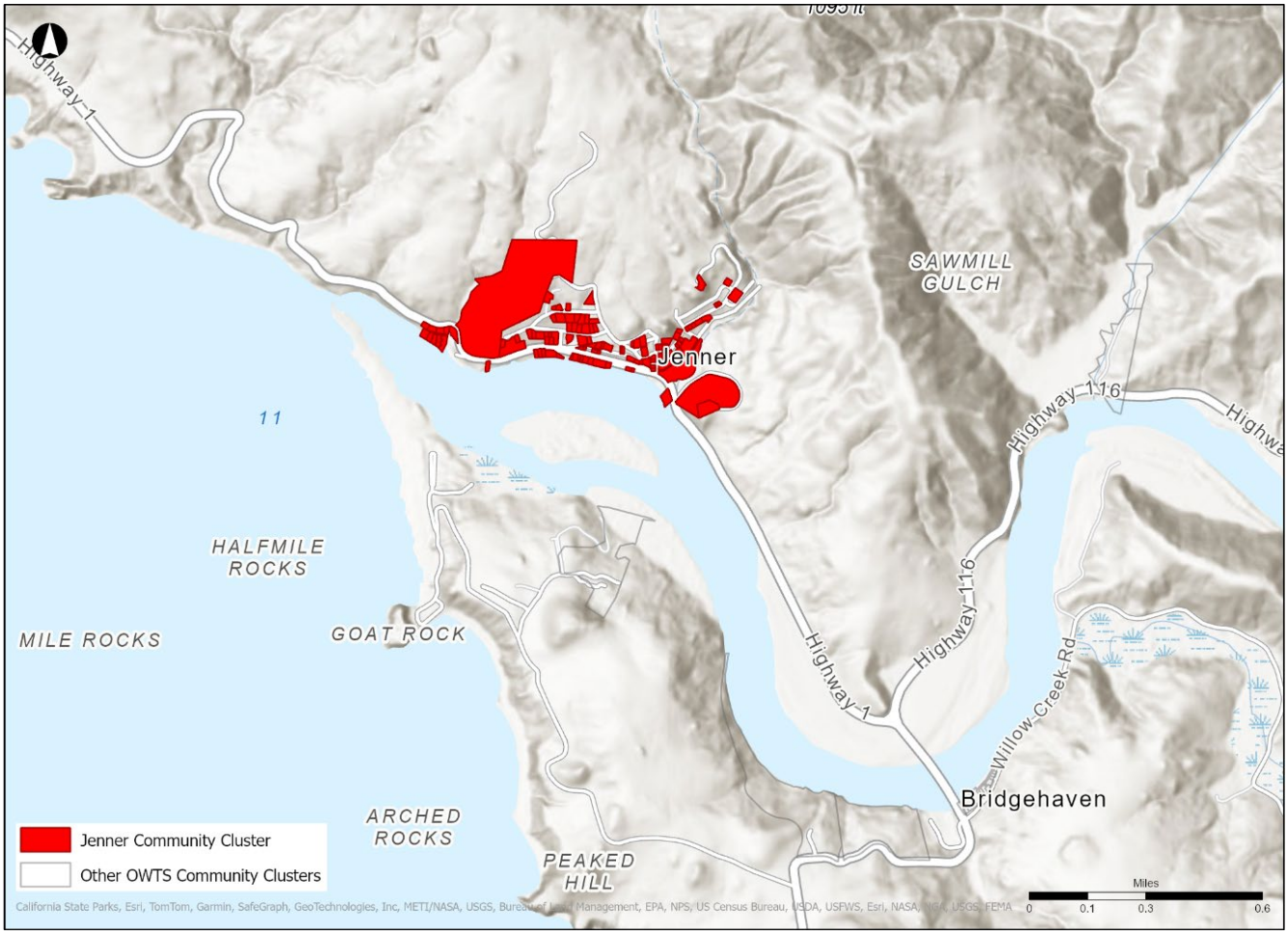

Figure 18 Jenner Community Cluster map

This small coastal community cluster in the west of Sonoma County consists of one high-density cluster of OWTS. It is remote from any existing sanitation district service areas and has over 50 parcels in the cluster, so this study has considered the creation of a community system and service district. The Sonoma County Draft Land Area Management Plan [3] identifies this area as containing many older non-conforming OWTS, so this community cluster should be considered a high priority for evaluation.

This cluster's density and shape suggest it may be appropriate for developing a community system. The presence of the Sonoma County Coast Municipal Advisory Council may present a strong opportunity for wastewater governance. As noted in Section 4.2, this community cluster is relatively flat and contains a dense concentration of OWTS that is near to lower-density open space parcels with potential land for shared OWTS. For these reasons, this community cluster may be appropriate for the creation of a community wastewater collection system and a wastewater service district.

5.2 Northern Bank of Russian River Community Cluster

Table 7 Northern Bank of Russian River Community Cluster quick facts

Community Cluster ID	23
APMP Zone	Russian River
Supervisorial District	5th
Resource Conservation District	Sonoma
Municipal Advisory Council	Lower Russian River
Number of OWTS Parcels	911 (291 known and 620 suspected)
Number of DAC Parcels	679 (74.5%)
Average Parcel Density	Medium (2.70 acres per parcel)
Total Parcel Area	2,458 acres (3.84 square miles)
Approximate Width and Height	10 miles × 7 miles

This community cluster is spread over a wide area along the northern bank of Russian River. It covers multiple communities which are separated geographically. Community clusters were defined by shared governance boundaries. Because this large area is all within the previously anticipated Russian River APMP, the 5th Supervisorial District, Sonoma Resource Conservation District, and Lower Russian River Municipal Advisory Council, it therefore covers a large geographical extent. This study has split it into three separate community clusters, covering the Hacienda and Korbel settlements to the east, the area northwest of Guerneville in the center, and the Monte Rio, Browns Gulch, and Duncans Mills areas to the south.

5.2.1 Eastern Area (Hacienda and Korbel) Community Cluster

The eastern area covers the communities of Hacienda and Korbel, to the east of Rio Nido. It is remote from the nearest wastewater treatment plant and consists of medium density parcels. Hacienda is identified by the Draft Land Area Management Plan [3] as containing many older non-conforming OWTS, so this community cluster should be considered a high priority for evaluation.

Since this community cluster is distributed over a large area and does not consist of a single core group of parcels, it may not be ideal for a community wastewater collection and treatment system. However, it does all fall within a single jurisdictional boundary, the Lower Russian River Municipal Advisory Council. For this reason, it may be appropriate to consider creating community wastewater collection and treatment systems and

service districts. Parcels could be considered alongside the Pocket Canyon area, directly to the south (described by Section 5.3.1).

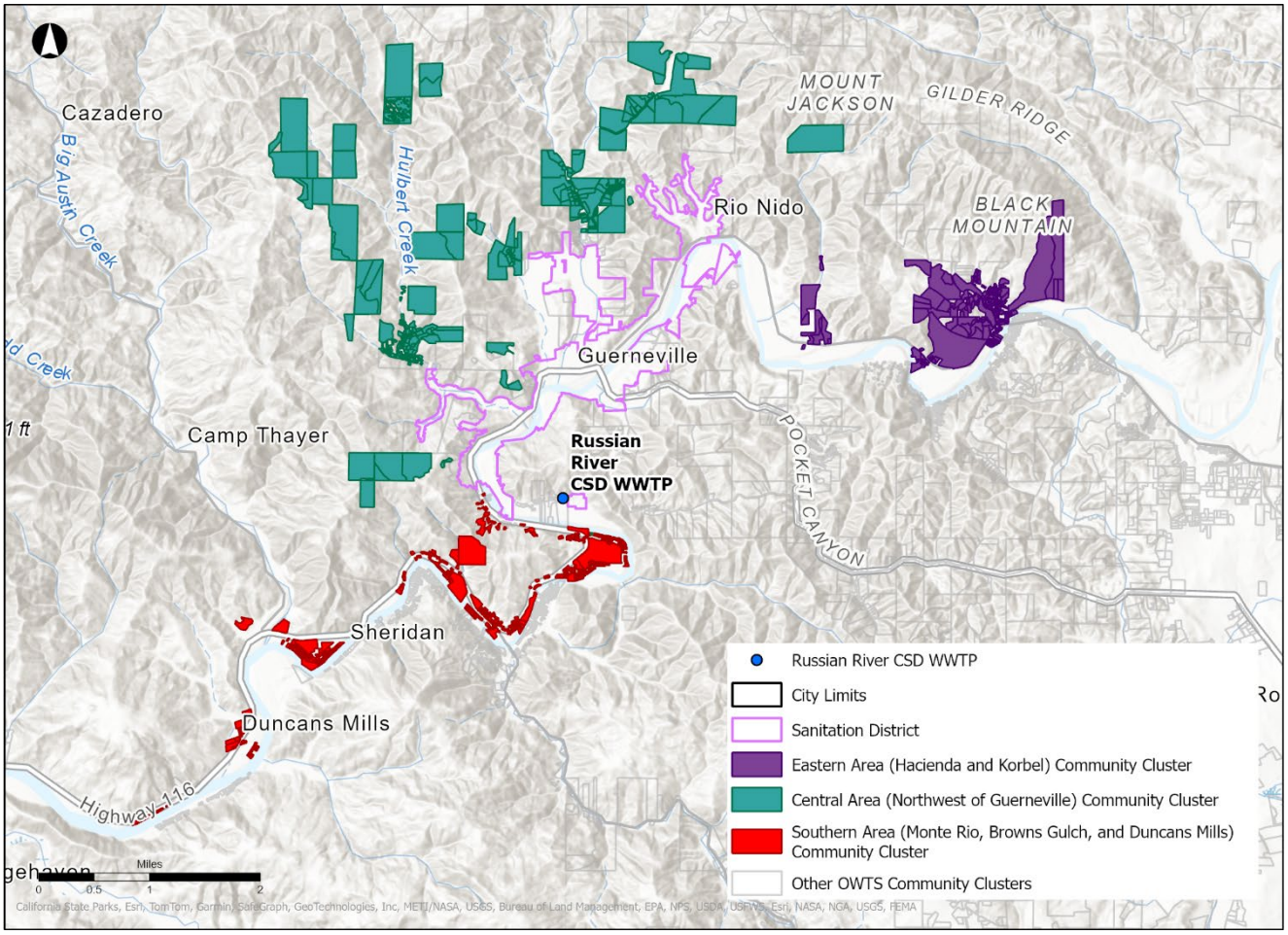

Figure 19 Northern Bank of Russian River Community Cluster map

5.2.2 Central Area (Northwest of Guerneville) Community Cluster

The central area is located to the northwest of Guerneville, neighboring the Russian River CSD Adjacent Community Cluster (see Section 5.4) which covers parcels closer to Guerneville. It consists of high and medium density parcels which are spread out over a wide extent. For this reason, it may be appropriate to evaluate localized options such as non-standard OWTS, on-site recycled water, or waterless toilets. Potential governance structures for this scenario are discussed in Section 4.1.

5.2.3 Southern Area (Monte Rio, Browns Gulch, and Duncans Mills) Community Cluster

The southern area covers the northern bank of Russian River through the settlements of Monte Rio, Browns Gulch, and Duncans Mills. It consists of closely distributed medium density parcels which form shared communities with those on the southern bank of the river. While the shape of the cluster is decentralized, this cluster falls within the boundary of the Lower Russian River Municipal Advisory Council. For these reasons, it may be appropriate to consider creating community wastewater collection and treatment systems and service districts. Parcels could be considered alongside the South Monte Rio and Villa Grande area, directly to the south (described in Section 5.3.2).

5.3 Southern Bank of Russian River Community Cluster

Table 8 Southern Bank of Russian River Community Cluster quick facts

Community Cluster ID	3
APMP Zone	Russian River
Supervisorial District	5th
Resource Conservation District	Gold Ridge
Municipal Advisory Council	Lower Russian River
Number of OWTS Parcels	1,984 (622 known and 1,362 suspected)
Number of DAC Parcels	754 (38.0%)
Average Parcel Density	Medium (2.56 acres per parcel)
Total Parcel Area	5,088 acres (7.95 square miles)
Approximate Width and Height	5 miles × 12 miles

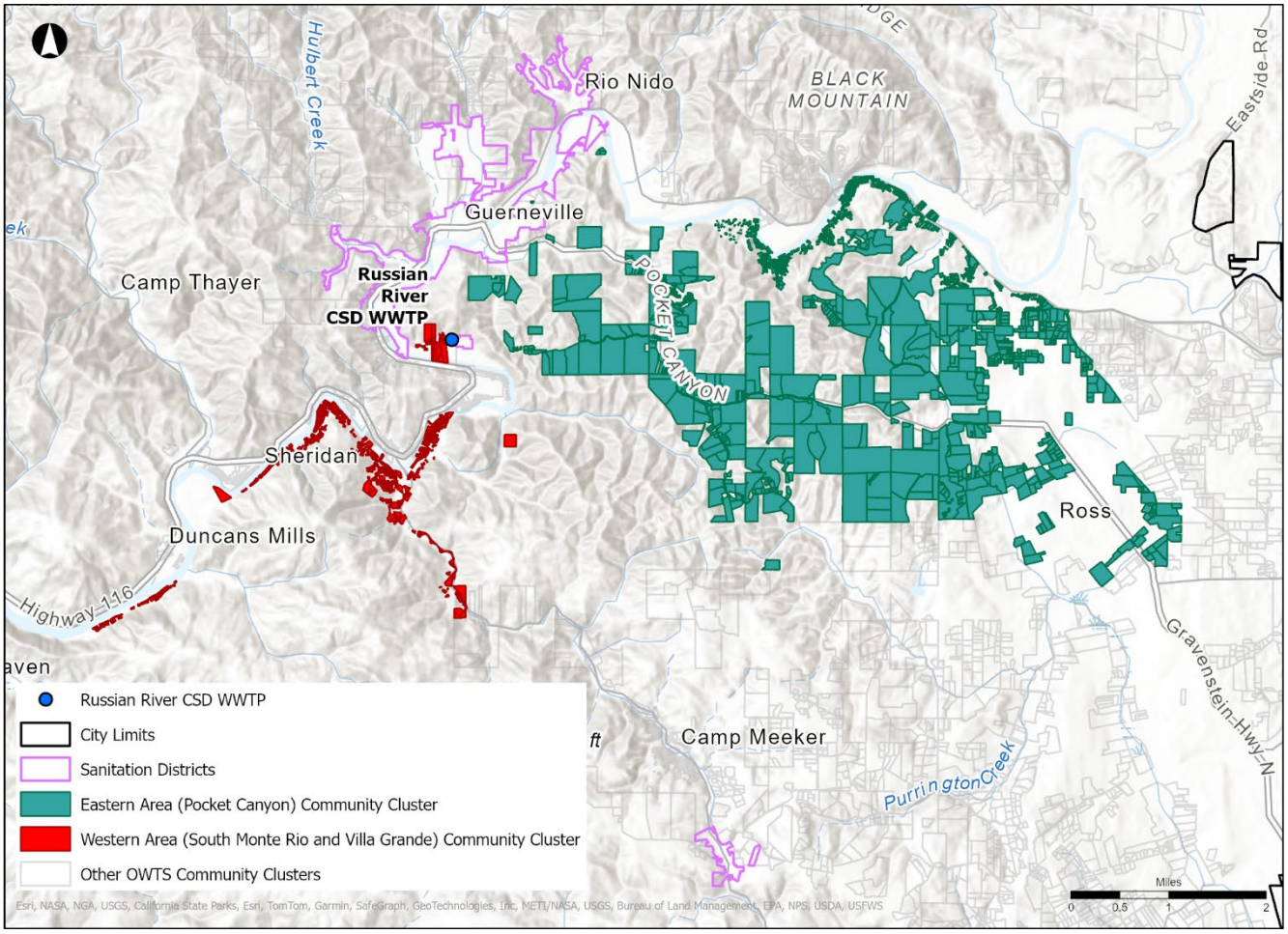

Figure 20 Southern Bank of Russian River Community Cluster map

This large community cluster of medium density parcels represents the communities to the south of Russian River in the northern part of the Gold Ridge Resource Conservation District. Because this large area is all within

the previously anticipated Russian River APMP, the 5th Supervisorial District, Gold Ridge Resource Conservation District, and Lower Russian River Municipal Advisory Council, it therefore covers a large geographical extent. The geographic distribution of the parcels suggests that communities within this community cluster may have differing wastewater treatment needs, so this study has decided to split this community cluster into two smaller community clusters.

5.3.1 Eastern Area (Pocket Canyon) Community Cluster

The eastern area is formed by the communities along Pocket Canyon Highway. This area includes Summerhome Park and Mirabel, both of which are identified by the Draft Land Area Management Plan [3] as containing many older non-conforming OWTS, so this community cluster should be considered a high priority for evaluation.

Parcels are typically medium density but spread over a wide area. The area is located a long distance from the nearest wastewater treatment plant, although the higher density parcels closer to Forestville and Guerneville could be candidates for connection to respective sanitation districts. For these reasons, this community cluster appears most appropriate for consideration of localized options such as non-standard OWTS, on-site recycled water, or waterless toilets. Parcels could be considered alongside those to the north (described in Section 5.2.1).

5.3.2 Western Area (South Monte Rio and Villa Grande) Community Cluster

The western area covers the south bank of Russian River in the Monte Rio and Villa Grande area. Most parcels within this area are over 1 mile from existing sanitation district service areas. The distribution of the parcels follows roadways and the river, making this cluster less conducive for a community system. Parcels are within 3 miles of the Russian River County Sanitation District (CSD) Wastewater Treatment Plant; however, this is upriver, meaning that any connections would require pumping stations[20]. For these reasons, this community cluster appears most appropriate for consideration of localized options such as non-standard OWTS, on-site recycled water, or waterless toilets. Parcels could be considered alongside the Monte Rio, Browns Gulch, and Duncans Mills area, directly to the north (described in Section 5.2.3).

[20] This should not be taken to mean that these are not recommended, and this study notes that the Monte Rio and Villa Grande project is considering adding pumping stations for this purpose. For the purposes of this countywide study, the additional complexity and cost of pumping stations is considered to be less preferred than other solutions, however more localized studies may conclude differently.

Monte Rio and Villa Grande Wastewater Solutions Pilot Project

A separate study [4] is being carried out for Sonoma Water focusing on the Monte Rio and Villa Grande areas. This pilot initiative is aimed at exploring community wastewater solutions. The project is developing a feasibility study with close community involvement with the aim of helping the settlements understand potential alternative wastewater treatment solutions. The underlying methodologies used by the Monte Rio and Villa Grande project to analyze existing OWTS patterns were used to help define the criteria and methodology described by this report.

As is clear throughout this report, the Monte Rio and Villa Grande area is not the only area in Sonoma County which would benefit from more detailed study. It does, however, exhibit several aspects that make it a particularly strong candidate for more detailed evaluation: it is over 1 mile downriver from the nearest existing wastewater treatment plant; parcels are typically high density but are located closely alongside roadways and the river; and the Draft Land Area Management Plan [3] identifies this area as containing many older non-conforming OWTS. Other areas described in Section 5 of this report exhibit differing but similarly compelling aspects.

The geographical scope of the Monte Rio and Villa Grande project is defined as the Monte Rio Census Designated Place, which intersects with Sections 5.2.3 and 5.3.2 of this report. In this report, they are evaluated separately because they fall in two different Resource Conservation Districts, with the boundary running along the Russian River. Since these community clusters are directly adjacent and share many other characteristics such as topography and density, it is logical to consider them as a single community for further study.

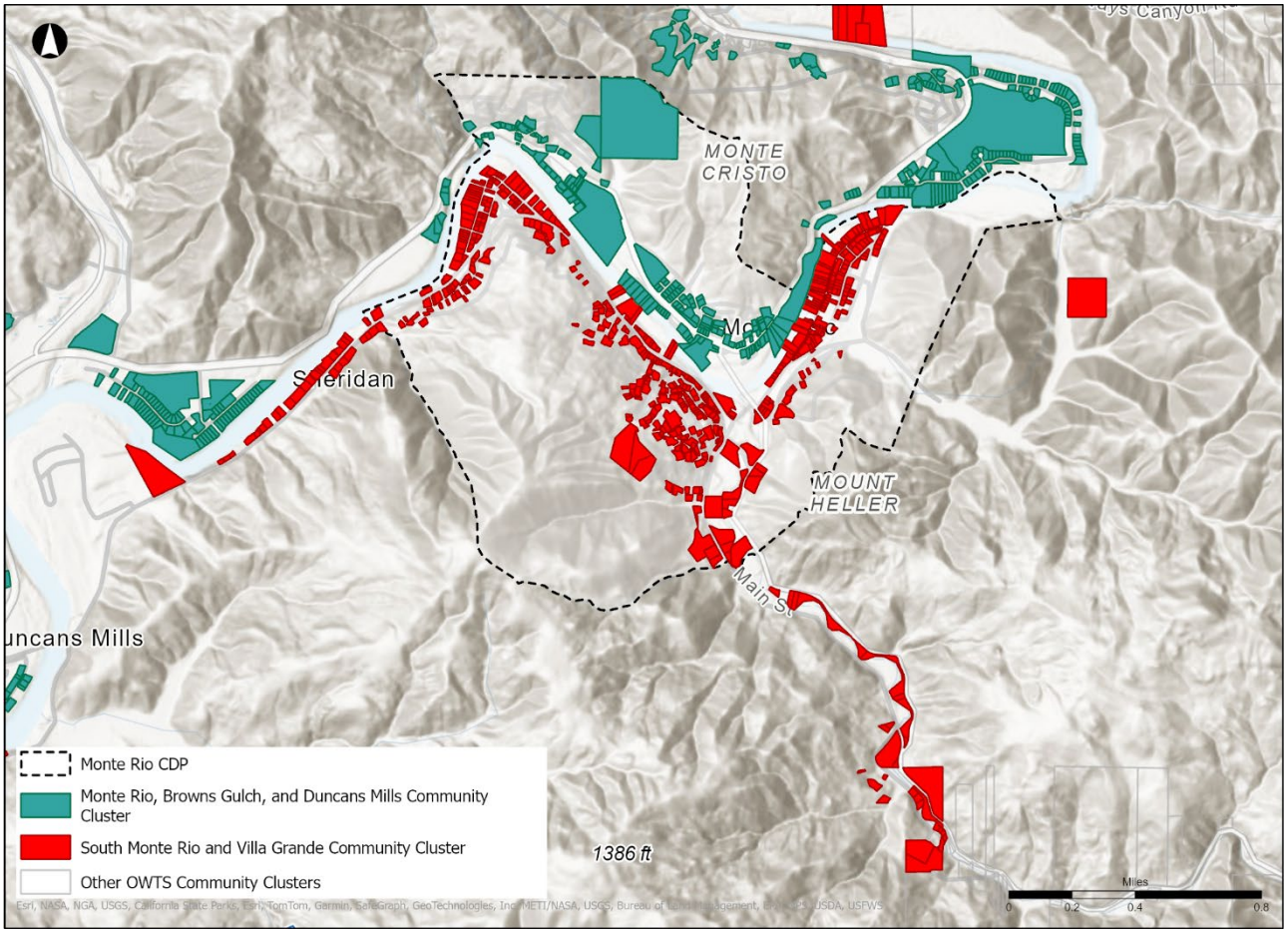

Figure 21 Community clusters in the Monte Rio and Villa Grande area

5.4 Russian River CSD Adjacent Community Cluster

Table 9 Russian River CSD Adjacent Community Cluster quick facts

Community Cluster ID	46
APMP Zone	Russian River
Supervisorial District	5th
Sanitation District	Russian River Community
Number of OWTS Parcels	94 (26 known and 68 suspected)
Number of DAC Parcels	42 (44.7%)
Average Parcel Density	Medium (8.33 acres per parcel)
Total Parcel Area (square miles)	762 acres (1.19 square miles)
Approximate Width and Height	4 miles × 4 miles

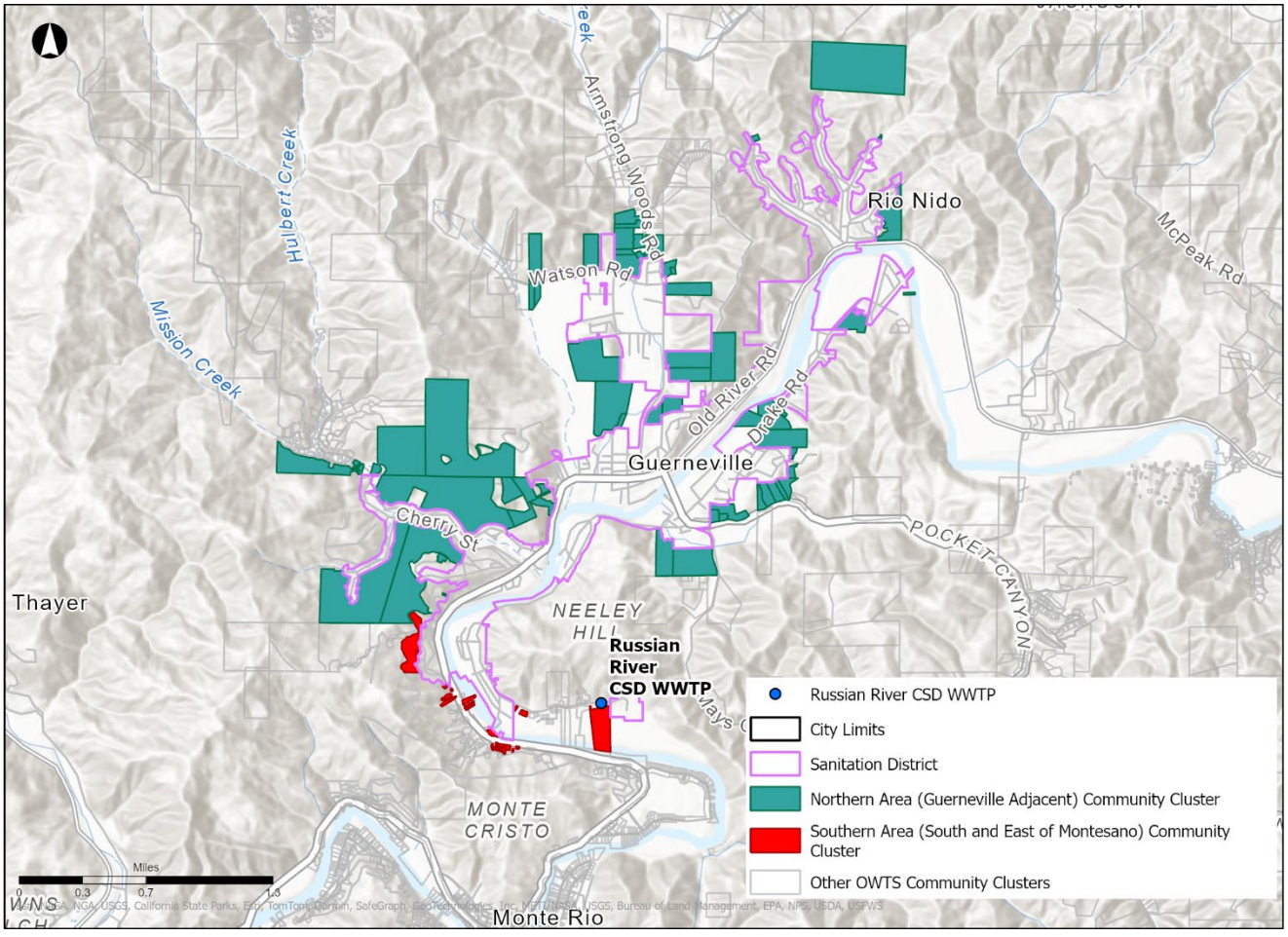

Figure 22 Russian River CSD Adjacent Community Cluster map

This community cluster neighbors those described by the two preceding sections and is located in the area in and immediately surrounding Guerneville. Because this large area is all within the previously anticipated Russian River APMP, the 5th Supervisorial District, and Russian River Community Sanitation District, it therefore covers a large geographical extent. It contains two separate groups of parcels: a northern group in Guerneville; and a second group to the south, closer to the Russian River Community Service District (CSD) Wastewater Treatment Plant.

5.4.1 Northern Area (Guerneville Adjacent) Community Cluster

The northern area of this community cluster covers the areas immediately adjacent to Guerneville. The Draft Land Area Management Plan [3] identifies this area as containing many older non-conforming OWTS, so this community cluster should be considered a high priority for evaluation.

This area contains too much variation in elevation for connection to existing wastewater collection and treatment plants. The smaller parcels in the cluster are distant from the larger ones which may have space to support a community wastewater collection and treatment system. For these reasons, it may be most appropriate to evaluate localized options such as non-standard OWTS, on-site recycled water, or waterless toilets.

5.4.2 Southern Area (South and East of Montesano) Community Cluster

The southern area covers the area closest to the Russian River CSD Wastewater Treatment Plant. This small community cluster contains less variation in elevation and is located close to the wastewater treatment plant. For these reasons, this community cluster may be appropriate for connection to Russian River CSD Wastewater Treatment Plant.

5.5 West of Sebastopol Community Cluster

Table 10 West of Sebastopol Community Cluster quick facts

Community Cluster ID	5
APMP Zone	Russian River
Supervisorial District	5th
Resource Conservation District	Gold Ridge
Number of OWTS Parcels	2,584 (884 known and 1,700 suspected)
Number of DAC Parcels	501 (19.4%)
Average Parcel Density	Medium (6.25 acres per parcel)
Total Parcel Area	16,275 acres (25.43 square miles)
Approximate Width and Height	13 miles × 12 miles

A large part of the 5th Supervisorial District also falls within the Gold Ridge Resource Conservation District and the previously anticipated Russian River APMP, therefore forming a single large community cluster, located between Ross, Sebastopol, Knowles Corner, and the Marin County line. This study used parcel density and topographic characteristics to split this into three separate community clusters.

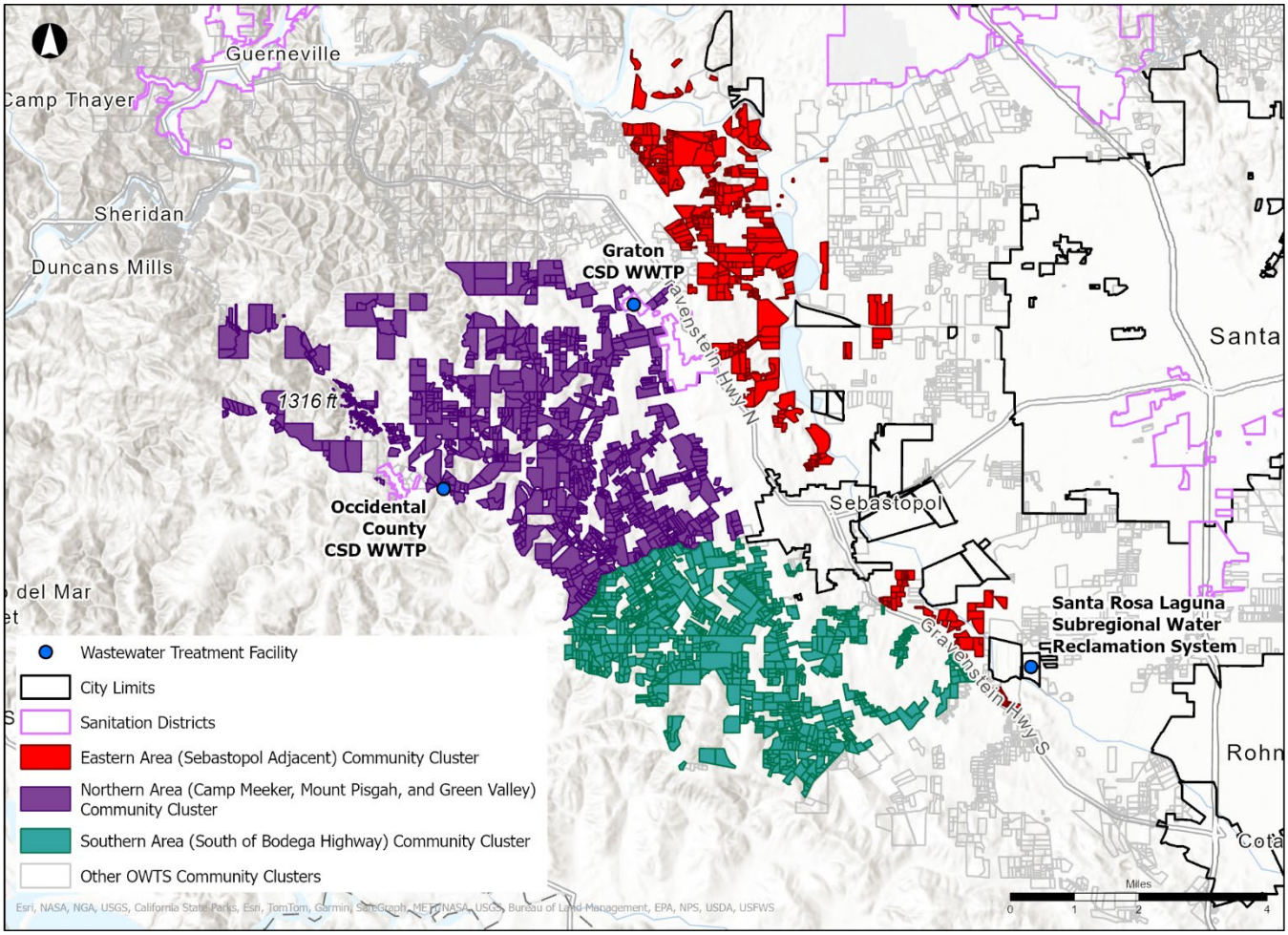

Figure 23 West of Sebastopol Community Cluster map

5.5.1 Eastern Area (Sebastopol Adjacent) Community Cluster

The eastern area of this cluster is bounded by Gravenstein Highway. It typically consists of medium density parcels which are spread out over a large area. The elevation is typically similar to or higher than the Laguna Wastewater Treatment Plant. It may also be possible to join this cluster with others and connect to the Graton CSD or Occidental CSD Wastewater Treatment Plants. For these reasons, this community cluster may be appropriate for annexation or connection to the existing adjacent wastewater collection and treatment systems.

5.5.2 Southern Area (South of Bodega Highway) Community Cluster

The southern area of this community cluster is bounded on the east by Gravenstein Highway and on the north by Bodega Highway. It has variations in elevation which would make connection to existing wastewater collection and treatment plants more complex. For this reason, it may be most appropriate to create a community wastewater collection and treatment system and service district in this area.

5.5.3 Northern Area (Camp Meeker, Mount Pisgah, and Green Valley) Community Cluster

The northern area is located to the west of Gravenstein Highway and north of Bodega Highway. This area includes Camp Meeker, which is identified by the Draft Land Area Management Plan [3] as containing many older non-conforming OWTS, so this community cluster should be considered a high priority for evaluation.

Like the southern area, this also has variations in elevation which would make connection to existing wastewater collection and treatment plants more complex. For this reason, if capacity permits, it may be possible to connect to the Graton CSD or Occidental CSD Wastewater Treatment Plants. If this is not possible, it may be most

appropriate to investigate the creation of a community wastewater collection and treatment system or the evaluation of non-standard OWTS, on-site recycled water, or waterless toilets. Potential governance structures for this scenario are discussed in Section 4.1.

5.6 Mark West Springs and Meadow Vista Trail Community Cluster

Table 11 Mark West Springs and Meadow Vista Trail Community Cluster quick facts

Community Cluster ID	44
APMP Zone	Russian River
Supervisorial District	4th
Resource Conservation District	Sonoma
Municipal Advisory Council	Mark West Area
Number of OWTS Parcels	194 (79 known and 115 suspected)
Number of DAC Parcels	72 (37.1%)
Average Parcel Density	Medium (5 acres per parcel)
Total Parcel Area	979 acres (1.53 square miles)
Approximate Width and Height	5 miles × 7 miles

This community cluster covers the Mark West Springs area, to the northeast of Larkfield-Wikiup. Because this large area is all within the previously anticipated Russian River APMP, the 4th Supervisorial District, Sonoma Resource Conservation District, and Mark West Area Municipal Advisory Council, it therefore covers a large geographical extent. It has been split due to the different terrain characteristics of the two areas of the community cluster.

5.6.1 Northern Area (Mark West Springs) Community Cluster

The northern area of this community cluster covers the areas closest to Mark West Springs and Larkfield-Wikiup. This closely distributed medium density community cluster falls in an area with significant variation in elevation, meaning that connection to existing wastewater collection and treatment plants would be difficult. This community cluster contains many parcels which fall in the State Water Resources Control Board's definition of Disadvantaged Communities, so may be eligible for grant funding. For these reasons, it may be appropriate to investigate the creation of community wastewater collection and treatment systems and service districts.

5.6.2 Southern Area (Meadow Vista Trail) Community Cluster

The southern area covers the area to the south of Larkfield-Wikiup. This closely grouped area of medium density parcels is located in a flat area and is close to the Airport-Larkfield-Wikiup Wastewater Treatment Plant. For this reason, if capacity is available, it may be appropriate to investigate connecting this community cluster to the nearby wastewater treatment plant and using existing governance structures.

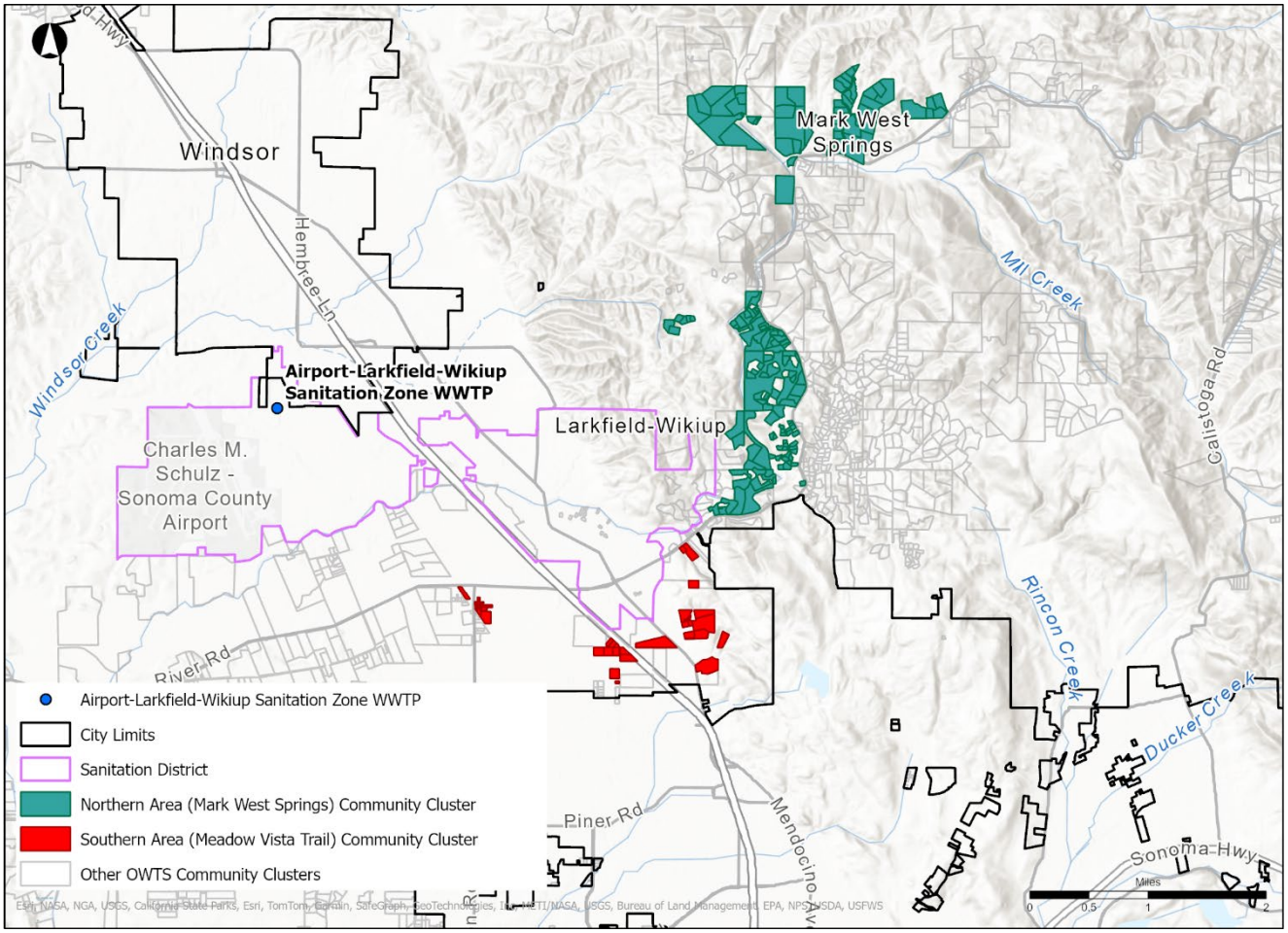

Figure 24 Mark West Springs and Meadow Vista Trail Community Cluster map

5.7 Santa Rosa Adjacent Community Cluster

Table 12 Santa Rosa Adjacent Community Cluster quick facts

Community Cluster ID	47
APMP Zone	Russian River
Supervisorial District	1st / 3rd / 4th / 5th
Adjacent City	Santa Rosa
Number of OWTS Parcels	320 (120 known and 200 suspected)
Number of DAC Parcels	45 (14.1%)
Average Parcel Density	Medium (6.25 acres per parcel)
Total Parcel Area	1,958 acres (3.06 square miles)
Approximate Width and Height	10 miles × 11 miles

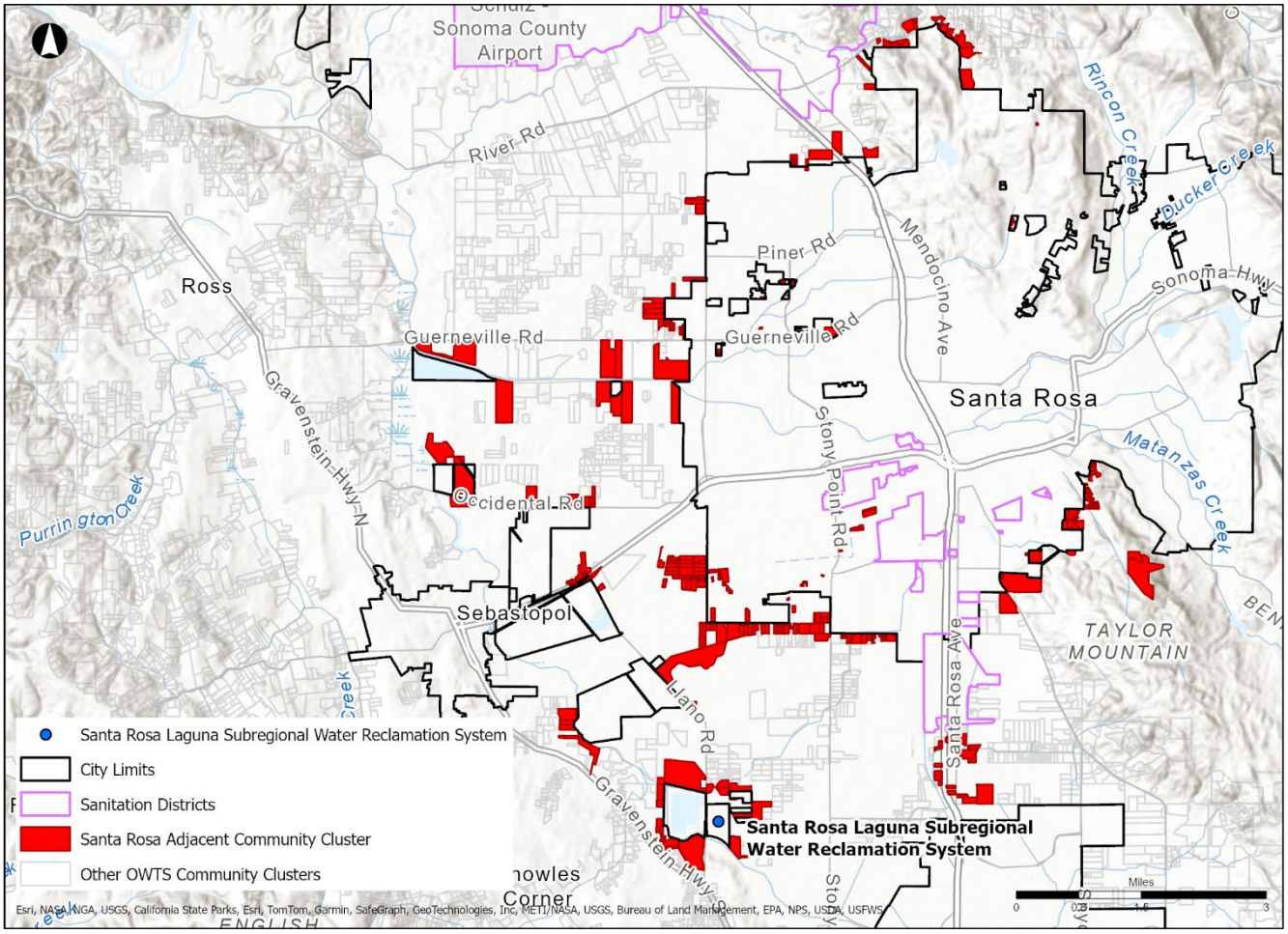

Figure 25 Santa Rosa Adjacent Community Cluster map

This small community cluster is located adjacent to the City of Santa Rosa and the wastewater collection and treatment system which transfers wastewater to the Laguna Subregional Water Reclamation System (SWRS). It was defined as a cluster because of its proximity to the city boundary.

Because of this community cluster's proximity to an existing sanitation district service area (see Section 6.2.4 for more details on the approach used to consider this factor) this study analyzed its topography and potential pipe routing. Parcel elevations are similar to or higher than the SWRS, and most parcels are located close to roadways or utility network corridors. For these reasons, this community cluster may be appropriate for annexation or connection to the existing wastewater collection and treatment system.

5.8 Cotati Adjacent Community Cluster

Table 13 Cotati Adjacent Community Cluster quick facts

Community Cluster ID	8
APMP Zone	Russian River
Supervisorial District	2nd
Adjacent City	Cotati
Number of OWTS Parcels	110 (29 known and 81 suspected)
Number of DAC Parcels	67 (60.9%)
Average Parcel Density	Medium (5.88 acres per parcel)
Total Parcel Area	659 acres (1.03 square miles)
Approximate Width and Height	3 miles × 3 miles

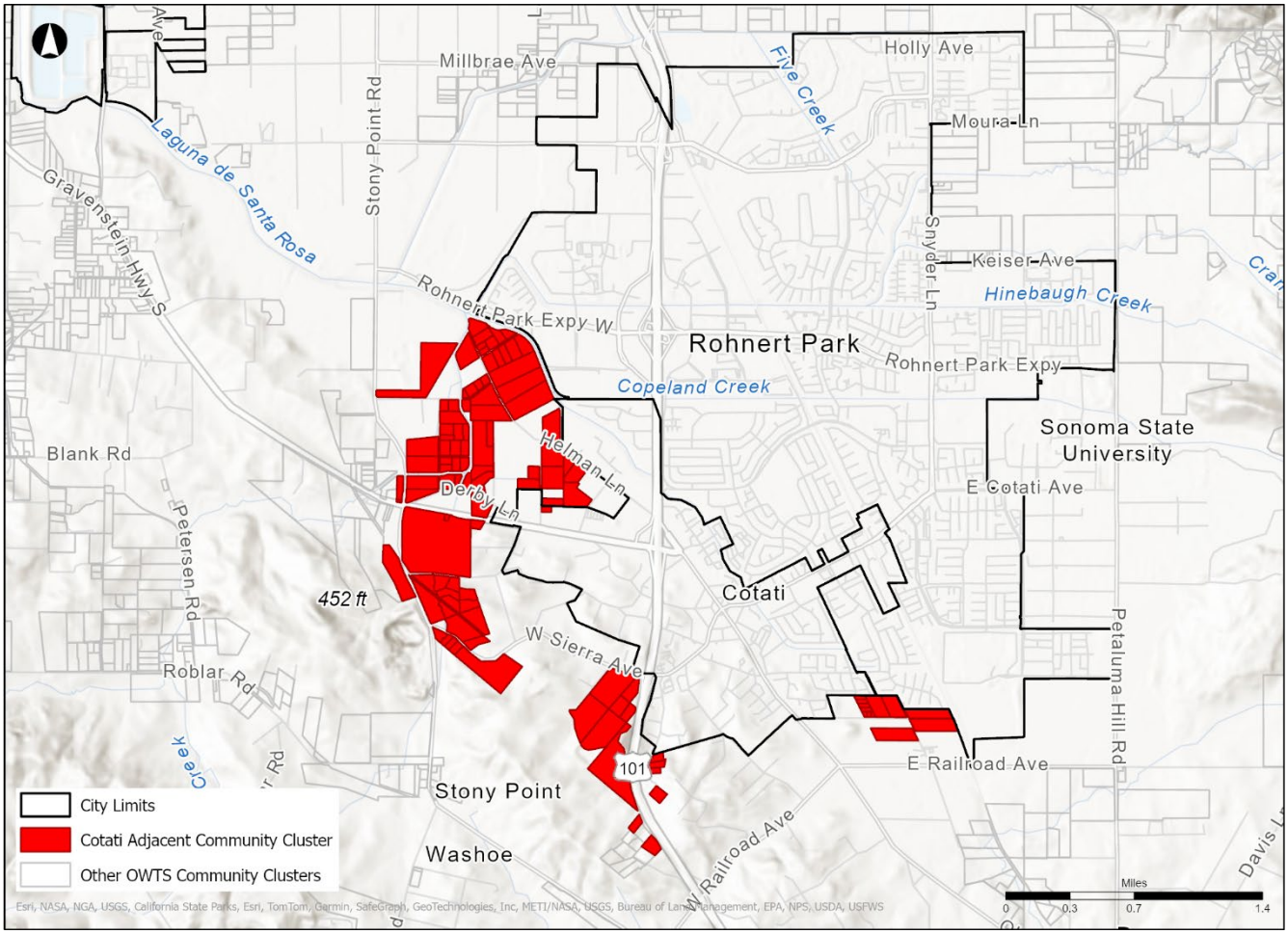

Figure 26 Cotati Adjacent Community Cluster map

This small community cluster is adjacent to the City of Cotati. It was defined as a cluster because of its proximity to the city boundary.

Because of this community cluster's proximity to an existing sanitation district service area (see Section 6.2.4 for more details) this study analyzed its topography and potential for pipe routing. Elevations are similar to or higher than the existing wastewater treatment plant. Further parcels could be incorporated into this cluster from neighboring clusters. For these reasons, this community cluster may be appropriate for annexation or connection to the existing wastewater collection and treatment system.

5.9 Rural Sonoma Creek Watershed Community Cluster

Table 14 Rural Sonoma Creek Watershed Community Cluster quick facts

Community Cluster ID	30
APMP Zone	Sonoma Creek
Supervisorial District	1st
Resource Conservation District	Sonoma
Number of OWTS Parcels	2,935 (1,289 known and 1,646 suspected)
Number of DAC Parcels	201 (6.9%)
Average Parcel Density	Medium (7.14 acres per parcel)
Total Parcel Area	20,653 acres (32.27 square miles)
Approximate Width and Height	13 miles × 22 miles

This large community cluster covers a wide area of the Sonoma Creek watershed, in Supervisorial District 1. The size and widespread nature of this community cluster make its evaluation complex.

This community cluster is mostly located over a mile from existing sanitation district service areas. While the parcels are typically medium density and have a shared governance structure, their disparate distribution may make them less appropriate for the development of a community system.

Roughly half of the parcels in this community cluster, including most of the higher density parcels, are within a groundwater basin. Other parcels are located near still water, within floodplains, and close to wells. Because of these factors, this community cluster is less appropriate for upgrades and monitoring of existing OWTS, and more appropriate for consideration for connection to existing wastewater and treatment facilities.

Parcels are typically within three miles of and at a higher elevation than the existing sanitation district service area with potential utility corridors and roadways to provide potential pipe routing options. For these reasons, it may be appropriate to consider the parcels within this community cluster for feasibility for connection to existing wastewater collection and treatment facilities, using existing governance structures.

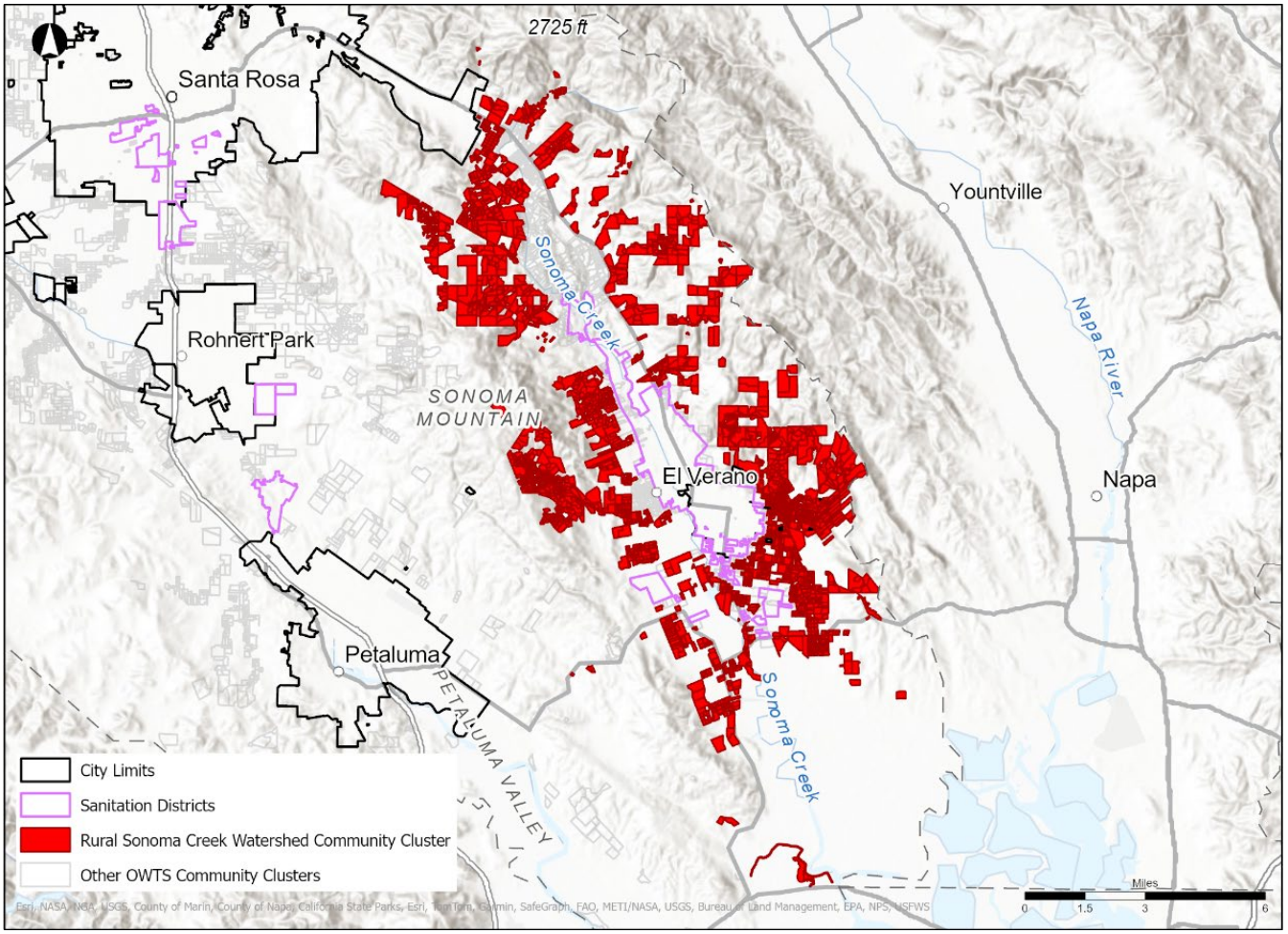

Figure 27 Rural Sonoma Creek Watershed Community Cluster map

5.10 Community Clusters Adjacent to Cities and Sanitation Districts

Fifteen community clusters[21] were not identified by the prioritization process used by this study, but are adjacent to existing service areas, so there may be a greater opportunity for annexation of these community clusters into the service areas of cities and sanitation districts. Analysis would be needed to confirm whether sewer and treatment plant capacities are sufficient for the additional flows and whether there are other impediments. Three of these were identified as prioritized clusters, shown with an asterisk in Table 15. These clusters are also illustrated by Figure 28.

Table 15 Community clusters adjacent to cities and sanitation districts

ID	Governance Structure	Name of Adjacent Area	Additional Notes
1	Sanitation District	Airport-Larkfield-Wikiup Sanitation Zone	
4	City Limits	City of Healdsburg	This area includes Fitch Mountain, which is identified by the Draft Land Area Management Plan [3] as containing many older non-conforming OWTS, so this community cluster should be considered a high priority for evaluation.
8*	City Limits	City of Cotati	Discussed in Section 5.8.
11	Sanitation District	Occidental County Sanitation District	
14	Sanitation District	South Park County Sanitation District	
15	City Limits	Town of Windsor	Different Supervisorial District from 16.
16	City Limits	Town of Windsor	Different Supervisorial District from 15.
22	City Limits	City of Sebastopol	
24	Sanitation District	Sonoma Valley County Sanitation District	
26	City Limits	City of Petaluma	
29	City Limits	City of Santa Rosa	Could connect to the Oakmont Treatment Plant in Santa Rosa, rather than the main Santa Rosa plant (Laguna Treatment Plant). Different Supervisorial District from 47.
39	Sanitation District	Penngrove Sanitation Zone	
45	City Limits	City of Rohnert Park	
46*	Sanitation District	Russian River County Sanitation District	Discussed in Section 5.4.
47*	City Limits	City of Santa Rosa	Different Supervisorial District from 29. Discussed in Section 5.7.

[21] One additional cluster was identified adjacent to San Antonio Creek Park; however, this contains only one parcel so it has been omitted from this list.

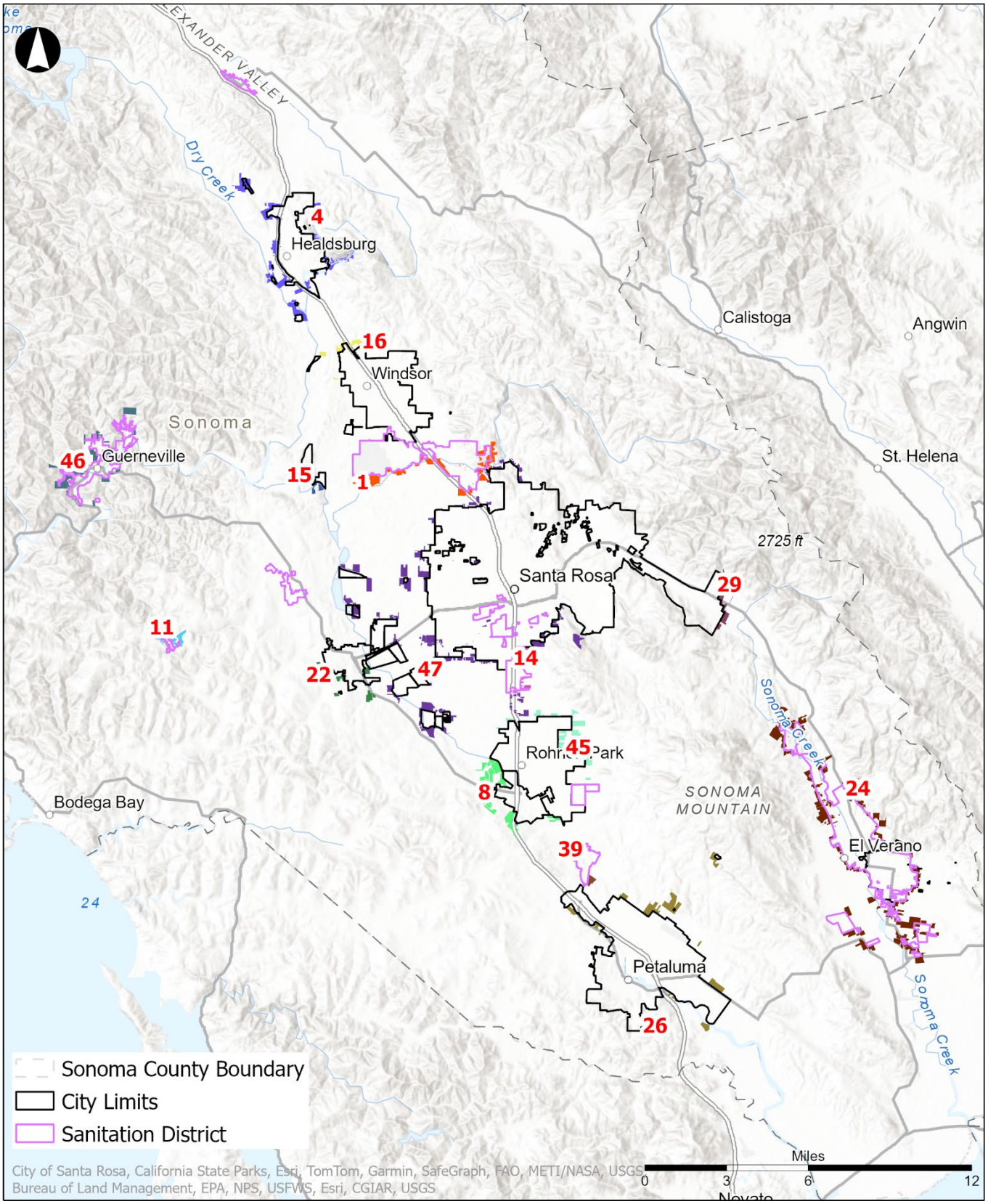

Figure 28 Map of community clusters Adjacent to Cities and Sanitation Districts

5.11 OWTS Parcels Outside Community Clusters

This study identified 22,268 parcels which are known or suspected to have OWTS in Sonoma County, but do not appear within a community cluster. There are two possible reasons for this:

- The OWTS parcel density is classified as “very low” (over 100 acres per parcel); or
- No part of the parcel intersects with an existing or previously anticipated APMP boundary.

Existing and previously anticipated APMP boundaries (shown in Figure 1) were used to develop the study area and criteria for this study. Because they vary in their definition (see Section 2.2), the relative distribution of community clusters varies across the county. Locations outside of these boundaries are therefore also unevenly distributed across the county. These additional locations are summarized below for informative purposes:

- The Sonoma Creek APMP covers the whole creek watershed, so only parcels with very low OWTS parcel density are excluded.
- Coverage of community clusters along the previously anticipated Russian River APMP is generally comprehensive but does not incorporate significant areas of high density in the Northwood Heights or Forest Hills areas.
- The Petaluma River APMP has less comprehensive coverage. Some areas to the north and west of Petaluma include medium and even high OWTS density because they are not close to the APMP.
- Some areas not covered by existing or previously planned APMPs have medium or high OWTS density, such as Timber Cove, Cloverdale, Asti, Windsor, and the settlements along the coast to the north of Bodega. This latter location is shown as an example in Figure 29.

Since OWTS is widely used outside the existing and previously used APMP boundaries, it may be beneficial to consider studies to evaluate OWTS and consider alternatives in areas across Sonoma County, not just within the APMP zones.

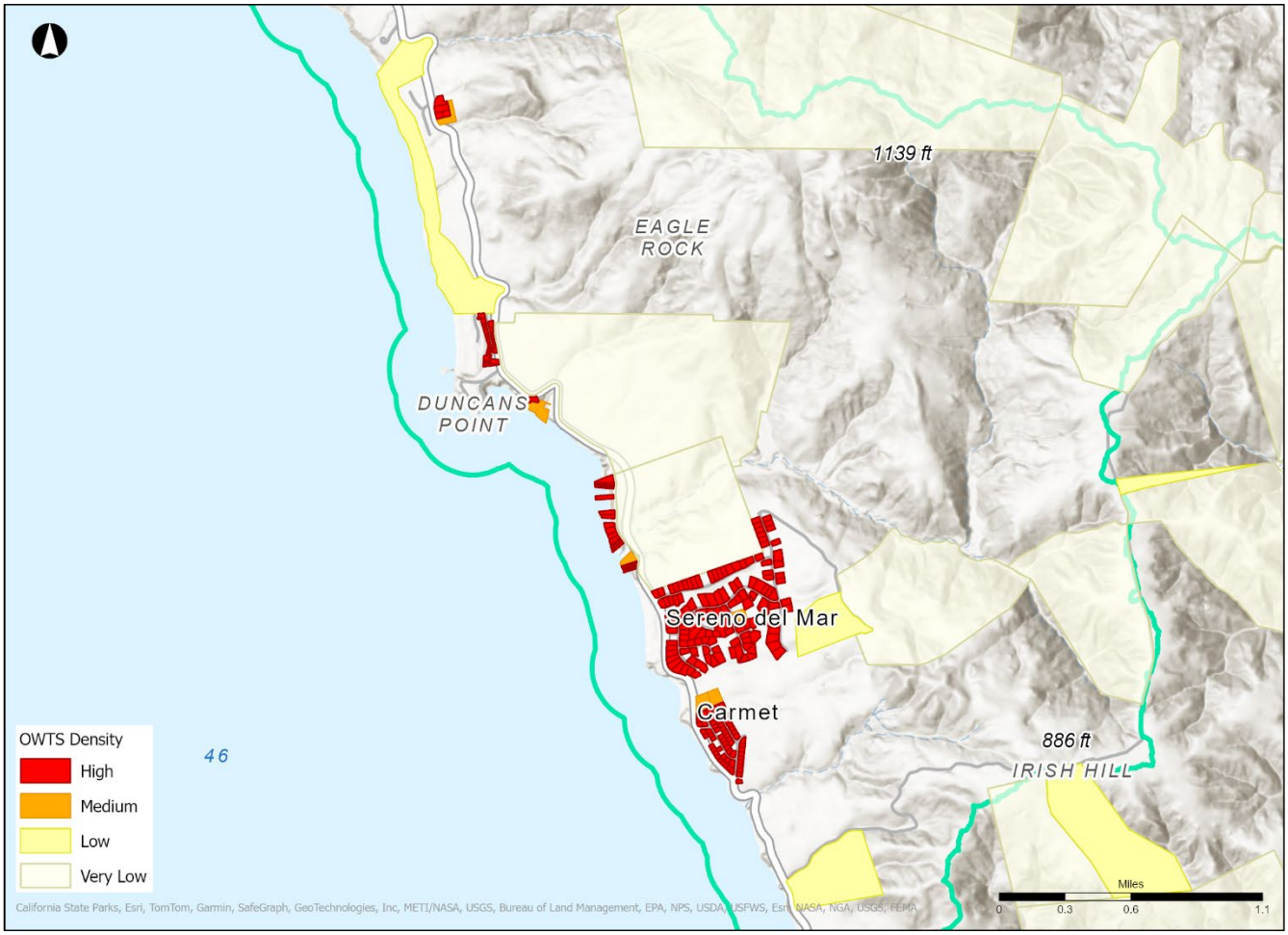

Figure 29 OWTS parcels outside community clusters in the area north of Bodega

6. Processes and Methodologies

This section describes the quantitative and qualitative approaches underlying the analysis presented in previous sections. It provides more technical detail than other sections for readers wishing to understand the approaches which were employed.

6.1 OWTS Locations

6.1.1 Known OWTS Locations

Permit Sonoma maintains a database of OWTS permits, Accela, which dates back to November 1991. Prior to this, paper records for OWTS permits exist dating back to the 1960s, but digitizing these records was beyond the scope of this study. This study therefore refers to data sourced from Accela as *Known OWTS Locations*. These locations were overlaid on parcel data to create a dataset of *Known OWTS Parcels*.

6.1.2 Suspected OWTS Locations

Building a study based only on OWTS permitted since 1991 would not be representative of the status and needs of the county, so this study needed to develop a process to identify *Suspected OWTS Parcels*. Methodologies to develop this dataset were reviewed alongside characteristics of the *Known OWTS Parcels* to develop an analytical approach considering minimum building size, land uses, coverage by a sanitation district, and recorded localized soil nitrate levels. Parcels located in exclave areas of unincorporated County within cities were removed from this dataset if they had a sewer service account.

The methodologies from five prior reports were reviewed[22]. Many of these contained core limitations such as focusing only on residential OWTS. Based on this review and considering other factors which may be relevant, this study developed the following criteria:

- Parcels with known OWTS should be excluded from the suspected OWTS data.
- Parcels within existing sanitation district service areas and cities should be excluded.
- Parcels with a known sewer connection should be excluded.
- Parcels which do not contain a building should be excluded.
- Agricultural, industrial, and commercial land uses should be excluded unless they also contain a residential land use or have high nitrate levels in their vicinity.

The dataset of *Suspected OWTS Parcels* should therefore include parcels with OWTS permits which predate 1991, parcels which had OWTS installed prior to the 1960s, and parcels which have OWTS but do not have a permit.

6.1.3 OWTS Parcel Density

In order to describe clustering patterns of OWTS, an initial dataset was needed describing the density of parcels. This study considered two measures of OWTS density. Both are calculated by measuring individual parcels, so therefore this density measure does not refer to the adjacency of OWTS in neighboring or nearby parcels.

The first density measure describes OWTS parcels as very low, low, medium, or high density. This measure was calculated using a methodology adapted from the analysis performed by the draft Russian River TMDL Report

[22] The Petaluma River [7] and draft Russian River [5] TMDL Reports and the Study Area Analysis for the Monte Rio and Villa Grande Wastewater Solutions Pilot Project [4] estimate OWTS through similar methods, effectively subtracting the number of sewered residential properties from residential properties. Sonoma County draft Local Area Management Plan [3] subtracts the number of undeveloped parcels from unincorporated parcels.

[5] to describe parcels as very low (over 100 acres per parcel), low (over 10 acres per parcel), medium (over 1.25 acres per parcel), or high (1.25 acres per parcel or less) density. Very low density parcels are predominantly agricultural and were therefore not considered further by this study.

The second density measure is defined by the State Water Resources Control Board [1], and describes the maximum allowable density of OWTS in new single family dwelling unit subdivisions and is based on average rainfall. While it is not intended as a limit of density for existing OWTS, the use of rainfall data means that an alternative measure of density can be considered, identifying areas of potential interest beyond the ranges described by the first measure.

The maximum allowable density value would also enable the use of future climate projections to demonstrate potential impacts of climate change on the behavior of OWTS outflows, which was explored by this study. However, while future climate projections show changes in future rainfall in Sonoma County, they do not agree on whether rainfall patterns will increase or decrease, and it is outside the scope of this study to make or review climate projections. Because of this uncertainty, this has not been explored further by this report.

6.2 OWTS Community Clusters

In order to perform the community characterization analysis, it was necessary to identify community clusters. These were defined as areas with low, medium, or high density of OWTS and other common characteristics. While geospatial approaches exist to develop spatial clusters of datasets, identifying governance solutions was a primary driver for this study, so the following approach was taken:

1. Separate parcels into clusters based on governance criteria.
2. Automatically score clusters based on technical criteria.
3. Prioritize clusters based on their impact, including characteristics and technical scores.
4. Perform qualitative analysis on priority clusters to characterize communities.

6.2.1 Governance Criteria

A key driver for this study was the desire to identify potential governance areas where new entities could be formed to govern wastewater management for communities or existing entities could be adapted.

The draft Lower Russian River Governance Study [6] describes the challenges relating to wastewater governance. It explores the strengthening of existing institutions, consolidating special area districts, creating a new community service district, and forming a new municipality, as potential governance solutions. Each of these presents unique political and financial challenges, and ultimately it identifies that community support is fundamental to the success of any governance solution.

Numerous analytical methods exist for developing clusters, however, the criteria design process concluded that the relationships between governance criteria were most important to this study. For this reason and in order to maintain a manageable number of community clusters, governance boundaries were considered in isolation when developing community cluster outlines.

For this study, the governance criteria that were used were Supervisor Districts, Municipal Advisory Council boundaries, unincorporated areas, sanitation and wastewater districts, and resource conservation districts.

This led to the identification of geographically discrete areas across Sonoma County with unique combinations of jurisdictional characteristics. Areas within 300 feet of a sanitation district, city boundary or sphere of influence were separated due to their proximity to existing potential sanitation district service areas. The resulting community clusters were grouped if they were located within 2 miles of another cluster with identical jurisdictional characteristics.

Community clusters were also enriched with information to help determine their potential Disadvantaged Community status.

6.2.2 Technical Criteria

Many different clustering criteria were considered by the study, so the criteria were grouped into two categories: technical; and governance. Each of the technical criteria was then classified as an opportunity (positive factor) or constraint (negative factor) for potential interventions.

Technical opportunities considered were:

- Proximity to existing utility corridors
- Industrial and agricultural land uses

Technical constraints considered were:

- Proximity to environmental receptors and sensitive sites
- Proximity to water wells
- Slopes greater than state requirements
- Soil types with poor rating for septic tank absorption
- Floodplains

Each of these constraints was assigned a score with equal weighting, which was averaged across each cluster to give an overall technical score. This is intended to help guide prioritization of clusters, so those with higher scores should typically be addressed sooner than those with lower scores.

6.2.3 Cluster Prioritization

Clusters were prioritized to identify those which would offer greater impact to water quality and communities, considering characteristics such as density, Disadvantaged Community status, and the technical scores described in Section 6.2.2.

It is important to highlight that, as stated in Section 5, insufficient data was available to this study to consider failing or aging OWTS as part of this process.

Prioritization was determined using a three-tier process:

- Tier 1 considered parcel density[23] and technical potential score values:
  - All clusters passing the Tier 1 criteria (2 clusters in total) were carried forward as prioritized.
  - Those below the maximum density were carried to Tier 2.
  - Those violating 6 of the 7 technical criteria were carried to Tier 3.
  - All other community clusters were not prioritized.
- Tier 2 considered possible Disadvantaged Community status:
  - All clusters passing Tier 2 criteria (3 clusters in total) were carried forward as prioritized.
  - Those which contained fewer than 50% but more than 20 Disadvantaged Community parcels were carried to Tier 3.
  - All other community clusters were not prioritized.
- Tier 3 carried forward all unique clusters from Tier 1 and Tier 2 (4 clusters in total) as prioritized.

[23] In order to calculate this density value, the entire cluster was considered as an aggregate.

This process is illustrated in Figure 30, and led to nine community clusters being identified as prioritized, as described in Section 5.

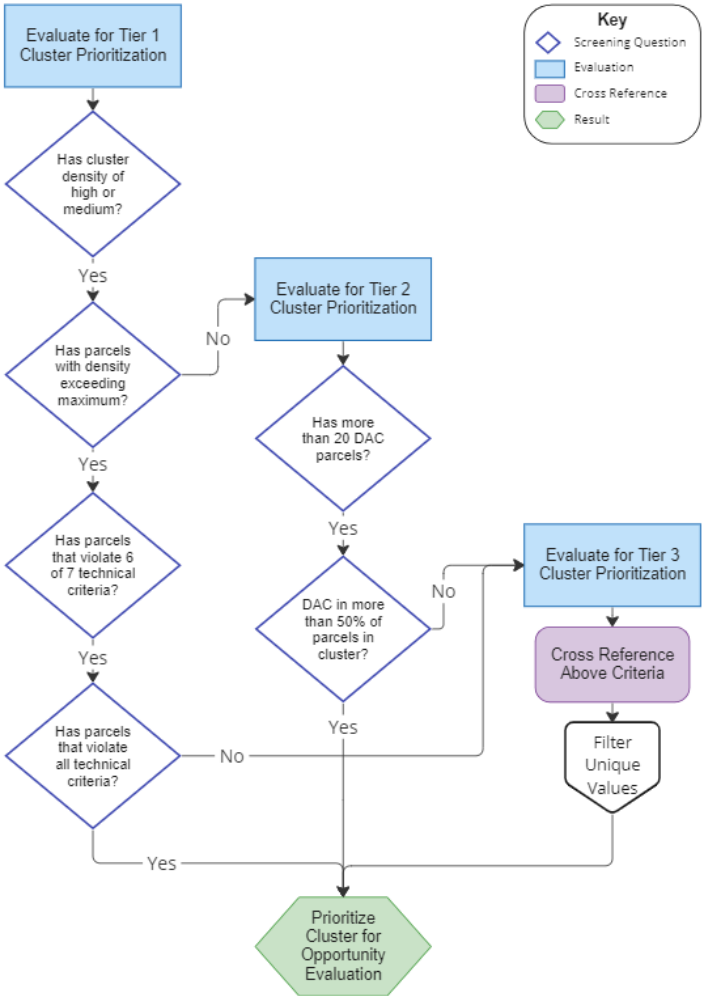

Figure 30 Decision tree for prioritizing OWTS community clusters based on impact

6.2.4 Community Characterization

The qualitative community opportunity analysis of the remaining clusters followed the following steps:

- Is the majority of the cluster located within 1 mile of an existing wastewater collection treatment service area? If so, perform a high-level evaluation of feasibility for connecting to an existing plant. (If not feasible, continue.)
- Does the cluster contain more than 50 parcels? If so, evaluate the feasibility of forming a community wastewater collection and treatment system. (If not feasible, continue.)
- Does the cluster have a low technical rating and low parcel density? If so, evaluate the feasibility of upgrading existing OWTS. If feasible, explore the creation of a septic district. (If not feasible, continue.)
- Does the cluster fall within 3 miles of an existing wastewater treatment service area? If so, perform a high-level evaluation of feasibility for connecting to an existing wastewater treatment plant. (If not feasible, continue.)
- Evaluate the feasibility of site upgrades (non-standard OWTS, recycled water, waterless toilets). Explore creation of a septic district.

Note that this process is qualitative and therefore subject to subjective views and judgement. It is illustrated in detail by the decision tree in Figure 31.

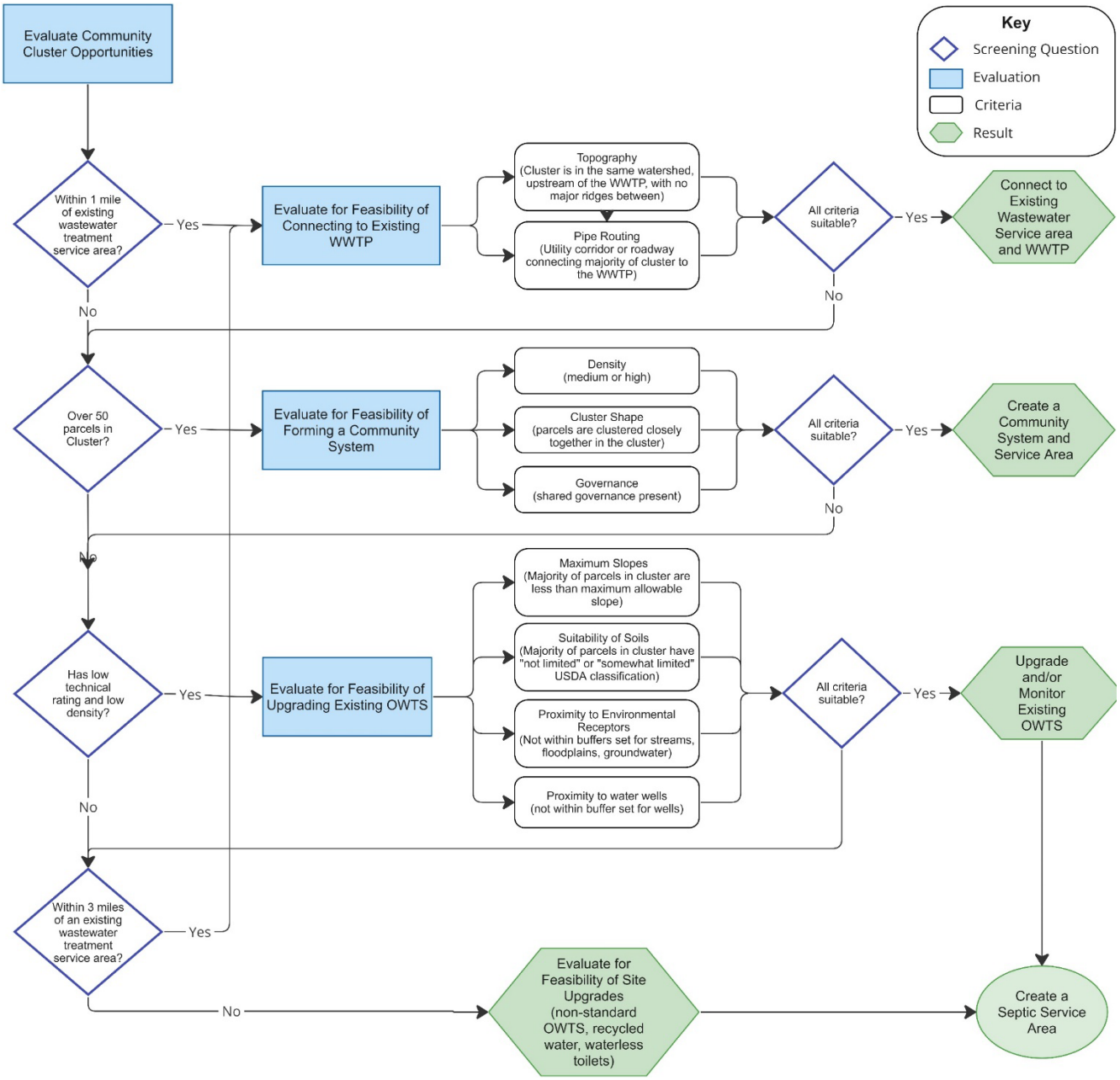

Figure 31 Decision tree for evaluation of OWTS community clusters to determine potentially suitable management opportunities

7. Suggested Next Steps

This study suggests the following next steps to continue identifying alternatives to OWTS in Sonoma County:

- Meet with communities in the nine prioritized community clusters and the resulting split community clusters to present the conclusions of this study and collect input from communities on their views and primary drivers.
- Perform closer reviews of the geographies of prioritized community clusters, redrawing approximate boundaries as needed to better represent communities.
- Survey owners of suspected OWTS parcels to develop a more accurate understanding of OWTS locations.
- Survey publicly owned parcels across Sonoma County to confirm OWTS use and whether alternative solutions may be available.
- Work with water providers to use water use data to estimate wastewater loading of OWTS parcels with water supply. Compare this data with parcels without water supply or use well permit data to identify OWTS parcels without water supply. Use combined datasets to estimate wastewater loading of OWTS parcels countywide.
- Coordinate with existing wastewater collection and treatment service providers to collect information and understand existing wastewater treatment plant capacities and collection network locations and capacities.
- Investigate funding opportunities to subsidize or support OWTS enhancements in disadvantaged communities.
- Where appropriate, evaluate potential connections between communities and existing wastewater treatment plants.
- Launch pilot programs in a small number of areas where OWTS alternatives could have significant impact.
- Evaluate the influence of OWTS management and regulation on land use planning, particularly the General Plan Update.
- Work with owners of properties located within city boundaries and in County exclaves within cities to identify opportunities to connect these communities to City wastewater treatment facilities.
- Review areas outside the APMP zones which may benefit from attention.

Superfund sites are locations which are contaminated by hazardous waste, which could be a safety hazard for construction of sewerage and wastewater treatment solutions and could also present operational concerns for OWTS if heavy metals or other materials were allowed to percolate into local aquifers. This study noted one active superfund site in Sonoma County, to the south of Cloverdale. While this site is in the Russian River area, it is outside the previously anticipated APMP boundary, so was not considered as part of this study but should be noted if future studies consider solutions for this area.

8. Conclusions

This study presents a view of the current OWTS situation across Sonoma County and describes potential interventions which the County and its communities may wish to explore together to reduce the collective impacts of OWTS and improve water quality across the county.

Prior work describes an imperative need to work closely with communities in developing collaborative solutions, and this is also true for OWTS. In order to maintain trust and develop a sense of ownership and shared direction, any proposed governance or technical interventions must be developed through close collaboration between communities and government bodies.

OWTS are distributed in large numbers across Sonoma County, with concentrations in the medium density rural communities. In general, public parcels are impacted less than private parcels. Vacation rentals have a disproportionately high amount of OWTS compared to non-rental properties.

This study identified nine priority community clusters for further analysis, based on the level of impact which interventions would offer. While most of these community clusters were in the 5th Supervisorial District and in the previously anticipated Russian River APMP, all five Districts were represented, and one priority cluster was in the Sonoma Creek APMP. Many community clusters represented unique characteristics, underscoring the need to work closely with communities in developing appropriate solutions.

Several opportunities do present themselves based on this analysis, including communities which may benefit from shared OWTS, connections to existing wastewater treatment facilities, and potential septic districts. Communities located close to existing cities and sanitation zones or districts face fewer technical hurdles than in other locations due to their proximity to existing community wastewater solutions. Even in these locations, however, it is paramount to understand the needs of the community before implementing a solution. The technical and governance implications of any intervention are closely interwoven.

OWTS forms an essential part of the wastewater infrastructure of Sonoma County, however the sheer numbers countywide suggest a need to work on interventions in selected areas. If the County and the communities which it represents can continue to work together on this important issue, then Sonoma County’s rivers can look forward to a cleaner and brighter future.

9. Glossary

- **APMP**: Advanced Protection Management Program. A planning document authored by the State Water Resources Control Board to describe the locations affected by a TMDL and the approach for meeting requirements.
- **CSA**: County Service Area. CSA 41 is a dependent district which governs water supply to Fitch Mountain, Jenner, Salmon Creek, and Freestone.
- **CSD**: Community Service District. The Russian River CSD operates a wastewater treatment plant downriver from Guerneville.
- **DAC**: Disadvantaged Community. A community described by the Federal and State Environmental Protection Agency as suffering from economic, health, and environmental burdens, including poverty, high unemployment, pollution, and high incidence of diseases. Identifying as a DAC helps a community to seek grants to improve local conditions.
- **GIS**: Geographic Information Systems. A computer system for capturing, storing, analyzing, and displaying spatial data.
- **OWTS**: Onsite Wastewater Treatment Systems. Commonly referred to as septic systems, the term describes systems used to treat and return wastewater from homes or businesses.
- **SWRS**: Subregional Water Reclamation System. The Laguna SWRS in Santa Rosa is a sophisticated water reuse system that recycles wastewater, transforming it to be suitable for irrigation and other purposes.
- **TMDL**: Total Maximum Daily Load. Defined by the U.S. Clean Water Act, this term identifies the maximum amount of pollutant that a waterbody can receive while still meeting water quality standards[24].
- **WWTP**: Wastewater Treatment Plant.

[24] See Overview of Total Maximum Daily Loads (TMDLs).

10. References

[1] State Water Resources Control Board, "OWTS Policy: Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems," 18 April 2023. [Online]. Available: https://www.waterboards.ca.gov/water_issues/programs/owts/docs/adopted_owts_policy.pdf. [Accessed 2 October 2023].

[2] County of Sonoma, "Onsite Wastewater Treatment System Regulations and Technical Standards (Draft OWTS Manual, version 8.4)," 22 June 2022. [Online]. Available: https://permitsonoma.org/divisions/engineeringandconstruction/wellandsepticsystems/septicsystems/owtsmanual. [Accessed 2 October 2023].

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Appendix A

Criteria Information

A.1 Questions and Criteria for Consideration

Underlying the Study Design Criteria described in Section 2.3 were the following thirteen core questions:

1. What community-based wastewater alternatives exist, including connection to sewer conveyance and treatment, community, or shared OWTS, and/or other alternative wastewater treatment technologies?
2. What governance options are available to provide for the various clusters' wastewater needs?
3. Where are the opportunities to provide services for ongoing management or support of OWTS?
4. Where are the opportunities for OWTS clusters to expand and/or join an existing management district's boundaries or functions or create a new governance option to manage or support wastewater treatment, considering factors such as geography and economics?
5. Can County Service Area 41 provide any services?
6. Where are the opportunities to utilize shared/community OWTS?
7. Where are the wells or parcels with water rights? How will this affect wastewater treatment alternatives?
8. Where are the utility corridors and roads?
9. Does parcel ownership or use affect possible community solutions?
10. Does population density or parcel density impact wastewater treatment alternatives?
11. Which geographic hurdles affect feasibility of community-based wastewater treatment alternatives? Watershed boundaries? Topography? Parcel size?
12. What economic factors contribute to wastewater treatment alternative feasibility?
13. Where are the opportunities to turn OWTS wastewater into recycled water?

These questions required a mixture of quantitative and qualitative analysis based on a core understanding of the distribution of OWTS, infrastructure, governance structures, and other items across Sonoma County. They formed the basis of the study design and analysis described in this report and are addressed on a countywide level in Section 4. Questions which provide useful details for the community characterization analysis are also addressed for specific locations in Section 5.

Appendix B

Data Information

B.1 Data Gaps and Limitations

B.1.1 OWTS Permits

Permit data from Accela appears to be of a high standard where available but includes no records prior to 1991 and includes permits for OWTS which have been repaired, replaced, or removed.

Since some information in the permit dataset is stored as free text, it was sometimes necessary to perform filtering based on specific keywords, which may not provide accurate results in every instance.

In developing the OWTS Density analysis, permit data was filtered to remove OWTS which were destroyed and either abandoned or connected to sewers, but still includes repairs and replacements. It is therefore possible that the OWTS count, used to calculate Maximum Allowable OWTS Density, may be overcounted.

Information about the type, age, and condition of OWTS was not included in this study. While some records in the permit datasets did include this information, in general the number of permits with this level of information was too low to draw significant conclusions.

Parcels contributing to existing community systems are not always identified as Known OWTS, since the permit is only associated with a single parcel. However, there are only a small number of community systems in the county and spot checks identified that suspected contributors had usually been identified instead as Suspected OWTS.

B.1.2 Parcels

Information about ownership status (i.e., whether a property is owned, rented, etc.) cannot easily be extracted from any of the County parcel datasets.

B.1.3 Sanitation Districts

Forestville has a wastewater treatment plant serving the communities but also has a high number of OWTS permits in the vicinity. No dataset was identified which clearly showed the coverage of this plant, so some parcels in this area may have incorrectly been identified as suspected OWTS.

B.1.4 APMP Boundaries

This study uses APMP boundary datasets provided by the State Water Resources Control Board. They differ in methodology and geographical characteristics between each river system. Because of this, the characteristics of the analysis will differ for each APMP.

B.1.5 Groundwater

While groundwater depth information can be extrapolated from publicly available well data, it is too low resolution to provide useful data for this study. Depth to groundwater and basin condition information was not included.

B.1.6 Soils

Since more detailed information was not easily and uniformly available, this study uses United States Department of Agriculture (USDA) Soil Survey (SSURGO) soil data to provide a high-level view of the appropriateness of soils for OWTS. The USDA's criteria are more conservative than those described by the Sonoma County OWTS Manual, therefore some sites may be identified by this study as unsuitable for OWTS when they may in fact be permitted by the County.

B.1.7 Wells and Water Rights

Well locations can affect the placement of OWTS. Data pertaining to public wells (e.g., city-owned, and operated wells) did not appear to be included in the wells dataset that was made available to this study, so only privately-owned wells were included in the analysis.

Water rights may indicate the presence of wells, and this study also investigated whether to include water rights as a governance opportunity or filter, but the data from the State's eWRIMS system was examined and was not found to be useful for this purpose. Private well data was sourced from Permit Sonoma to provide data on existing water extraction.

B.1.8 Culturally Sensitive Sites

While not required for this study, consideration was given to evaluating distances from sites of historical or cultural significance (churches, cemeteries, etc.) However, the number of sites within the APMP areas was extremely low and did not add meaningful information for this study.

B.1.9 Tribal Boundaries

This study used Federally Recognized Tribal Boundaries as defined by the United States Census (2022 data). This shows two recognized Tribal Boundaries in Sonoma County, at Dry Creek and Stewarts Point. Since both are outside of the APMP boundaries, this is not used as a governance criterion.

B.1.10 Special Planning Areas

Some local bodies are known to exist in Sonoma County with a scope to handle water or wastewater, however there is no single GIS dataset known to exist which describes these or other special planning jurisdictions across the County, so these have not been included in this study. This study recommends that any work to develop wastewater interventions within Community Clusters should include research into local bodies within the cluster.

B.1.11 Resource Conservation Districts

No dataset was available to this study showing Resource Conservation Districts, so Tax Rate Area (TRA) data was used instead. This had gaps for some properties including those which were publicly owned. For the purposes of this study, the gaps were manually plugged based on a general understanding of the intended district boundaries.