Executive Summary

This Groundwater Sustainability Plan (GSP) was developed by the Sierra Valley Groundwater Management District (SVGMD) and Plumas County, the Groundwater Sustainability Agencies (GSAs) for the Sierra Valley Groundwater Basin (SV Subbasin). The GSP is summarized below and includes the following chapters:

1. Introduction
2. Plan Area
3. Sustainable Management Criteria
4. Projects and Management Actions
5. Plan Implementation

Chapter 1: Introduction

The Sustainable Groundwater Management Act (SGMA), a three-bill legislative package regulating a path for groundwater basins throughout California to achieve sustainable groundwater management, required those high- and medium-priority basins not considered to be critically overdrafted to be managed under a GSP by January 31, 2022. Additionally, SGMA requires demonstrated sustainability within 20 years of GSP implementation, and continued sustainability through the 50-year planning and implementation horizon. The Sierra Valley Subbasin is ranked a medium-priority basin by the California Department of Water Resources and is not considered to be critically overdrafted.

The purpose of the SV Subbasin GSP is to facilitate groundwater management in a manner that reduces and/or eliminates significant or unreasonable impacts associated with groundwater level declines, groundwater storage reductions, water quality degradation, land subsidence, and surface water depletion that can result from groundwater extraction. The GSP is meant to prevent these locally defined significant and unreasonable impacts from occurring prior to 2042 and thereafter until at least 2072. A sustainability goal to manage groundwater resources in a manner that best supports the long-term health of the people, the environment, and the economy of Sierra Valley into the future by avoiding significant and unreasonable impacts to environmental, domestic, agricultural, and industrial beneficial uses and users of groundwater was also developed for this GSP through input from stakeholders within the SV Subbasin.

SVGMD was authorized under Senate Bill 1391 in 1980 to protect and oversee the management of the groundwater within the SV Subbasin. SVGMD submitted a notification to the California Department of Water Resources (DWR) in 2017 to become the GSA for the portion of the basin under its existing jurisdiction. A small portion of the SV Subbasin's northwest corner falls out of SVGMD's jurisdiction, so Plumas County became the GSA for this area. A memorandum of understanding (MOU) exists to confirm the intent of the two GSAs to work together on a single SGMA-compliant GSP for the SV Subbasin. SVGMD, as the lead GSA, is responsible for monitoring groundwater levels using monitoring wells located throughout the District, metering all active large-capacity wells (those capable of pumping 100 gallons per minute or more), preparing technical reports and evaluations on groundwater, reviewing development project proposals within the District boundary, and executing all other powers vested in the District by SB 1391 and SGMA.

The general guidance from the SVGMD Board of Directors in regard to funding GSP implementation is that District expenses should be well-controlled and guided by a locally viable, right-sized funding strategy focused on fairness. The estimated cost of GSP implementation over the next 20 years (2022 to 2042) is estimated to be in the range of $68,500 to $142,000 (present dollar value), annually, based on the best available information, excluding specific project funding for which grants may be sought. The major cost categories are agency administration and operations; GSP reporting (annual and 5-year reports); monitoring, data collection, and technical support; technical work and model maintenance; outreach, coordination, and education; and legal support. Most of the projects and management actions identified in the GSP are likely to require grant funding and partnerships to implement. Local, state, and federal sources may provide funding toward the GSP implementation. As part of the implementation, the GSAs will review their current revenue structure and update as necessary. It is expected that SVGMD will manage the implementation and reporting described in the GSP, with support from other entities as needed.

Chapter 2: Plan Area

Sierra Valley is an irregularly shaped, complexly faulted valley with seismic influences located in southeastern Plumas County and northeastern Sierra County in northeastern California. It is a valley renowned for its beauty, is a nationally designated Important Bird Area, and has a long history of agriculture. It is the largest wetland in the Sierra Nevada Mountains (FRLT, 2018), is considered one of the most biodiverse landscapes in the United States (FRLT, 2018), and is commonly regarded as the largest high-alpine valley in the United States (Vestra, 2005).

The outer boundaries of the SV Subbasin and adjacent Chilcoot Subbasin (excluding the straight-line boundary held in common) approximately parallel the boundaries of Sierra Valley (defined by the interface of the valley floor and surrounding mountains), with some minor exceptions.

The SV Subbasin has a surface area of 184 square miles (DWR, 2004a), and the Chilcoot Subbasin has a surface area of 12 square miles (DWR, 2004b). The hydrologic connection between the Sierra Valley Subbasin and the Chilcoot Subbasin is known to be significant, with some level of surface water hydrology and groundwater interaction, but it is not well understood. The subbasins are to some extent discontinuous at depth due to a bedrock sill (DWR, 2004b).

Present day land use is generally characterized by residential, commercial, industrial, agricultural, mineral resources, recreational, and natural resources and is typically controlled directly by local regulations and indirectly by other state and federal laws intended for public safety, public welfare, or to protect natural resources (Vestra, 2005).

The primary existing land use designation is agriculture/cropland and grazing. There are numerous farmland designations in the Sierra Valley defined by the California State Farmland Mapping and Monitoring Program. These include urban and built-up land (783 acres), grazing land (35,845 acres), farmland of local importance (90,187 acres), prime farmland (8,515), farmland of statewide importance (4,718 acres), unique farmland (2,642 acres), water (45 acres), and other land (3,281 acres).

Crops are grown throughout Sierra Valley including alfalfa, improved pasture, meadow pasture, grain, and specialty crops. The majority of crops are pasture or the production of hay. The top five crops in Plumas and Sierra County for 2002 listed by value were timber products, cattle, irrigated and dryland pasture and rangeland pasture, alfalfa hay, and other hay (CFBF, 2004).

Other land uses include various forms of recreation. Large areas of open space that are publicly and privately owned accompany relatively low-density areas of human settlement in the Sierra Valley Watershed. Some of the land remains generally accessible for informal public recreational activities of a dispersed, low-intensity nature. These activities include camping, hunting, fishing, running, walking, mountain biking, cross-country skiing, snowmobiling, agritourism, birding, and nature study. Water Rights law and existing water rights in Sierra Valley also play a major role in dictating land use (crop production, grazing).

Water sources for domestic, commercial, industrial, and irrigation water supply are both surface water and groundwater. DWR basin prioritization (DWR, 2019a) states that groundwater makes up 36% of the total water supply in the SV Subbasin. Because of the surplus of surface water during the wet season and lack of surface water during the dry season, conjunctive use of surface and groundwater is an important component of water supply management in Sierra Valley. For surface waters in Sierra Valley, there are adjudicated water rights (established in 1940[1]) along Last Chance Creek, Smithneck Creek, West Side Canal, Fletcher Creek, Little Truckee River (imported water), and Middle Fork Feather River. These water rights place some restrictions on water use and water diversions.

All of the communities within the Plan Area are to some extent groundwater-dependent, and virtually all residences outside of community areas use domestic wells for water. While many wells are not listed in state databases, those that are, fall into the following categories: agricultural, domestic, municipal, and unknown. The density of recorded domestic wells and municipal wells, agricultural wells, and unknown wells in the Plan Area range from 0 to 80, 0 to 10, and 0 to 17 per square mile, respectively, with the majority of domestic and municipal wells located around the communities of Sierra Valley, the majority of the agricultural wells located in the central and eastern portions of the valley, and unknown wells primarily located within/around the communities of Beckwourth, Chilcoot, Loyalton and Sierraville. Sierraville obtains its municipal water supply from springs. A comprehensive review of existing wells documented in state databases, which included locating wells based on well log information, was performed during the development of the hydrogeologic conceptual model for this Plan. Agricultural wells account for the majority of groundwater pumping in the subbasin. Industrial wells are limited to the Loyalton Mill/Co-gen plant supply well near Loyalton and a number of smaller wells providing water to industrial facilities near Beckwourth and in other areas of Sierra Valley.

Groundwater conditions and how they have changed over time in the SV Subbasin has been characterized through water resources monitoring which includes groundwater level monitoring, agricultural groundwater extraction monitoring, a limited amount of stream and channel surface water flow monitoring, and sporadic water quality monitoring. The SV Subbasin has been included in several geology and hydrogeology studies and several focused studies and monitoring projects. Additionally, several water resources management programs exist in Sierra Valley, including surface water rights allocation management/tracking by the Sierra Valley Watermaster, waterway preservation/restoration efforts by the Sierra Valley Resource Conservation District, and groundwater management by SVGMD. SVGMD maintains a large-capacity well inventory, metering and tracking program, monitoring and decision authority over new well applications and subdivisions proposals, and observation well groundwater level monitoring. SVGMD has also implemented a moratorium on new large-capacity agricultural wells in the overdrafted portion of the subbasin. Conjunctive use strategies also play a role throughout the subbasin.

[1] Judgement and Decree State of California, Division of Water Resources to F. E. Humphrey, Jr., et al" dated January 19, 1940 Superior Court of California, County of Plumas, Case No. 3095

The GSP includes a plan for providing public engagement opportunities in the decision-making process by promoting active involvement and informing the public on GSP implementation progress. Many beneficial users exist within the basin that require domestic, municipal, industrial, agricultural, environmental, and interconnected surface water supplies. The varying interests of the beneficial users within the basin have been considered by the GSAs when expressed through any of the outreach activities offered by SVGMD. In addition to the beneficial users, the general public within the SV Subbasin was kept informed on GSP development progress through progress summary presentations provided during public workshops as documented in the Communication and Engagement Plan and through information and documents posted on the District's website. To keep the public informed on GSP implementation progress, information will continue to be posted on the website, and updates will be provided at SVGMD Board meetings.

The GSP includes a hydrogeologic conceptual model (HCM) as a framework for understanding how water moves into, within, and out of a groundwater basin and underlying aquifer system. Several characteristics of the basin, including physiography, climate, vegetation and land use, soils, geology and hydrogeologic framework, were taken into consideration when developing the HCM. The model's development is an ongoing iterative process due to the availability of new data arising periodically, as well as the occasional lack of existing data.

The GSP summarizes existing and historical groundwater conditions including groundwater elevation data, groundwater storage, groundwater quality, land subsidence conditions, identification of interconnected surface water systems, and identification of groundwater-dependent ecosystems. The seawater intrusion indicator which is part of SGMA is not considered because the valley is not located adjacent to the coast. In regard to groundwater levels, the well levels are generally slightly increasing to slightly decreasing in the western and southern portion of the valley, with wells in the central and north-eastern portion of the basin showing the greatest decline. Groundwater in the Subbasin is generally of good quality and meets local needs for municipal, domestic, and agricultural uses. The high-quality water is derived from the large amount of snowmelt runoff from the surrounding mountains that recharges the groundwater aquifer and the limited amount of industry in the Subbasin. The various data available for Sierra Valley show that inelastic subsidence has occurred in the recent past and likely continues to the present. Based on intermittent observations, subsidence rates vary across the basin from less than 1" per year to about 6" per year. While the subsidence has occurred in varying areas in Sierra Valley over time, it has overlapped with areas known to have significant groundwater pumping. Only a few interconnected surface water systems were identified, as channel thalwegs are generally on the order of 5 feet lower than the adjacent floodplain areas, meaning that the adjacent surface water and groundwater bodies are not hydraulically connected in most locations within the basin. Evaluation of GDEs determined that the Sierra Valley Groundwater Basin contains 17,581 acres of GDEs, approximately 14% of the total basin area. About 80% of the GDEs in the basin are associated with the large wetland complex in the western half of the groundwater basin. The meadows along Carman Creek contain approximately 226 acres of the GDEs.

This Plan includes a water budget (reported in tabular and graphical form) for the Basin to provide an accounting and assessment of the total annual volumes of groundwater and surface water that enter and leave the Basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored (Reg. § 354.18[a]). The surface water system does not exhibit significant changes in budget due to the inflows primarily consisting of streamflow entering at the Basin boundaries and groundwater discharge to streams, while the outflows stem from streamflow that leaves the groundwater basin from the Middle Fork Feather River, irrigation diversions, and streambed percolation. The groundwater system does experience varying changes in water budget depending on the water year type. During dry, normal, and wet years, land surface flows within the Basin average about 125,000 AFY, 200,000 AFY, and 375,000 AFY, respectively. The main source of outflow in the groundwater system is evapotranspiration, but pumping for irrigation and municipal use is also present. Inflows to the groundwater basin consist of recharge distributed across the groundwater basin area, mountain-front recharge, and streambed percolation.

Chapter 3: Sustainable Management Criteria

A high-level "Sustainability Goal" created with input from stakeholders who participated in the GSP planning effort qualitatitvely outlines the purpose of the GSP. The Sustainability Goal for the SV Subbasin is "To manage groundwater resources in a manner that best supports the long-term health of the people, the environment, and the economy of Sierra Valley into the future by avoiding significant and unreasonable impacts to environmental, domestic, agricultural, and industrial beneficial uses and users of groundwater"..Progress towards sustainable groundwater management in the SV Subbasin is measured by first quantifying when significant and unreasonable impacts are identified for five sustainability indicators (lowering groundwater levels, reduction of groundwater storage, degraded groundwater quality, land subsidence, and surface water depletion). Next, sustainable management criteria (SMC) are designed that by avoiding certain measurable thresholds (e.g., minimum thresholds for groundwater level and maximum thresholds of groundwater quality) beyond which undesirable results would be identified. SMC chart a course towards sustainable groundwater management via interim milestones and measurable objectives, which when meet over the planning and implementation horizon results in the realization of the Sustainability Goal. SMC pertain to the five sustainability indicators present in the SV, and ensure the following:

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- Groundwater elevations and groundwater storage do not significantly decline below their historically measured low range (i.e., 2015 levels), thereby protecting the shallow wells from dewatering, protecting groundwater-dependent ecosystems, and avoiding significant ISW depletion due to groundwater pumping.
- Groundwater quality is suitable for the beneficial uses in the SV Subbasin and is not significantly or unreasonably degraded.
- Significant and unreasonable land subsidence is prevented in the SV Subbasin. Infrastructure (e.g., roads, foundations, water conveyances, and well casings) and agriculture production in the SV Subbasin remain safe from land subsidence.
- Significant and undesirable depletions of interconnected surface water (ISW) due to groundwater pumping are avoided by maintaining groundwater flows, magnitude and direction near ISW and through projects and management actions that bolster groundwater levels.
- The GSA groundwater management is effectively integrated with other watershed and land use planning activities through collaborations and partnerships with local, state, and federal agencies, private landowners, and other organizations, to achieve the broader "watershed goal" of adequate groundwater recharge and sufficient surface water flows to sustain healthy ecosystem functions.

Sustainable management criteria (SMC) for each applicable sustainability indicator are addressed in the GSP. SMCs consist of minimum thresholds, measurable objectives, and interim milestones that are quantitative criteria measured at a network of representative monitoring points (RMPs) that provide adequate coverage such that undesirable results, consistent with the sustainability goal, are avoided during the implementation period and sustainability is fully achieved by 2042 and maintained beyond (after 2042). Applicable SMC addressed in the SV Subbasin GSP are groundwater elevation, groundwater storage, depletion of interconnected surface waters, degraded groundwater quality, and land subsidence. These SMCs will be tracked, and the GSAs may choose to conduct periodic monitoring and modeling throughout GSP implementation. If groundwater levels or groundwater storage were to drop to a trigger level or fall below a minimum threshold, a process involving a combination of monitoring, reporting, investigation, and when necessary, corrective actions would be executed to recover the basin's levels and storage to acceptable values.

While the general trends for the majority of wells are between +1 and -1 ft/yr, the groundwater level shows significantly higher rates of decline in the central and northeastern portions of the subbasin. Wells with greatest declines generally have high seasonal variability corresponding to seasonal irrigation use and demonstrate high potential for recharge and recovery during wet events. The eastern, and especially the north-eastern, portion of the basin experiences the greatest depression of groundwater levels over the irrigation season, and the western portion of the basin remains relatively stable.

Overall, groundwater levels are declining in the Subbasin, but there is no evidence of chronic decline. While water levels in the Sierra Valley Subbasin show seasonal fluctuations, temporary downward trends during drought period, and recovery during wet periods, the overall trend for most of the wells is downward. SGMA regulations also require the GSP to identify future conditions (over 50 years) that may lead to chronically declining water levels. For example, increased periods of drought are preventing the complete recovery of levels that would happen in normal and wet years, thus creating the decline discussed in the plan.

Significant and unreasonable depletion of interconnected surface water (ISW) due to groundwater extraction will be identified if ISW depletion exceeds the maximum depletion rates indicated in the monitoring record from January 2000 to January 2021. At the time of writing, these rates have not been calculated and depend on results from the Sierra Valley integrated hydrologic model. However, this GSP acknowledges that ISW depletion is occurring, but this depletion is not significant and unreasonable. The conservative approach of not worsening ISW gradients is taken to ensure that previously unexperienced effects do not occur in the Subbasin. These management objectives are quantitatively achieved by maintaining groundwater levels near ISW at historical levels, which thereby maintains hydraulic gradients and ISW depletion.

Groundwater quality in the SV Subbasin is generally good and well-suited for the municipal, domestic, agricultural, and other existing and potential beneficial uses designated for groundwater in the Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin (Basin Plan). Based on the water quality assessment, constituents of concern in the SV Subbasin were deemed to include nitrate, total dissolved solids (TDS), arsenic, boron, pH, iron, manganese, and MTBE. SMCs are defined for two constituents: nitrate and TDS.

Sierra Valley has experienced land subsidence in the past and some land subsidence continues into the present day. Subsidence has occurred in varying areas in Sierra Valley over time and has overlapped with areas of significant groundwater pumping. The Sierra Valley subsurface geology is typical of Californian mountain valleys, and predominantly composed of eroded, alluvial, sedimentary deposits (e.g., clay, silt, sand, and gravel). The clay deposits are particularly susceptible to inelastic compression resulting in land subsidence when significant levels of drawdown have occurred.

Monitoring is fundamental to measure progress toward Plan management goals. The monitoring networks described in this GSP support data collection to monitor the SV Subbasin's sustainability indicators which include the lowering of groundwater levels, reduction of groundwater storage, depletion of interconnected surface water, degradation of water quality, and land subsidence. For each SMC, Representative Monitoring Points (RMPs) are a sub-component of the overall monitoring network which collectively "represent" hydrologic conditions that permit the evaluation of sustainable groundwater management. SMC are measured at RMPs. Monitoring data collected at the RMPs will be used to track spatial and temporal changes in groundwater conditions that may result from projects and actions that are part of GSP implementation. Per SGMA requirements, the goal of the monitoring networks is to demonstrate progress towards achieving Measurable Objectives (MO) described in the Plan, to monitor impacts to the beneficial uses or users of groundwater, to monitor changes in groundwater conditions relative to Mos, and minimum or maximum thresholds; and, to quantify annual changes in water budget components.

Chapter 4: Projects and Management Actions

Multiple projects and management actions (PMAs) have been identified for potential implementation by the GSA to achieve this Plan's sustainability goal by 2042 and avoid undesirable results as required by SGMA regulations. The PMAs are divided into two tiers. Tier I consists of existing PMAs that are currently being implemented and are anticipated to continue to be implemented, potentially with enhancements. In Tier II, PMAs are identified for consideration within the first five years of GSP implementation. The initiation and implementation of potential PMAs will occur based on an evaluation of need, feasibility, and funding availability.

The PMAs in Tier I are inventory and monitoring, monitoring and reporting, data management and modeling updates, education and outreach, well permit ordinances, water reuse, and Sierra Brooks – Smithneck Wildland Urban Interface Fuels Reduction Project. Each of the PMAs consists of a current ongoing MA, and MA enhancements. The enhancements are near-term actions that will be implemented in order to make each PMA more effective. The Tier I management actions are summarized below:

- Inventory and Metering – SVGMD maintains a list of large-capacity wells in the SV Subbasin, including active metered wells and inactive wells. All active large-capacity agricultural wells are fitted with flow meters owned and read by SVGMD.
- Monitoring and Reporting – Monitoring of groundwater levels in the Subbasin is conducted by SVGMD and DWR. The Sierra Valley Watermaster collects stream flow data in the SV Subbasin.
- Data Management and Modeling: Water usage data, water-level data, and water quality data have been collected by SVGMD, DWR, and the County Environmental Health Departments in various wells in the SV Subbasin.
- Education and Outreach: SVGMD and UCCE have conducted periodic workshops to update stakeholders on topics related to water management.

- Well Permit Ordinances: SVGMD has ordinances that require metering on large-capacity wells, and to review or restrict wells in certain circumstances
- Water Reuse: Reuse of treated wastewater from Loyalton Wastewater Treatment Plan and former Loyalton Mill/Co-gen plant for alfalfa irrigation
- Sierra Brooks – Smithneck Wildland Urban Interface Fuels Reduction Project - Grant funded project to reduce heavy fuel loads through mastication, manual forest thinning and brush abatement and includes the potential benefit of increasing groundwater recharge.

Tier II PMAs consist of agricultural efficiency improvements, aquifer characterization analysis, reoperation of surface water supplies, off-stream storage, drought mitigation & planning, water conservation, groundwater trading and allocations system, watershed and upland management and restoration, voluntary managed land repurposing, groundwater recharge/managed aquifer recharge, and assessment of post-fire hydrology. These PMAs are still under review and development and will be updated based on stakeholder input. The following summarizes the Tier II PMAs:

- Agricultural efficiency improvements: Various equipment and operational improvements designed to reduce overall water demand.
- Aquifer characterization: Coordinate with parties that have large capacity wells to conduct aquifer characterization studies throughout the SV Subbasin to provide a more comprehensive understanding of groundwater conditions.
- Reoperation of, or adjustments to, surface water supplies: More efficient use of surface water resources to reduce long-term groundwater pumping
- Off-stream storage: Develop off-stream surface water storage projects
- Drought mitigation & planning: Drought mitigation planning and identification of drought triggers tied to precipitation, runoff, and other factors.
- Water Conservation: Develop a water conservation program to reduce water demand to offset ground and surface water pumping.
- Groundwater Trading and Allocations System: Develop an approach for establishing groundwater pumping allocations if other management actions do not result in needed reductions
- Watershed and Upland Management and Restoration: Implement multi-benefit projects that enhance precipitation retention and infiltration (i.e., reducing runoff), reduce fuel loads, and support ecosystem services such as reducing peak flood flows and sedimentation and enhancing summer baseflows
- Voluntary Managed Land Repurposing: This includes a wide range of voluntary activities that make dedicated, managed changes to land use (including crop type) on specific parcels in an effort to reduce consumptive water use in the SV Subbasin
- Groundwater Recharge / Managed aquifer recharge (MAR): Develop aquifer recharge projects to store and augment water supply.

Chapter 5: Plan Implementation

Over the next 20 years, this GSP will be implemented throughout the basin. The SVGMD is coordinating with other agencies, organizations, and landowners in the region to effectively manage the groundwater basin. As described in prior sections, a variety of projects and management actions (PMAs) that support groundwater levels, groundwater storage, and interconnected surface waters (ISWs) are currently being, have previously been, or potentially will be implemented. Existing and planned PMAs will contribute to the attainment of the Basin's groundwater sustainability goal over the planning horizon of this GSP. These PMAs support the continued use of groundwater and will protect all groundwater uses and users into the future.

Management and administration of the GSP is a major factor in plan implementation. GSA staff will provide administrative support and management for the GSA. GSA administration activities include coordination meetings with other organizations on projects or studies, email communications for updating GSAs stakeholders about ongoing activities within the Basin, administration of projects implemented by the GSA, and general oversight and coordination. Other oversight and administrative activities will occur on an as-needed basis.

Implementation of the GSP includes functions associated with monitoring activities, including logistics and coordination with third-party entities performing monitoring in the GSP Monitoring Network and any related monitoring data management. Improvements to or expansion of the GSP Monitoring Network may be necessary to address data gaps, which includes additional monitoring wells, monitoring well instrumentation; sampling and in-situ measurements; sample analysis; and associated data management and analysis that may be required in the future.

Outreach activities under this element of the GSP implementation plan include continuation of education, outreach, and engagement with stakeholders, building off the framework and activities established in the Communication and Engagement Plan. Such activities performed during GSP implementation include maintaining the SVGMD website and public workshops. These activities may also include electronic newsletters, informational surveys, coordination with entities conducting outreach to diverse communities in the Basin, and the development of brochures and print materials. Decisions regarding the nature and extent of these outreach activities will be made by the GSAs.

The implementation of this GSP through 2042 is estimated to have a total annual cost of $68,500 – 142,000 excluding capital projects based on the best available information at the time of Plan preparation and submittal. The actual cost of the GSP implementation for each year will depend on the specific tasks that need to be conducted during that year. The GSAs may pursue various funding opportunities from state and federal sources for GSP implementation. As the GSP implementation proceeds, the GSAs will further evaluate funding mechanisms and may perform a cost-benefit analysis of fee collection to support consideration of potential refinements.