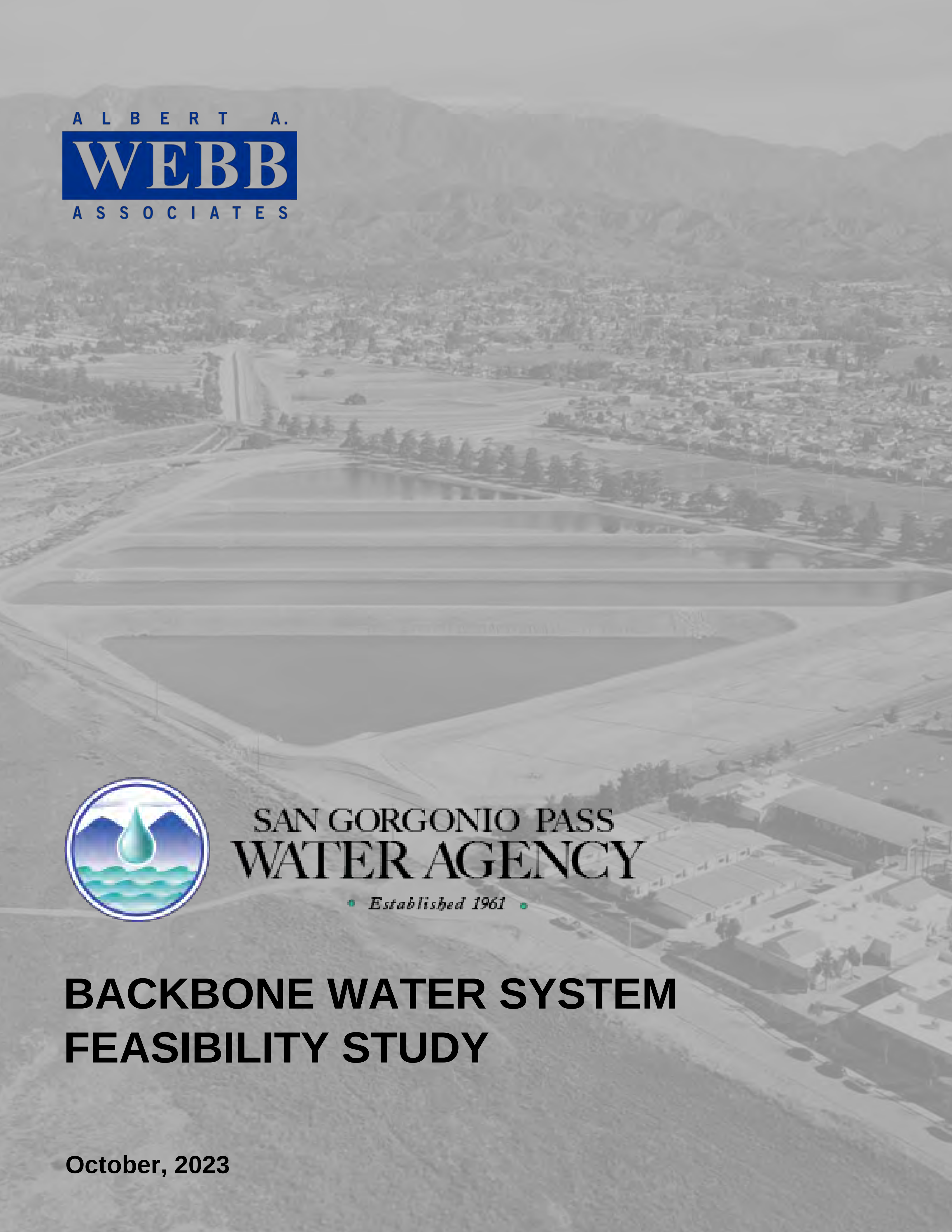

ALBERT A. WEBB ASSOCIATES

SAN GORGONIO PASS WATER AGENCY

Established 1961

BACKBONE WATER SYSTEM FEASIBILITY STUDY

October, 2023

ALBERT A. WEBB ASSOCIATES

BACKBONE WATER SYSTEM FEASIBILITY STUDY

San Gorgonio Pass Water Agency

Prepared for:

SAN GORGONIO PASS WATER AGENCY

Established 1961

October 2023

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Table of Contents

List of Tables

List of Figures

List of Appendices

Section 1 Executive Summary

The San Gorgonio Pass Water Agency ("SGPWA" or "the Agency") is one of 29 public agencies contracted to buy State Water Project ([SWP] California Aqueduct) water. The Agency purchases water from the State Water Project and sells it to local retail water agencies within the Agency's service area: City of Banning, Banning Heights Mutual Water Company, Beaumont-Cherry Valley Water District, High Valleys Water District, South Mesa Water Company, Yucaipa Valley Water District (the Calimesa area), Mission Springs Water District, Cherry Valley Water Company, and Cabazon Water District. The Morongo Band of Mission Indians is not a participant in the San Gorgonio Pass Water Agency's water conveyance facilities. Because the Tribe produces water from the Cabazon Storage Unit of the San Gorgonio Pass Subbasin, assumptions on the future water demands of the Tribe are included herein for planning purposes. The East Branch Extension (SWP facility) currently ends at Noble Street and Orchard Street (City of Beaumont) within the western portion of the Agency. The Agency is planning facilities to extend imported water service further east into the Agency's service area to groundwater recharge facilities within the Banning and Cabazon Groundwater Basins. The subject of this feasibility report includes several groundwater recharge basins, a backbone pipeline, and pressure reducing stations. The proposed facilities are:

- Terminus Reservoir[1]
- 36-inch Dia. Backbone Pipeline, 15,500 linear feet
- 30-inch Dia. Backbone Pipeline, 21,200 linear feet
- 24-inch Dia. Backbone Pipeline, 38,300 linear feet
- 48-inch Dia. Bypass Pipeline, 14,800 linear feet[2]
- Turnout Connection to State Water Project East Branch Extension Pipeline[3]
- Two (2) Pressure Reducing Stations
- Smith Creek Recharge Basin in the Atwell Development
- Cabazon Recharge Basin at Banning Wastewater Treatment Plant
- Cabazon Recharge Basin at Robertson's Ready Mix Cabazon Pit

1.1 Groundwater Model

Projections of water demand and water supply assumptions for the Agency's retail agencies and the Morongo Band of Missions Indians were developed to determine the backbone pipeline sizing

[1] The proposed terminus reservoir may not be required when implementing the Bypass Pipeline which consists of the turnout connection to State Water Project East Branch Extension Pipeline and a pipeline bypassing the Cherry Valley Pump Station.

[2] Bypass Pipeline Alignment bypassing the Cherry Valley Pump Station.

[3] Turnout connection to State Water Project East Branch Extension Pipeline within the future Danny Thomas Ranch Park.

and to model groundwater storage capacities within the Agency's groundwater basins. The following Table 1-1 summarizes the groundwater modeling input assumptions used for this report.

Table 1-1 Groundwater Model Input Assumptions

		Scenarios						
		1	2	3	4	5	6	7
Local Runoff/Precipitation		2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level
Pumpage / Water Use (Assumption/Source)								
	Beaumont Cherry Valley WD	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045
	City of Banning	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045
	Cabazon WD	Historic	Historic	Proj. 2070	Historic	Proj. 2070	Proj. 2070	Proj. 2070
	Morongo Band of Mission Indians	IWMP 2040	IWMP 2040	IWMP 2040	Proj. 2070	IWMP 2040	Proj. 2070	Proj. 2070
Model Area Pumping (Acre-Feet)								
	Beaumont Cherry Valley WD	15,227	15,227	15,227	15,227	15,227	15,227	15,227
	City of Banning	13,467	13,467	13,467	13,467	13,467	13,467	13,467
	Cabazon WD	500	500	4,800	500	4,800	4,800	4,800
	Morongo Band of Mission Indians	2,500	2,500	2,500	6,300	2,500	6,300	6,300
	Total Model Area Pumping	31,694	31,694	35,994	35,494	35,994	39,794	39,794
San Gorgonio Pass Average Annual Recharge (Acre-Feet)								
	Noble Creek	18,550	16,050	16,050	16,050	16,050	16,050	16,050
	Atwell Project (Detention Basin)	0	2,500	2,500	2,500	2,500	2,500	2,500
	Montgomery Creek	0	0	0	0	0	0	0
	Location 1 (Robertsons, Banning)	0	0	0	4,500	0	4,500	4,500
	Location 2 (Banning WWTP)	0	0	0	0	4,300	0	2,000
	Location 3 (Robertsons, Cabazon)	0	0	4,300	0	0	0	0
	Location 4 (Cabazon Area)	0	0	0	0	0	4,300	2,300
	Total Imported Recharge	18,550	18,550	22,850	23,050	22,850	27,350	27,350

Source: October 2022, *San Gorgonio Pass Backbone Pipeline Recharge Report,* Provost & Pritchard, p. 12. (Appendix A)

1.2 Groundwater Recharge Basins

The results of the groundwater recharge modeling suggest the following recommendations:

- Cabazon Basin Location 3 (Robertson's Cabazon Plant) is the preferred site for its ability to most effectively mitigate drawdown and protect key wells from exceeding Minimum Thresholds (MTs) with an insignificant difference in the amount of flows lost to the Indio Subbasin relative to other potential recharge sites.
- Cabazon Basin Location 2 (Banning WWTP) is the runner-up for striking a balance of reducing flows lost out to the Indio Subbasin while reducing MT exceedances relative to the baseline.
- Cabazon Basin Location 4 (Smith Creek Cabazon) ranks third for its ability to minimize MT exceedances when both CWD and MBMI increase pumping.

- Cabazon Basin Location 1 (Robertson's Banning Plant) ranks fourth for its ability to raise groundwater levels in the basin without losing flow to the Indio Subbasin
- Modeling assumed an application of 16,050 AFY of recharge at the existing Noble Creek recharge facility and 2.500 AFY at the proposed basin located in the Atwell Development.

Therefore, the following groundwater recharge sites are the bases of this analysis and evaluation:

- Existing recharge at Noble Creek Recharge Basins
- Smith Creek Basin at Atwell Development
- Cabazon Basin Location 2 Recharge Basin at Banning WWTP
- Cabazon Basin Location 3 Recharge Basin at Robertson's Cabazon Plant[1]

1.3 Backbone Pipeline

A review of four (4) possible pipeline alignments resulted in the selection of Alternative A Alignment. The Alternative A Alignment begins at the connection point to the existing East Branch Extension Pipeline at Orchard Street and Noble Street, crossing Noble Creek, the proposed alignment heads southerly along Noble Street, easterly along Lincoln Street, southerly along Bellflower Avenue, and easterly along Brookside Avenue. A turnout lateral would continue easterly into the Atwell Development for the Smith Creek Basin, then southerly along Highland Springs Avenue, easterly along Wilson Street, southerly along Hargrave Street, crossing the I-10 Freeway overpass, crossing Union Pacific Railroad (UPRR) tracks (using jack and bore trenchless method), easterly along Lincoln Street, southerly along Hathaway Street, easterly along Westward Avenue, easterly along the I-10 Bypass Road, northerly along Apache Trail, ending at the proposed Groundwater Recharge Basin Location 3 (Robertson's Cabazon Plant). The pipeline will be Class 150 to 250 welded steel pipe. The recommended Alternative A Alignment comprises of the following reaches and sizes for a total of 76,500 linear feet of backbone pipeline.

- Reach 1: 15,500 linear feet of 36-inch diameter waterline
- Reach 2: 21,200 linear feet of 30-inch diameter waterline
- Reach 3 and 3A: 16,300 linear feet of 24-inch diameter waterline
- Reach 4A: 23,500 linear feet of 24-inch diameter waterline

The following summarizes the various public agencies to coordinate with during the project planning process.

- City of Beaumont
- City of Banning

[1] As a result of groundwater recharge modeling Cabazon Basin Location 1, Robertson's Banning ready mix plant was ranked the lowest for its ability to raise groundwater levels in the basin without losing flow to the Indio Subbasin and did not provide adequate groundwater recharge to the Cabazon Water District, therefore was not included in the pipeline alternative evaluation.

- County of Riverside
- Caltrans
- Cabazon Water District
- Beaumont-Cherry Valley Water District
- Union Pacific Railroad
- Riverside County Flood Control & Water Conservation District
- Morongo Band of Mission Indians

There are a number of approvals that would be required as follows:

- Caltrans – Encroachment Permit for interstate crossings
- UPRR – Encroachment Permit / License for crossing
- City of Beaumont – Encroachment Permit for use of public right-of-way
- County of Riverside – Encroachment Permit for use of public right-of-way
- RCFC&WCD – Easement or Encroachment Permit for channel crossing
- DDW – Permit for major water transmission pipeline
- DOSH – Underground Tunneling Classification
- DWR - Department of Water Resources

Portions of the pipeline will be within the would be located on private property, therefore requiring temporary and permanent easements.

1.4 Hydraulic Analysis

1.4.1 Terminus Reservoir

A terminus reservoir located at a hydraulic grade elevation of approximately 3,100 feet is recommended to maintain proper pumping head conditions. A possible location for the reservoir would be north of the Noble Creek Crossing, at the end of the EBX pipeline near the intersection of Orchard Street, Avenue San Timoteo, and Noble Street. The following design and property parameters should be considered for further evaluation:

- Site property evaluation;
- Pipeline lateral alignment to feed the reservoir;
- Hydraulic analysis for reservoir sizing; and
- Separate environmental review and evaluation.

1.4.2 Pressure Reducing Stations

Two pressure reducing stations (PRS) are required to maintain proper operational pressures with the backbone pipeline[1]. Based on the flow rates and required pressure drop, a 16-inch diameter Cla-Val valve and flow meter is recommended for each pressure reducing station. The following summarizes the recommended location of each station:

- PRS No. 1 – Sunset Avenue and Wilson Street, Banning
- PRS No. 2 – Lincoln Street and Hathaway Street, Banning

The initial baseline rate of for this report is 36 cfs was for the purposes of groundwater recharge modeling and should not be considered the maximum pipeline conveyance capacity. Based on the pipeline sizing and a maximum of water velocity of 6 fps (feet per second) in the pipeline, the maximum pipeline capacities are approximately (a) 42 cfs (36-inch dia.), (b) 29 cfs (30-inch dia.), and (c) 18 cfs (24-inch dia.).

1.5 Cherry Valley Pump Station Bypass Pipeline

The Agency is in a unique position to partner with Danny Thomas Ranch Park to provide a recharge basin within the Park's proposed water feature. A portion of the EBX Pipeline (54-inch diameter) upstream of the Cherry Valley Pump Station runs through the Park's property providing SGPWA a possible location for a pipeline outlet to connect the EBX to the proposed Project, therefore bypassing the Cherry Valley Pump Station (CVPS).

The available capacity of the existing 54-inch diameter EBX pipeline is 64 cfs (based on pipeline velocity of 4 fps). The Cherry Valley Pump Station capacity is 52 cfs. To maximize the potential conveyance capacity of the bypass pipeline during peak periods, a 48-inch diameter pipeline is recommended, which will provide a capacity of 50 cfs (4 fps pipeline velocity), 63 cfs (5 fps pipeline velocity), and 75 cfs (6 fps pipeline velocity). This size would only need to extend to the existing 24-inch diameter Beaumont Recharge Pipeline at the intersection of Beaumont Avenue and Cherry Valley Boulevard, after which would reduce to 36-inch diameter.

With the potential of greater conveyance capacity, the Bypass Pipeline is recommended to be incorporated into the Alternative A Alignment as part of the SGPWA Backbone Facilities.

Beginning at the connection point to the existing EBX Pipeline with a proposed 48-inch diameter outlet within a parcel owned by Riverside County, the alignment heads southerly and easterly, then southerly within various parcels owned by Riverside County along an existing driveway, easterly along Cherry Valley Boulevard, and connecting to the proposed backbone project pipeline at Noble Street.

[1] This project may benefit from hydroelectric facility to reduce pressure and generate power, however further studies should be conducted such as (a) capital and operational cost analysis, (b) site location(s) evaluation, (c) hydraulic review.

- Reach 5A: 12,000 linear feet of 48-inch diameter waterline
- Reach 5B: 2,800 linear feet of 36-inch diameter waterline[1]

The Cherry Valley Pump Station Bypass Alternative Alignment will require acquisition of easements on private property, particularly at the connection to the existing 54-inch EBX pipeline and the beginning of Reach 5. Much of the beginning of Reach 5 is located on property owned by Riverside Country, therefore temporary construction easements and permanent easements are required to construct and maintain this portion of the project.

1.6 CEQA Compliance

Pending review of a forthcoming Preliminary Design Report, this project is not expected to have significant impacts that could not be mitigated to less than significant, therefore, the appropriate level analysis could be provided by an Initial Study and Mitigated Negative Declaration (IS/MND). To support the analysis in an IS/MND the following technical studies should be prepared:

- Air quality/greenhouse gas emissions modeling
- Biological habitat assessments and plant/animal species surveys
- Cultural and paleontological resources assessments

Additionally, the Agency will need to initiate and complete the government-to-government AB 52 Tribal Consultation process. An IS/MND includes a 30-day public comment period; however, if a clean water or drinking water State Revolving Fund grant is pursued, then the State Water Board has a 35-day public comment period. In the event Project impacts cannot be mitigated to less than significant, then an Environmental Impact Report (EIR) is needed. However, pending approval by DWR, the Project may be eligible for the CEQA suspension in Executive Order N-7-22, Action 13[2].

1.7 Project Costs

The project costs were determined by using a 1.4 multiplier on the construction cost estimates in order to include construction costs; construction contingencies; design engineering including plans and specifications; environmental; design and construction surveying; geotechnical services; contract administration; field inspection; etc. Escalation and costs associated with right-of-way and/or land acquisition are excluded. The cost estimates are considered Class 3 (Budget Level) per the Association for Advancement of Cost Engineering (AACE) and therefore the range around the estimates is approximately minus 15% on the low end to plus 20% on the high end.

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[1] This portion of the Bypass Pipeline could be upsized to 48-inch diameter. However, this evaluation should be performed with the potential of upsizing the entire Backbone Pipeline all the way to Cabazon Water District.

[2] Refer to Section 1.10 Plan of Action on how a CEQA suspension may be applied to this project.

Property acquisition for various Project facilities such as recharge basins, pressure reducing stations, turnouts, and pipeline easements were not included in the cost evaluations.

Recharge Basin at Smith Creek (Atwell Development)……………….$8,460,000

Recharge Basin at Banning WWTP (Location 2)……………………..$8,460,000

Recharge Basin Robertson's Cabazon (Location 3)………………….$5,120,000

Backbone Pipeline (Alternative A Alignment)………………………..$99,680,000

Backbone Pipeline (Bypass Pipeline)..………………………………..$26,610,000

Pressure Reducing Stations……………………………………..…...$1,820,000

1.8 Project Phasing

Phasing the various project components provides for a more manageable project that the Agency can implement over the next 13 years. The following summarizes the proposed project phases.

- Phase 1
    - Connect to the existing East Branch Extension
    - 12,900 LF of 36-inch diameter steel pipeline
    - 2,000 LF of 24-inch diameter lateral pipeline
    - Smith Creek Recharge Basin (Atwell Development)

- Phase 2 (Bypass Pipeline)
    - 12,000 linear feet of 48-inch steel pipeline
    - 2,800 linear feet of 36-inch steel pipeline
    - Turnout Connection to existing 54-inch East Branch Extension
- Phase 3
    - 21,200 LF of 30-inch steel pipeline
    - PRS No. 1
- Phase 4
    - 25,800 LF of 24-inch diameter steel pipeline
    - PRS No. 2
    - Recharge Basin at Banning WWTP (Location 2)
- Phase 5
    - 14,000 LF of 24-inch diameter steel pipeline
    - Recharge Basin at Robertson's Ready Mix Cabazon (Location 3)

1.9 Recommendations

The following summarizes the project recommendations for next steps.

- Coordination with participating agencies
- Property and easement acquisition
- Permitting and right of way
- Preliminary design report
- Geotechnical and corrosion investigation
- Project survey
- Potholing and utilities
- CEQA process
- Development of financing strategy

1.10 Plan of Action

This plan of action provides SGPWA with actionable steps and procedures to implement the project.

1. Hire a grants professional to help discern optimal funding opportunities for SGPWA, and to coordinate the preparation/processing of grant application(s).
2. Consult SGPWA legal counsel on whether the CEQA suspension offered by DWR in Executive Order N-7-22 Action 13 can be applied to this project, particularly in the event of property acquisition from an unwilling seller.
3. Hire a civil engineering firm to prepare a Preliminary Design Report (PDR) containing preliminary engineering plans, alternatives analysis, and cost estimates. The following summary details the basic requirements, however additional efforts may be warranted as identified by the civil engineering firm.
    a. Survey and Aerial Mapping
    b. Utilities and Right of Way Research
    c. Preliminary Potholing
    d. Pipeline Alignments Review
    e. System Hydraulics and Finalize Pipe Sizing
    f. Geotechnical Investigation
    g. Corrosion Investigation
    h. 30-percent Design Plans
    i. Detailed Project Phasing and Schedule
    j. Preliminary Engineering's Estimate and Project Cost
    k. Preliminary Design Report

4. When the optimal grant opportunity is selected by SGPWA, and when legal counsel has opined on the usefulness of the CEQA suspension, and the PDR has a firm description of project elements, hire a CEQA/NEPA firm to procure technical studies to support the CEQA and/or NEPA documentation that is required by the funding opportunity.
    a. Applicable technical studies include but are not limited to, biological surveys/report, jurisdictional delineation survey/report, cultural surveys/report, paleontological survey/report, and air quality and greenhouse gas analysis.
        i. If NEPA is required, then the technical studies must include analysis of applicable federal regulations (often referred to as “cross-cutters” by the federal agency), such as Section 106 of the National Historic Preservation Act (NHPA) and federal Endangered Species Act (ESA). Federal involvement typically includes consultation with the federal agency to document impacts to federally regulated resources (e.g., Section 7 of ESA and Section 106 of NHPA).
        ii. In regard to biological studies, because SGPWA is not a permittee to the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) or the Coachella Valley MSHCP, SGPWA would not have Take coverage for listed species should they be present in the project area. If federally listed endangered or threatened species (including Candidate species) are found, SGPWA may consider becoming a Participating Special Entity (PSE) to the MSHCP, which would provide Take coverage if the project can demonstrate consistency with the MSHCP.
        iii. The study area of the technical studies may include, but are not limited to, analysis of the project footprint, areas of temporary project activities (e.g., construction buffer zones), staging areas, hauling routes, and sources of fill (if needed). For cultural resources a three-dimensional area of potential effect (APE) must be established. Depending on the project, the APE may include both below and above ground areas.
    b. If the CEQA suspension cannot be used for the project, then we expect a CEQA-Plus document with federal cross-cutters, such as an Initial Study/Mitigated Negative Declaration (IS/MND) would be the appropriate level of documentation for most funding opportunities.[1] That process is typically as follows:
        i. Procure technical studies as described previously in item 4a.
        ii. Using the PDR and in consultation with the grant opportunity guidance documents, prepare a CEQA checklist analyzing the project impacts, including the federal cross-cutter questions to address applicable federal regulations.
            1. SGPWA and legal counsel would review the document.
        iii. Distribute public notices pursuant to CEQA, including requests for input from interested entities, public comments, and notices of adoption of the final CEQA document by SGPWA.

[1] In the event the Project impacts cannot be mitigated to less than significant, then an Environmental Impact Report would be required pursuant to CEQA. However, we are of the opinion that impacts can be mitigated to less than significant and an IS/MND would be appropriate at this time.

   c. In the event a separate NEPA document is required, (e.g., the CEQA suspension is used but the funding opportunity still requires a NEPA document), then that process is as follows:
      i. If a Categorical Exclusion cannot be used because the significance of impacts are unsure, then prepare an Environmental Assessment[1] and, if all impacts are less than significant, adopt a Finding of No Significant Impact (FONSI). Potentially significant impacts will require preparation of an Environmental Impact Statement (EIS).
5. A copy of the adopted environmental documents, including appendices and technical studies must be submitted to the grant funding agency as part of the grant application.
6. After completion of CEQA/NEPA requirements, the permits and approvals can be secured such as the following:
   a. Lake and Streambed Alteration Agreement from California Department of Fish and Wildlife (CDFW) pursuant to Section 1600 et al of the Fish and Game Code.
   b. Waste Discharge Requirement (WDR) from Regional Water Quality Control Board (RWQCB) pursuant to Porter-Cologne Water Quality Act for impacts to Waters of the State.
   c. If a Clean Water Act Section 404 permit for impacts to Waters of the U.S. is needed from U.S. Army Corps of Engineers, then a Section 401 Water Quality Certification instead of a WDR is needed from the RWQCB.
      i. If a Corps-built or Corps-funded facility will be affected by the project, then a Section 408 permit may be needed from the Corps, which can take up to one year to obtain.
7. If mitigation measures are required to reduce impacts to less than significant, mitigation measure must be adopted and implemented during project construction and/or operation. The grant funding agency may impose additional environmental commitments to be implemented or CDFW may impose conditions as part of the Lake and Streambed Alteration Agreement. SGPWA must document compliance with all mitigation measures and environmental commitments.

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[1] In the event project impacts are found to be significant, then an Environmental Impact Statement would be required pursuant to NEPA. However, we are of the opinion that the federal nexus can be addressed with federal cross-cutters with a CEQA IS/MND.

Section 2 Introduction

2.1 Background

The San Gorgonio Pass Water Agency ("SGPWA" or "the Agency") is a State Water Contractor that is responsible for the importation of water from Northern California through the State Water Project (California Aqueduct) in the SGPWA service area. The East Branch Extension (EBX) is the portion of the State Water Project that brings water to the Agency's service area. The EBX is operated by both the Agency and San Bernardino Valley Municipal Water District under an agreement with the Department of Water Resources.

The Agency purchases water from the State Water Project and sells it to local retail water agencies who store the water in the local groundwater basins. The retail water agencies that are within the Agency's service area include: City of Banning, Banning Heights Mutual Water Company, Beaumont-Cherry Valley Water District, High Valleys Water District, South Mesa Water Company, Yucaipa Valley Water District, Mission Springs Water District, Cherry Valley Water Company, and Cabazon Water District. The Morongo Band of Mission Indians is not a participant in the San Gorgonio Pass Water Agency's water conveyance facilities.[1]

The Agency's service area extends roughly 225 square miles from Calimesa to Cabazon including the cities of Calimesa, Beaumont, and Banning as well as the unincorporated communities of Cherry Valley, Cabazon, and the Banning Bench (Figure 2-1).

In carrying out its mission, the Agency is planning for facilities to extend imported water service further east into the Agency's service area to groundwater recharge facilities within the Banning and Cabazon Groundwater Basins. This report builds on the efforts of many prior studies, as follows:

- May 2008, *Evaluation of Potential Recharge Sites for San Gorgonio Pass Water Agency*, Albert A. Webb Associates and Lytle Water Solutions, LLC.
- October 2009, *Supplemental Water Supply Study,* Albert A. Webb Associates.
- October 2010, *Implementation Plan for Capacity Fee*, Albert A. Webb Associates.

[1] Yucaipa Valley Water District, South Mesa Water Company, and Morongo Band of Mission Indians are only partially within SGPWA's service area.

- March 2011, *Summary of Justification for the Agency's Proposed "Backbone Water System"*, Albert A. Webb Associates.

SGPWA is currently unable to take full advantage of its imported water allocation from the SWP. In addition, the producers within the San Gorgonio Pass would benefit from increased water security especially during extended drought periods. SGPWA is therefore proposing the project described herein to provide conveyance capacity from Noble Creek to Cabazon Water District.

2.2 Project Description

Pursuant to discussions with the Agency and upon their authorization, Albert A. Webb Associates (WEBB) in partnership with Provost & Pritchard (P&P) and INTERA Geoscience & Engineering Solutions (INTERA) have prepared herein a feasibility study that begins the necessary engineering research, alignment analysis, groundwater basin site evaluation, and environmental constraints review for the Agency's proposed "Backbone Water System" ("Project"). The ultimate aim of this feasibility study is to provide the Agency information that will position the Project for future federal and state grant funding opportunities within a two- to five-year timeframe.

The Project consists of several reaches of pipeline and appurtenances that would convey the Agency's allocated State Water Project water from the existing EBX Pipeline in the City of Beaumont to recharge groundwater basins located in the Banning and Cabazon Groundwater Basins for use by the Agency's retail agencies in the Cabazon and Banning communities. The Project components included in this study are as follows and shown on Figure 2-2:

- Terminus Tank[1]
- Reach 1 Pipeline, 36-inch Dia., 15,500 linear feet
- Reach 2 Pipeline, 30-inch Dia., 21,200 linear feet
    - Reach 2 Alternate A Pipeline, 30-inch Dia., 18,700 linear feet
    - Reach 2 Alternate B Pipeline, 30-inch Dia., 12,000 linear feet
- Reach 3 Pipeline, 24-inch Dia., 13,300 linear feet
    - Reach 3 Alternate A Pipeline, 24-inch Dia., 3,000 linear feet
    - Reach 3 Alternate B Pipeline, 24-inch Dia., 13,200 linear feet
    - Reach 3 Alternate C Pipeline, 24-inch Dia., 17,300 linear feet
- Reach 4 Pipeline, 24-inch Dia., 25,000 linear feet[2]
    - Reach 4 Alternate A Pipeline, 24-inch Dia., 24,000 linear feet[3]
- Reach 5 Pipeline, 48-inch Dia., 14,800 linear feet[4]

[1] Terminus tank may not be required when implementing the Bypass Pipeline.
[2] Riverside County Transportation Department, I-10 Bypass Road, Alternative 12 alignment.
[3] Riverside County Transportation Department, I-10 Bypass Road, Alternative 5 alignment.
[4] Also known as, Bypass Pipeline which bypasses the Cherry Valley Pump Station.

- Smith Creek Basin in the Atwell Development[1]
- Cabazon Recharge Basin Location 1 (Robertson's Banning Plant)
- Cabazon Recharge Basin Location 2 (Banning Wastewater Treatment Plant [WWTP] property)
- Cabazon Recharge Basin Location 3 (Robertson's Cabazon Plant)
- Cabazon Recharge Basin Location 4 (Smith Creek in Cabazon)
- Two (2) Pressure Reducing Stations

Because this is a feasibility study, the dimensions and facility locations listed above and shown on Figure 2-1 are approximate and preliminary and they are subject to change.

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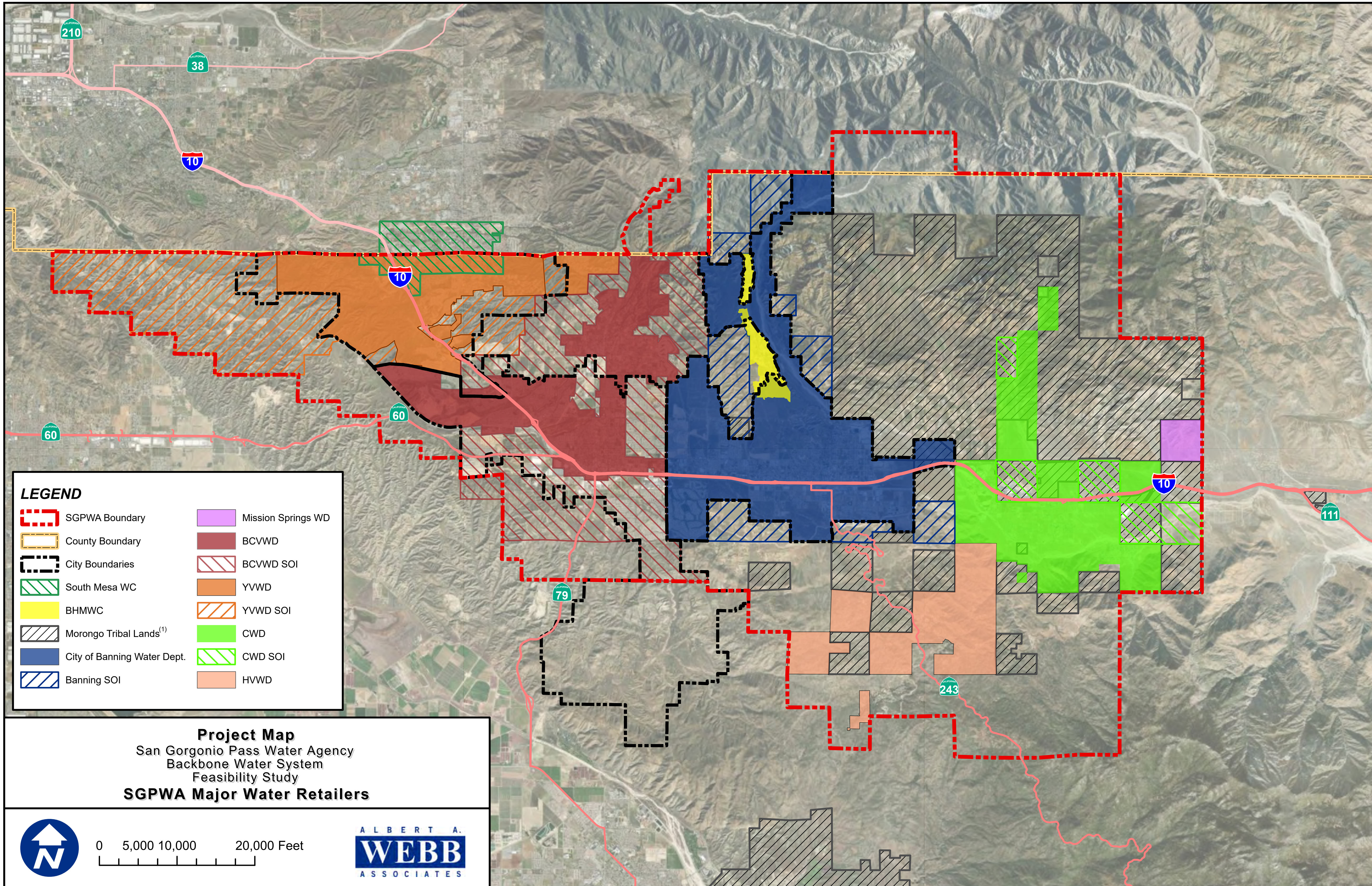
[1] The Atwell Development (formerly, Butterfield Specific Plan) in the City of Banning includes construction of the Smith Creek Basin, which is a flood control facility planned for in the Banning Master Drainage Plan.

FIGURE 2-1

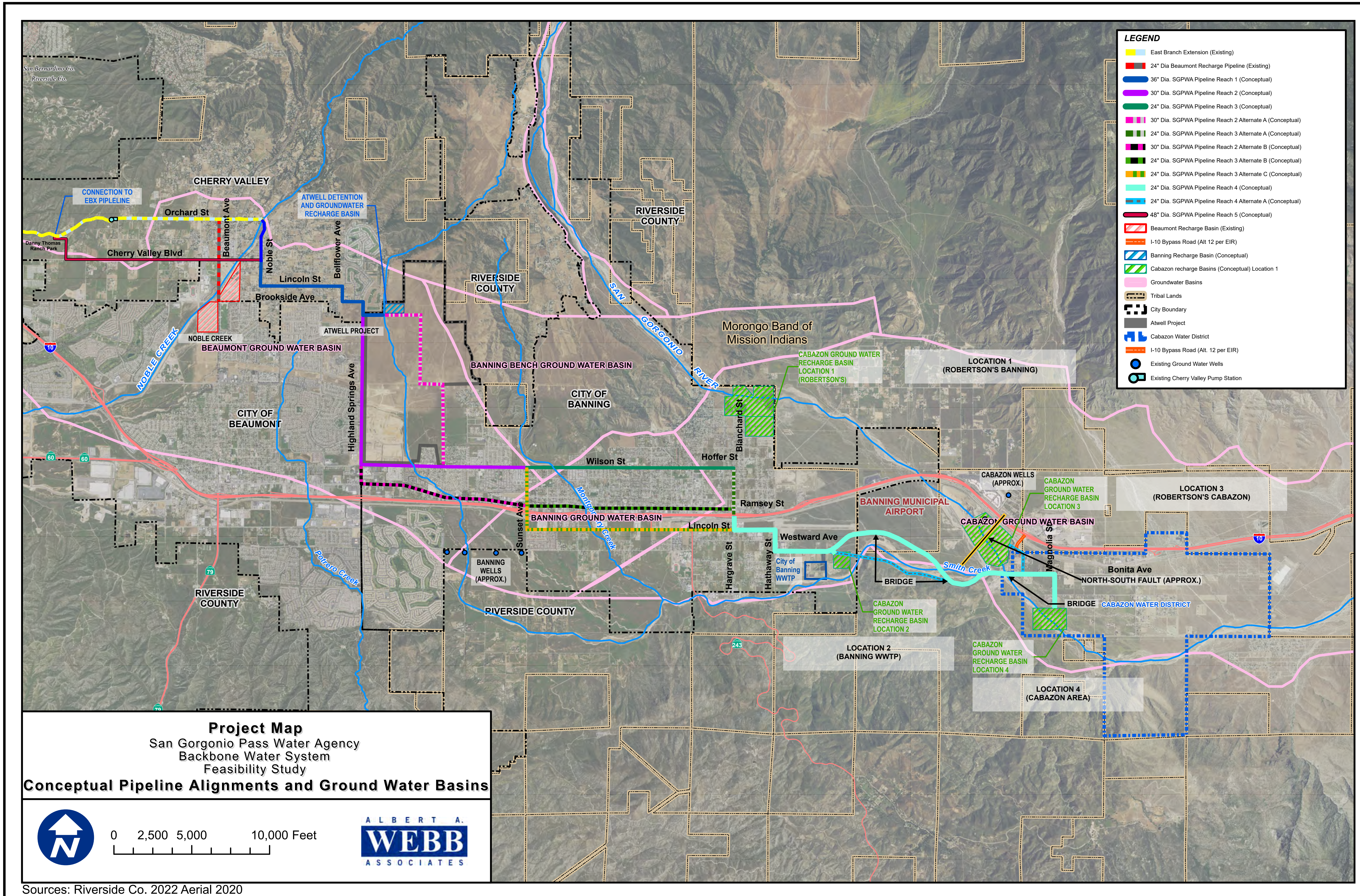


Sources: Riverside Co. LAFCO, April, 2008; YVWD, 2008; BCVWD, 2005; BHMWC, 2008; Riverside County GIS, 2022. (all boundaries subject to verification)

(1) Morongo Band of Mission Indians are not a participant in the San Gorgonio Pass Water Agency's water conveyance facilities.

H:\2022\22-0025\GIS\PRO\SGPWA Major Water Retailers.aprx Map created 01 Aug 2023

FIGURE 2-2



Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 2-1 Project Map.aprx Map created 18 May 2023

Section 3 Water Demand and Supply Assumptions

This section summarizes the assumptions used for sizing of the Backbone Pipeline, including identification of water supply needs, characterization of water supply availability, quantification of needed conveyance capacity, location and size of groundwater recharge facilities and assumptions used for groundwater model simulations. This section summarizes a more detailed description that is contained in the October 2022 SGPWA Report located in Appendix A, "San Gorgonio Pass Backbone Pipeline Recharge Project" by Provost & Pritchard.

3.1 Water Demands

Four entities in SGPWA have existing or potential water supply needs for imported water from the proposed backbone pipeline. The water supply needs for these four entities – Beaumont-Cherry Valley Water District (BCVWD), the City of Banning, Cabazon Water District (CWD) and Morongo Band of Mission Indians (MBMI)[1] – are described and quantified below.

- Beaumont-Cherry Valley Water District – BCVWD provides water to its customers in the City of Beaumont and nearby semi-rural communities from groundwater pumping in the Beaumont Basin that depends on a combination of local surface water runoff, imported surface water, and groundwater reuse. Estimates of current and projected water supplies and demands for BCVWD were taken from their 2020 Urban Water Management Plan (UWMP). The BCVWD UWMP includes consideration of increased water conservation requirements and practices that have been implemented over recent years, as well as including other potential water supply sources such as surface water runoff capture and recycled water. Based on BCVWD's 2020 UWMP, their imported water supply needs are projected to increase from 12,216 AF to 16,050 AF between 2025 and 2045.
- City of Banning – The City of Banning provides groundwater supplies to its service area from groundwater extraction in the Banning Canyon, Banning Bench, Banning, and Cabazon storage units in addition to the Beaumont Basin. The City of Banning developed estimates of water supply in their 2020 UWMP that are sufficient to meet the City's water demand, including consideration of water conservation measures, and other potential water supply sources such as surface water capture and recycled water. Based on the City of Banning's 2020 UWMP, their imported water supply is projected to increase from 250 AF to 2,500 AF between 2025 and 2045.
- Cabazon Water District – CWD provides groundwater supply to residential customers in its service area overlying the Cabazon storage unit. As a small municipal water district with less than 3,000 customers, CWD does not prepare an UWMP. CWD's current use of 500 acre-feet (AF)[2] was assumed to increase to approximately 4,800 AF by 2045 based on CWD estimates of potential increased water use.

[1] The Morongo Band of Mission Indians, as a federally recognized tribe, are not within San Gorgonio Pass Water Agency's obligation to supply State Water Project water.

[2] San Gorgonio Pass Groundwater Sustainability Plan, 2022,

- Morongo Band of Mission Indians – The MBMI provides water for residential customers in its reservation as well as for miscellaneous commercial and industrial operations. MBMI's water supply is provided by local natural recharge, diversions from upstream watersheds on Potrero Creek and Millard Creek, and return flows from local water use. The MBMI, as a federally recognized tribe, are not required to provide water use forecasts, and have not provided forecasts of their water use. Based on approximate estimates by non-MBMI entities, there appears to be the potential for an additional 3,800 AF of water demands that could require additional imported water supply. This information represents a planning judgement that has not been endorsed by the MBMI and may not accurately represent their plans.

Based on the various sources described above, the 2045 projected imported water demands for the identified service areas is estimated at 27,350 AF.

3.2 Water Supply and Conveyance

The projected imported water demand of 27,350 AF in 2045 may be made available from a variety of sources, including the SGPWA State Water Project (SWP) contract supplies. In addition to a portion of the SGPWA Table A contract amount of 17,300 AF, other potential imported water supply studies include: participation in the Sites Reservoir Project in the Sacramento Valley, participation in the DWR Delta Conveyance Project, use of purchased Nickel water, and purchase of SWP Table A amounts on a long-term or intermittent basis from other SWP contractors. Allowing for the existing water supplies available, the amount of supplemental water supply needed to be conveyed by the proposed SGP Backbone Pipeline (the total of increased forecasted use by the City of Banning, CWD, and MBMI) totals 11,300 AF per year.

All the imported water supply sources have varying periods of availability that can differ somewhat depending on the project. The proposed backbone pipeline would need to have adequate capacity to distribute these water supply as available, which would include many periods of non-use and result in significantly higher required capacities as compared to the average delivered amounts. To estimate the capacity needs for the imported water supplies, the SWP Table A amounts (taken from the Department of Water Resources 2021 SWP Delivery Capability Report studies) have been used as a pattern of availability. These would be directly representative of the SGPWA Table A amounts as well as any purchases of Table A from other SWP contractors. Additionally, the SWP delivery pattern would also be generally representative of the pattern of availability from other water supply sources from the Sacramento-San Joaquin watershed. It should be noted that a variety of other future sources of Project and Non-Project water is likely to be available to purchase and store locally or banked.

Based on the pattern of water supply availability in the SWP Delivery Capability Report studies, a capacity of 30 cubic feet per second (cfs) would be sufficient to directly supply deliveries for an annual target of 11,300 AF 97 percent of the time on an instantaneous basis, which is considered to be an upper target for capacity for the SGP Backbone Pipeline. A lower target for capacity for the SGP Backbone Pipeline of 21 cfs was also considered, which considers proportionate access to capacity in the East Branch Extension as compared to existing SWP deliveries to SGP. This lower target would require additional upstream supply management of SWP supplies to meet the 11,300 AF annual delivery target in all years. Considering the benefits and costs of the higher and lower potential conveyance capacity targets, a conveyance/recharge rate of 25 cfs[1] is proposed for the initial studies. A Backbone Pipeline with a capacity of 25 cfs would be able to directly supply available SWP supplies for about 85 percent of the time and would require some upstream supply management (such as temporary storage in San Luis Reservoir) the remaining 15 percent of time.

3.3 Groundwater Recharge Facilities and Modeling Assumptions

Groundwater recharge facilities in SGPWA are currently available at the BCVWD Noble Creek recharge facilities and the nearby SGPWA Brookside Recharge Facility. The additional water supply needs in the Banning and Cabazon Storage Units would require new conveyance facilities (such as the San Gorgonio Pass Backbone Pipeline) in addition to new recharge facilities. Table 3-1 summarizes the groundwater storage units that would be served by the East Branch extension and the San Gorgonio Pass (SGP) Backbone Pipeline, the agencies that would be supplied, the alternative recharge facilities that have been identified and the recharge facility total capacity.

Table 3-1 – Groundwater Storage Units and Proposed Recharge Facilities

Storage Unit	2045 Annual Supplemental Water Demand (AF)	Agency Supplied	Groundwater Recharge Facilities	Recharge Capacity (cfs)	Recharge Area (acres)
Beaumont	16,050	BCVWD	Noble Creek/Brookside (existing)	TBD	TBD
Banning	2,500[2]	City of Banning	Noble Creek/ Brookside (existing) Proposed Smith Creek Basin	11.5	14
		City of Banning	Proposed Smith Creek Basin Proposed Montgomery Creek Debris Basin[3]	11.5	14
Cabazon	4,500	Morongo Band of Mission Indians	Location 1 (Robertson's Plant, Banning)	20.6	26
	4,300	Cabazon Water District	Location 2 (Banning WWTP) Location 3 (Robertson's Plant, Cabazon) Location 4 (Smith Creek, Cabazon)	19.8	25

Notes: cfs= cubic feet per second; AF = acre-feet; BCVWD = Beaumont-Cherry Valley Water District; TBD = to be determined.
Source: October 2022, *San Gorgonio Pass Backbone Pipeline Recharge Report,* Provost & Pritchard, p. 8. (Appendix A)

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[1] This is an initial baseline rate for the purposes of groundwater recharge modeling and should not be considered the maximum pipeline conveyance capacity. Based on the pipeline sizing and a maximum of water velocity of 6 fps (feet per second) in the pipeline, the maximum pipeline capacity is approximately (a) 75 cfs (48-inch dia.), (b) 42 cfs (36-inch dia.), (c) 29 cfs (30-inch dia.), and (d) 18 cfs (24-inch dia.).

[2] City of Banning 2,500 acre-feet demand not differentiated between Banning and Beaumont Storage Unit. The 2,500 acre-feet demand is not additive for the Banning and Beaumont Storage Units

[3] Riverside County Flood Control & Water Conservation District's "Banning Master Drainage Plan" exhibit (revised Sept. 1994) plans for a Montgomery Creek Debris Basin, which is not analyzed herein.

In developing the recharge assumptions shown in Table 3-1, an assumption has been made that long term recharge rates at developed facilities would be approximately 1 acre-foot per acre. This assumption was made as a basis for conservative design. For purposes of this initial evaluation, mapped surface infiltration rates were used as an indicator that recharge is feasible. Additional site-specific evaluations would be useful to confirm that subsurface conditions are also adequate to support recharge. The potential recharge facilities identified in Table 3-1 provide alternatives that were evaluated for effectiveness using groundwater modeling.

Groundwater modeling analysis was conducted to determine the potential effectiveness of providing additional water supplies with facilities located at alternative sites in SGPWA. Groundwater model analyses were identified that evaluate a base condition for 2045 with supplemental water supply only at Noble Creek that is compared with alternatives that provide supplemental recharge at various locations. A summary of the potential scenarios and the assumptions that are used for the scenarios is shown in Table 3-2.

Table 3-2 – Groundwater Model Input Assumptions

		Scenarios						
		1	2	3	4	5	6	7
Local Runoff/Precipitation		2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level
Pumpage / Water Use (Assumption/Source)								
	Beaumont Cherry Valley WD	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045
	City of Banning	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045
	Cabazon WD	Historic	Historic	Proj. 2070	Historic	Proj. 2070	Proj. 2070	Proj. 2070
	Morongo Band of Mission Indians	IWMP 2040	IWMP 2040	IWMP 2040	Proj. 2070	IWMP 2040	Proj. 2070	Proj. 2070
Model Area Pumping (Acre-Feet)								
	Beaumont Cherry Valley WD	15,227	15,227	15,227	15,227	15,227	15,227	15,227
	City of Banning	13,467	13,467	13,467	13,467	13,467	13,467	13,467
	Cabazon WD	500	500	4,800	500	4,800	4,800	4,800
	Morongo Band of Mission Indians	2,500	2,500	2,500	6,300	2,500	6,300	6,300
	Total Model Area Pumping	31,694	31,694	35,994	35,494	35,994	39,794	39,794
San Gorgonio Pass Average Annual Recharge (Acre-Feet)								
	Noble Creek	18,550	16,050	16,050	16,050	16,050	16,050	16,050
	Atwell Project (Detention Basin)	0	2,500	2,500	2,500	2,500	2,500	2,500
	Montgomery Creek	0	0	0	0	0	0	0
	Location 1 (Robertsons, Banning)	0	0	0	4,500	0	4,500	4,500
	Location 2 (Banning WWTP)	0	0	0	0	4,300	0	2,000
	Location 3 (Robertsons, Cabazon)	0	0	4,300	0	0	0	0
	Location 4 (Cabazon Area)	0	0	0	0	0	4,300	2,300
	Total Imported Recharge	18,550	18,550	22,850	23,050	22,850	27,350	27,350

Source: October 2022, *San Gorgonio Pass Backbone Pipeline Recharge Report,* Provost & Pritchard, p. 12. (Appendix A)

The scenarios, and the information that is expected from the model simulations are described below:

3.3.1 Groundwater Modeling Scenario 1

Base scenario which includes projected 2045 pumping amounts from the 2020 Urban Water Management Plans for Beaumont-Cherry Valley Water District and the City of Banning. This scenario also includes continued historical level groundwater pumping for other entities in the SGP service area (e.g., Cabazon Water District, Mission Springs Water District, etc.) with the exception of MBMI, which is assumed to have pumping increased to 2,500 acre-feet per year (AFY) consistent with the SGP Integrated Water Management Plan of 2016. Finally, this scenario includes recharge at the existing Noble Creek and Brookside Recharge facilities (Figure 3-1) of an average of 18,550 AFY that is assumed to have a SWP source and availability pattern. This scenario would provide a basis for comparison of other scenarios.

3.3.2 Groundwater Modeling Scenario 2

This scenario would be a slight modification of Scenario 1, with recharge for the City of Banning moved to the proposed Smith Creek Basin in the Atwell Development (Figure 3-2). The average 2,500 AFY of supplemental water for the City of Banning would be applied to the Smith Creek Basin, which is closer to City of Banning pumping locations in the Beaumont Basin and the Banning Storage Unit. Recharge at the existing Noble Creek and Brookside Recharge facilities would be reduced to 16,050 AFY with the shift of some recharge to the Smith Creek Basin.

3.3.3 Groundwater Modeling Scenario 3

Scenario 3 would be the first in a sequence of scenarios considering different levels of groundwater pumping and supplemental recharge for the Cabazon Storage Unit. With this scenario, CWD total pumping would be increased to an approximate ultimate build-out level totaling 4,300 AF per year. Two additional wells for CWD are assumed to be required for the additional pumping. As described previously, the increase in pumping above current levels (4,300 AF/Year) would be supported by additional recharge at new facilities in the Cabazon Storage Unit, which would be located at Location 3, (Figure 3-3), within the Robertson's Cabazon Plant. There would be no assumed increase in use (beyond the 2040 level) by MBMI for development, and no additional recharge specifically for MBMI. The results of this simulation would indicate the effectiveness of recharge at Location 3 in meeting increased CWD pumping.

3.3.4 Groundwater Modeling Scenario 4

Scenario 4 would be used to show the effectiveness of additional recharge at Location 1 (Robertson's Banning Plant). For this scenario, CWD would be kept at historical levels (about 500 AF/Year) and MBMI pumping would be increased by 4,800 AF to 6,300 AF per year. Additional recharge of 4,500 AF/year on an SWP availability schedule would be added for Location 1. Four additional wells are assumed to be added for MBMI pumping at locations along the I-10 corridor. This scenario would show the effectiveness of recharge at Location 1 in providing for additional MBMI use.

3.3.5 Groundwater Modeling Scenario 5

Scenario 5 would have the additional CWD pumping from Scenario 3, with recharge moved to Location 2 (Banning WWTP). (Figure 3-5). As with Scenario 3, there would be no additional pumping by MBMI or recharge for that pumping. Location 2 is expected to be less effective in providing supply for CWD than Location 3, however it would require reduced conveyance with corresponding reductions in projects costs for the Backbone Pipeline.

3.3.6 Groundwater Modeling Scenario 6

This scenario would combine the additional pumping in Scenarios 3 and 4 into a combined alternative. Additional pumping (with the additional wells indicated in the descriptions for Scenarios 3 and 4) would be included in the model for both CWD and MBMI. Additional recharge to support increased MBMI pumping would be provided at Location 1 as described for Scenario 3. Additional recharge would also be provided at Location 4, (Figure 3-6), which is located down gradient of north-south fault in the Cabazon Storage Unit that may be a flow limitation. The results of this modeling analysis would identify where the combination of additional pumping and additional recharge is complementary or negative as compared to the individual scenarios.

3.3.7 Groundwater Modeling Scenario 7

Scenario 7 would be a slight variation of Scenario 6, with increased pumping and recharge for both CWD and MBMI (Figure 3-7). The difference between this scenario and Scenario 6 would be that recharge intended for CWD would be split between Locations 2 (2,000 AF/Year) and 4 (2,300 AF/Year), with a corresponding reduction in pipeline size east of Location 2. It is proposed that this scenario would be deferred to the end of the modeling analysis, so allow for possible re-definition in case of unexpected results from prior scenario simulations.

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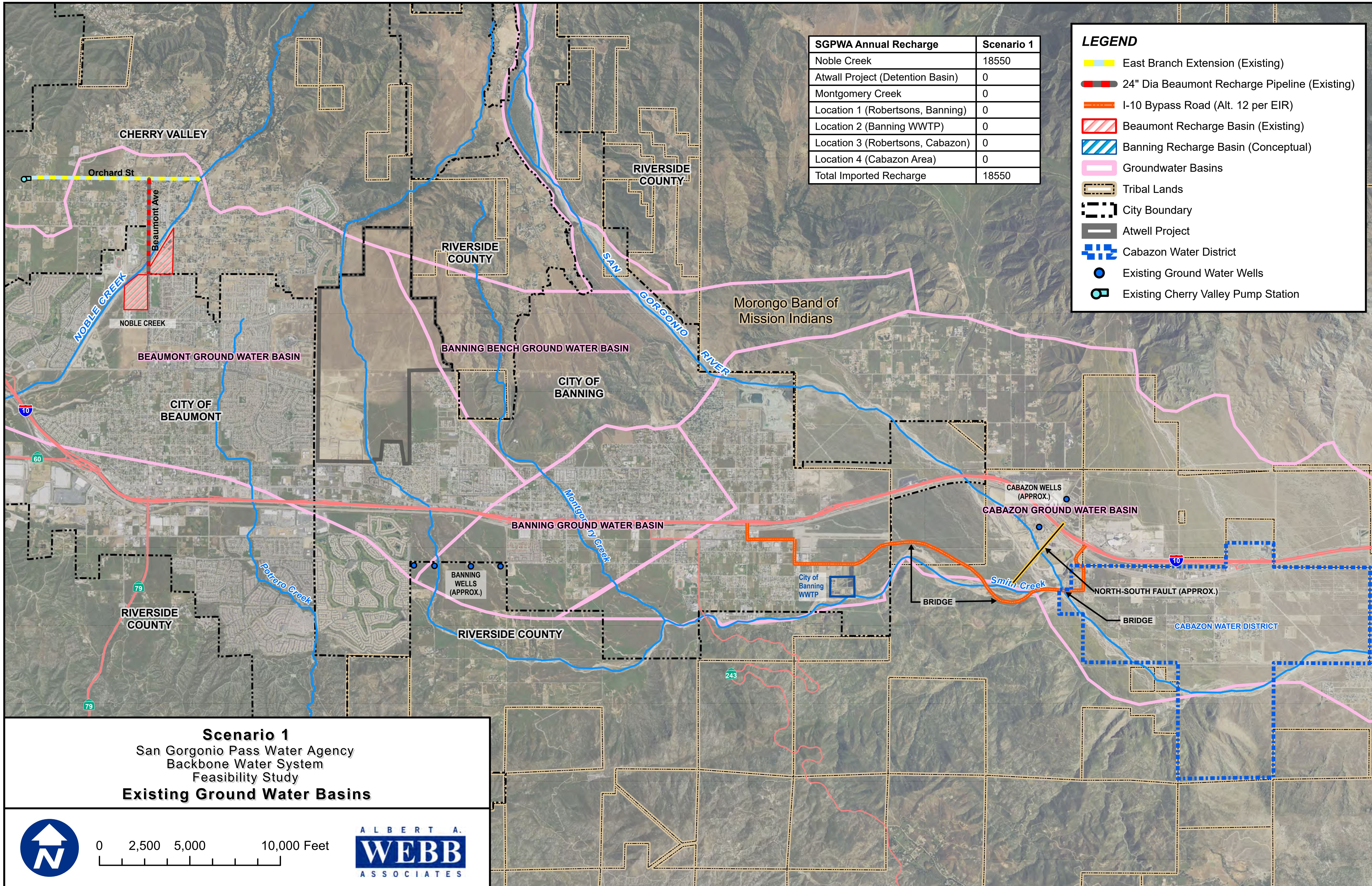
FIGURE 3-1

SGPWA Annual Recharge	Scenario 1
Noble Creek	18550
Atwall Project (Detention Basin)	0
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	0
Location 3 (Robertsons, Cabazon)	0
Location 4 (Cabazon Area)	0
Total Imported Recharge	18550



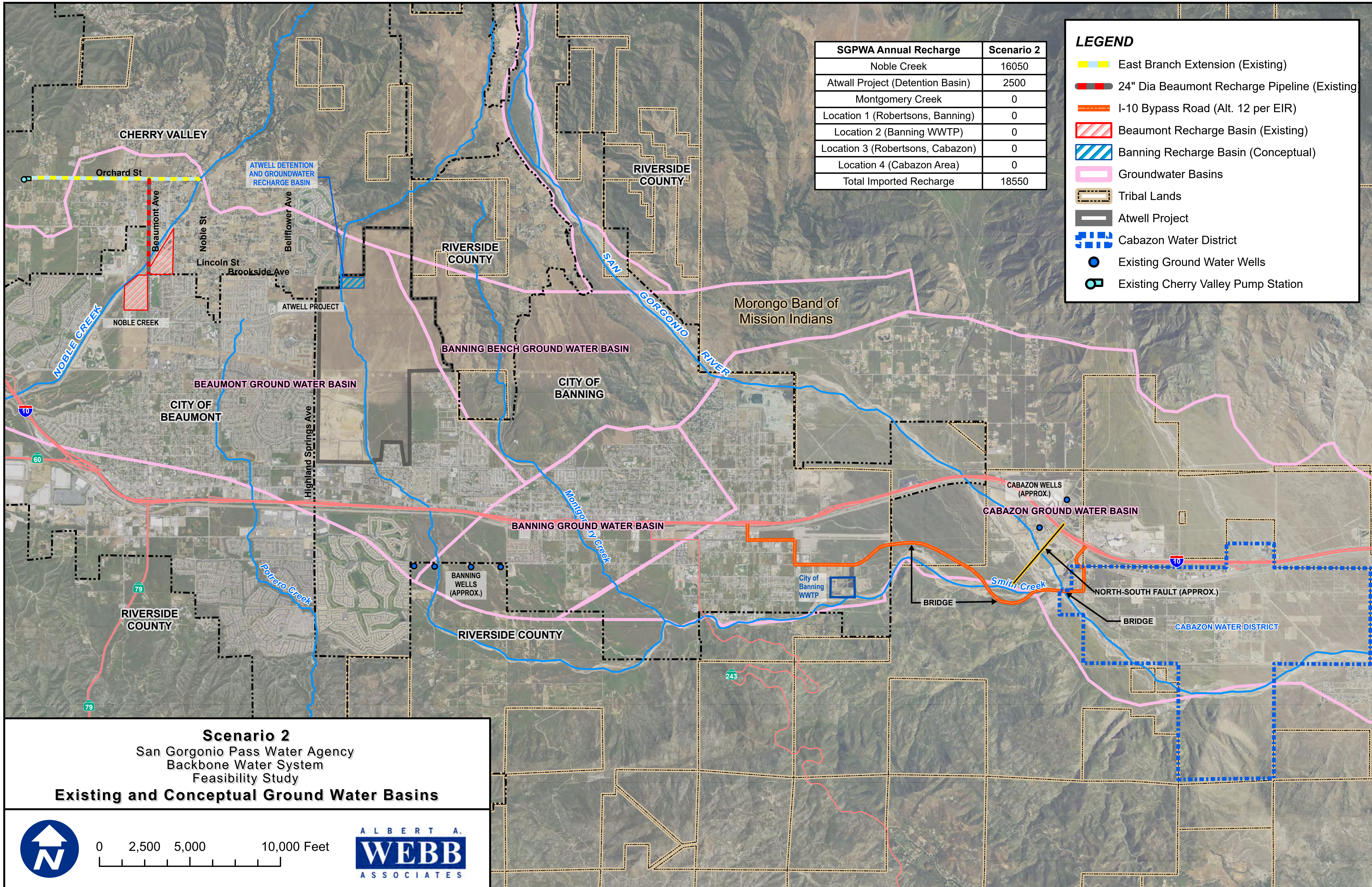
Scenario 1
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Existing Ground Water Basins

0 2,500 5,000 10,000 Feet

ALBERT A. WEBB ASSOCIATES

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 3-1 Scenario 1.aprx Map created 19 Apr 2023



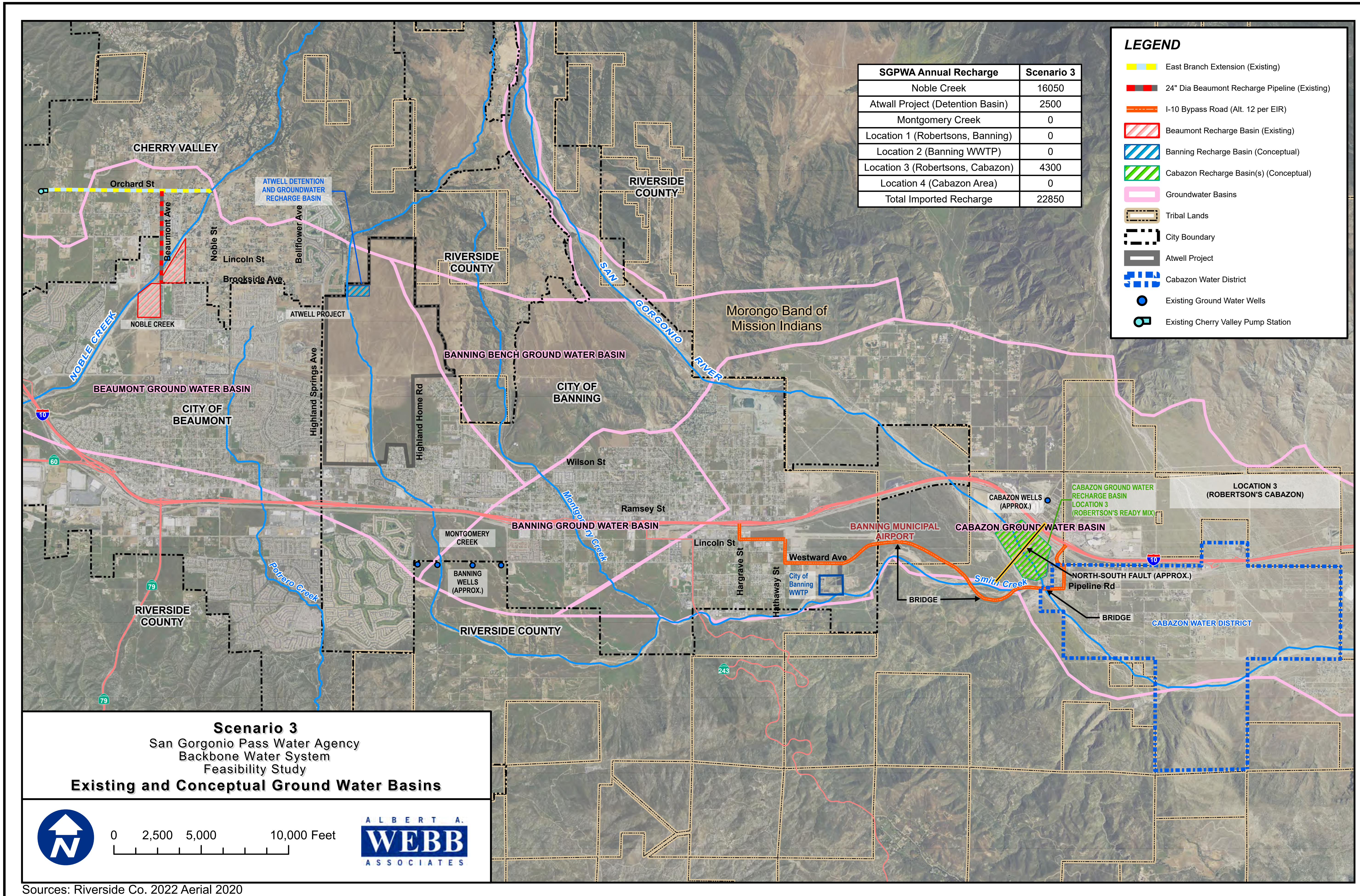
SGPWA Annual Recharge	Scenario 2
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	0
Location 3 (Robertsons, Cabazon)	0
Location 4 (Cabazon Area)	0
Total Imported Recharge	18550

Scenario 2
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Existing and Conceptual Ground Water Basins

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 3-2 Scenario 2.aprx Map created 21 Apr 2023

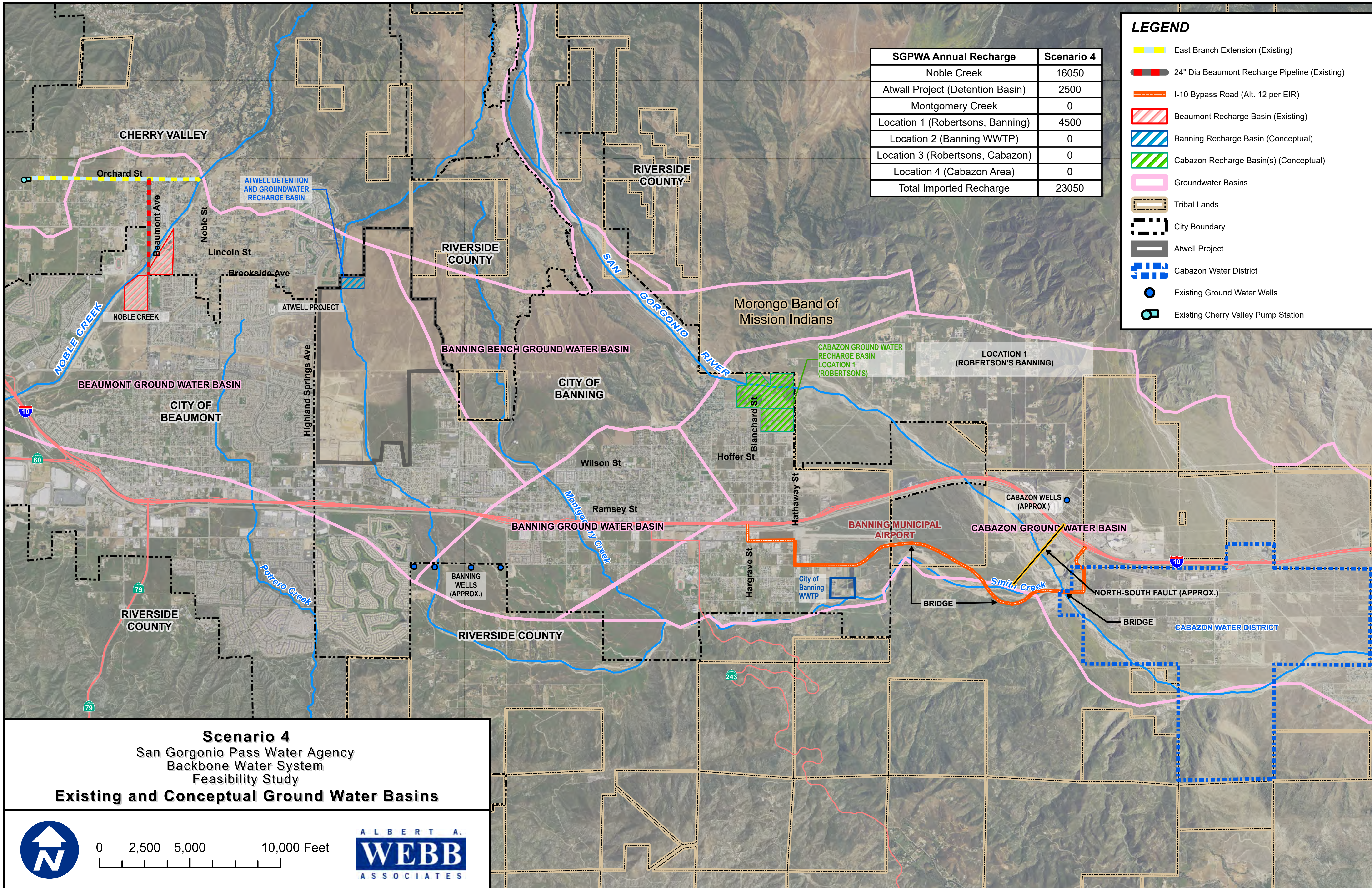
FIGURE 3-3



SGPWA Annual Recharge	Scenario 3
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	0
Location 3 (Robertsons, Cabazon)	4300
Location 4 (Cabazon Area)	0
Total Imported Recharge	22850

H:\2022\22-0025\GIS\PRO\Fig 3-3 Scenario 3.aprx Map created 21 Apr 2023

FIGURE 3-4



SGPWA Annual Recharge	Scenario 4
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	4500
Location 2 (Banning WWTP)	0
Location 3 (Robertsons, Cabazon)	0
Location 4 (Cabazon Area)	0
Total Imported Recharge	23050

Scenario 4

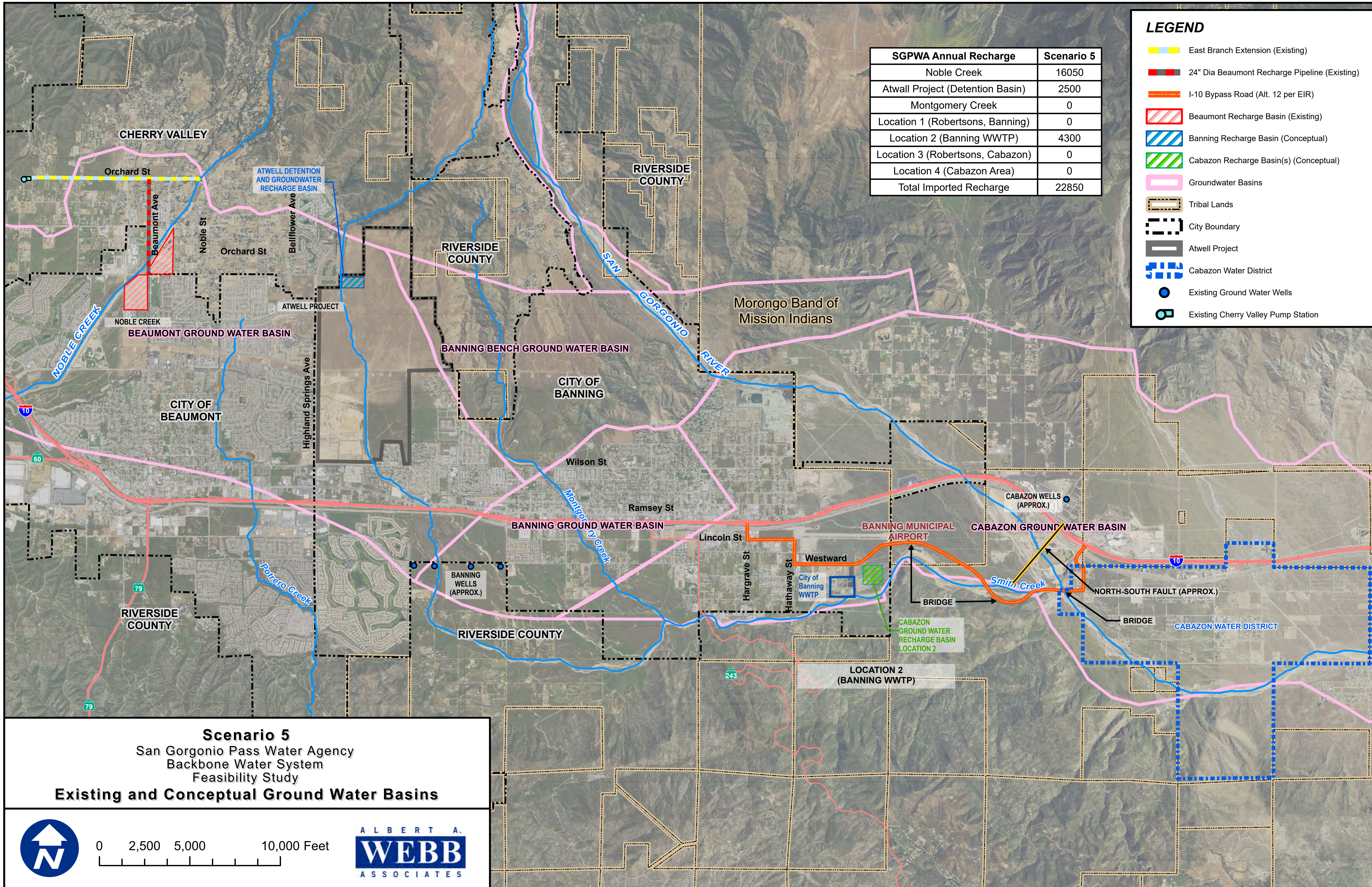
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study

Existing and Conceptual Ground Water Basins

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 3-4 Scenario 4.aprx Map created 19 Apr 2023

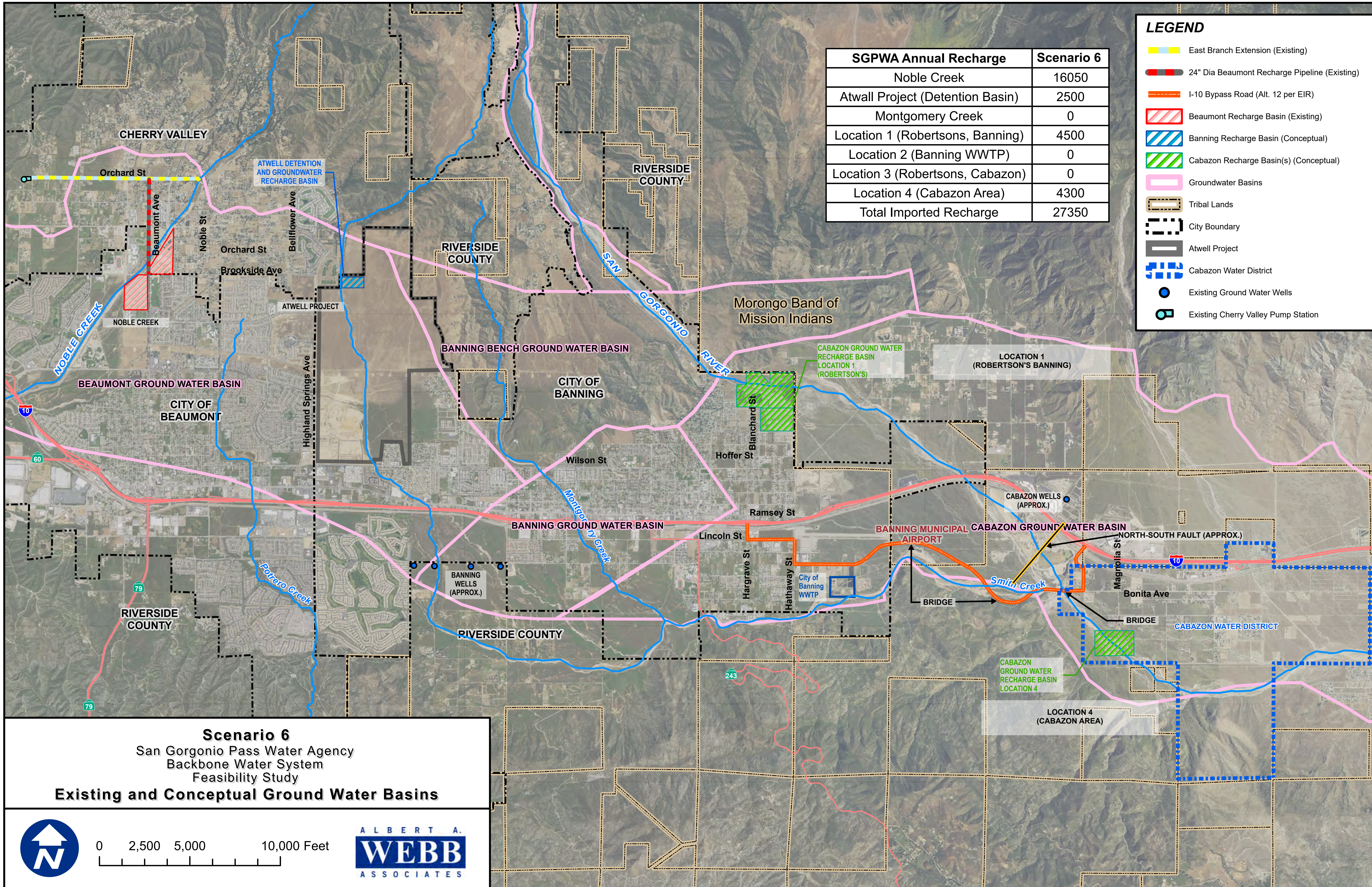
FIGURE 3-5



SGPWA Annual Recharge	Scenario 5
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	4300
Location 3 (Robertsons, Cabazon)	0
Location 4 (Cabazon Area)	0
Total Imported Recharge	22850

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 3-5 Scenario 5.aprx Map created 19 Apr 2023



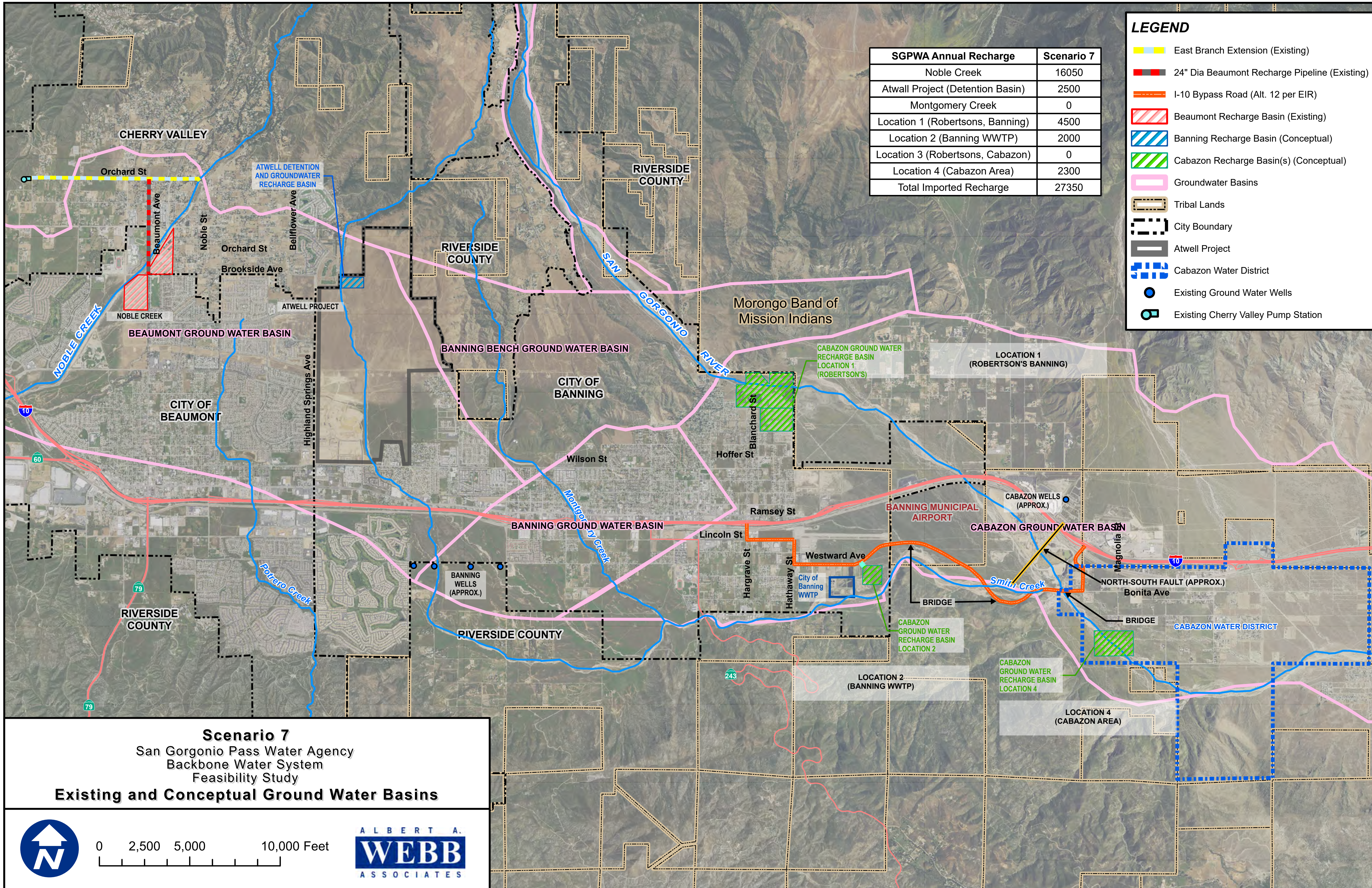
SGPWA Annual Recharge	Scenario 6
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	4500
Location 2 (Banning WWTP)	0
Location 3 (Robertsons, Cabazon)	0
Location 4 (Cabazon Area)	4300
Total Imported Recharge	27350

Scenario 6
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Existing and Conceptual Ground Water Basins

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 3-6 Scenario 6.aprx Map created 24 Apr 2023

FIGURE 3-7



SGPWA Annual Recharge	Scenario 7
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	4500
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	0
Location 4 (Cabazon Area)	2300
Total Imported Recharge	27350

Scenario 7
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Existing and Conceptual Ground Water Basins

0 2,500 5,000 10,000 Feet

ALBERT A. WEBB ASSOCIATES

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 3-7 Scenario 7.aprx Map created 19 Apr 2023

Section 4 Groundwater Recharge Basins

4.1 Introduction

In 2021, INTERA, Inc. developed for the San Gorgonio Pass (SGP) Subbasin Groundwater Sustainability Plan (GSP) a calibrated groundwater model of future conditions in the SGP Subbasin by simulating management actions and transient, climate-change-impacted future hydrology (Appendix B, INTERA 2023, Sec. 1, p. 1). For this feasibility study, INTERA was tasked to use said groundwater model to understand the best locations for recharge in the SGP Subbasin. This section is adapted from the April 2023 Technical Memorandum by INTERA, Inc. located in Appendix B.

4.1.1 San Gorgonio Pass Subbasin Geography

The SGP Subbasin includes the Banning Canyon, Banning, and Cabazon storage units. The Banning and Cabazon storage units are relatively large aquifers with several hundred thousand AF of groundwater in storage. However, the storage units have relatively small annual extractions (currently about 8,000 AF). Nonetheless, the Banning and Cabazon storage units have very large long-term storage changes (greater than 200,000 AF) as a result of hydrologic trends and variations in long-term deep percolation. Therefore, the relatively small incremental variations in groundwater conditions identified by the groundwater model projections should be considered in light of the underlying long-term variations and the uncertainty in model predictions (Appendix B, INTERA 2023, p. ES-1).

4.1.2 Model Description

INTERA's SGP Subbasin groundwater model evaluated the benefits of recharge at four different locations in the SGP Subbasin: Location 1 (Robertson's Banning Plant), Location 2 (Banning WWTP), Location 3 (Robertson's Cabazon Plant), and Location 4 (Smith Creek, Cabazon) as shown on Figure 4-1.

Nine scenarios were modeled where pumping from the Morongo Band of Missions Indians and Cabazon Water District were increased in different configurations based on each entities' projected future increases in groundwater demand (Table 4-1).

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Table 4-1 - Model Boundary Conditions by Model Scenario

<table>
<tr><th rowspan="2">Acre-feet per year (AFY)</th><th></th><th colspan="15">Modeling Assumption for Boundary Conditions</th></tr>
<tr><th>Natural Recharge</th><th>Indio Water Levels</th><th>Return Flows (Distributed)</th><th>Return Flows (WWTP)</th><th>Pumping – City of Banning</th><th>Pumping - BCVWD</th><th>Pumping - MBMI</th><th>Pumping - CWD</th><th>Total Pumping</th><th>Managed Recharge – Noble Creek</th><th>Managed Recharge – Atwell</th><th>Managed Recharge – Location 1</th><th>Managed Recharge – Location 2</th><th>Managed Recharge – Location 3</th><th>Managed Recharge – Location 4</th><th>Total Managed Recharge</th></tr>
<tr><td>Scenario 1a</td><td rowspan="9">Historical impacted by 2030s Climate Change Factors</td><td rowspan="9">2030-Level</td><td rowspan="9">Repeat last 5 years of Historical Model</td><td rowspan="9">4,034</td><td rowspan="9">11,896</td><td rowspan="9">16,797</td><td>2,500</td><td>500</td><td>31,694</td><td rowspan="2">18,550</td><td rowspan="2">-</td><td rowspan="3" colspan="4">-</td><td rowspan="3">18.550</td></tr>
<tr><td>Scenario 1b</td><td>6,300</td><td>4,809</td><td>39,803</td></tr>
<tr><td>Scenario 2</td><td rowspan="3">2,500</td><td>500</td><td>31,694</td><td rowspan="7">16,050</td><td rowspan="7">2,500</td></tr>
<tr><td>Scenario C2</td><td rowspan="2">4,809</td><td rowspan="2">36,003</td><td>-</td><td>4,300</td><td>-</td><td>-</td><td rowspan="2">22.850</td></tr>
<tr><td>Scenario C3</td><td>-</td><td>-</td><td>4,300</td><td>-</td></tr>
<tr><td>Scenario M1</td><td rowspan="4">6,300</td><td rowspan="2">500</td><td rowspan="2">35,494</td><td>4,500</td><td>-</td><td>-</td><td>-</td><td>23.050</td></tr>
<tr><td>Scenario M3</td><td>-</td><td>-</td><td>4,300</td><td>-</td><td>22,850</td></tr>
<tr><td>Scenario CM14</td><td rowspan="2">4,809</td><td rowspan="2">39,803</td><td rowspan="2">4,500</td><td>-</td><td>-</td><td>4,300</td><td rowspan="2">27,350</td></tr>
<tr><td>Scenario CM124</td><td>2,300</td><td>-</td><td>2,300</td></tr>
</table>

Source: Appendix B, INTERA 2023, Table 2-1 Model Boundary Conditions by Scenario

The model simulations demonstrated the effectiveness of increased recharge at the four locations to offset increased pumping and whether groundwater outflow from the SGP Subbasin would be increased. Specifically, the effect of the recharge basins and the respective model scenarios were evaluated on the bases of:

- How much groundwater levels were impacted positively, and demonstrated mitigation of drawdown from increased pumping in the SGP Subbasin;
- How much more groundwater flowed out to the Indio Subbasin;
- How water levels (at representative monitoring wells) responded to recharge in relation to minimum thresholds defined in the GSP to avoid undesirable results.[1]

4.2 Findings

Model results suggest Location 3 (Robertson's Cabazon Plant) performed the best due to its ability to maintain baseline water levels and minimize exceedance of the GSP minimum thresholds, while not losing significantly more flow to the Indio Subbasin compared to scenarios with recharge at other potential sites. In general, Locations 3 and 4 (Smith Creek Cabazon) performed best to maintain water levels in the areas where pumping increased. Locations 1 and 2 had minimal flow out to the Indio Subbasin and increased water levels albeit in areas of the Subbasin where there is not significant pumping. The difference in flow out to the Indio Subbasin was not significant in comparison to the total flow from the SGP Subbasin to the Indio Subbasin; therefore, this criterion was considered less substantial than the impact of recharge on water levels. All modeling scenarios that simulated additional recharge demonstrated a clear, positive impact on the Subbasin relative to baseline conditions.

Recharge rates from surficial recharge basins are strongly influenced by the hydraulic permeability of the sediments underlying the recharge basin above the deeper aquifer system where much of the groundwater production occurs. However, the thickness and permeability of the intermediate vadose zone (between the shallow and deeper aquifer systems) is an area of uncertainty in the model. Appendix A of the INTERA 2023 Technical Memorandum located in Appendix B of this study details the uncertainty of this vertical flow with respect to permeability of the vadose zone. Model results show that while the recharge rates vary based on the assumed permeability of the underlying sediments, the relative performance of the different recharge locations for different scenarios remains largely the same; therefore, the conclusions are not impacted by this uncertainty. Because of this uncertainty however, site investigations are recommended for any potential recharge site that is chosen to ensure the maximum benefit for the recharge is received.

[1] A "minimum threshold" is the quantitative value that represents the groundwater conditions at a representative monitoring site that, when exceeded individually or in combination with minimum thresholds at other monitoring sites, may cause an undesirable result(s) in the basin. "Undesirable results" are one or more of six significant and unreasonable effects of groundwater conditions including chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depleted interconnected surface water. (*Draft Sustainable Management Criteria Best Management Practice*, DWR, Nov. 6, 2017)

4.3 Recommendations

The following recommendations are based on INTERA's modeling to suggest the most beneficial location of potential recharge basins.

- Location 3 (Robertson's Cabazon Plant) is the preferred site for its ability to most effectively mitigate drawdown and protect key wells from exceeding Minimum Thresholds (MTs) with an insignificant difference in the amount of flows lost to the Indio Subbasin relative to other potential recharge sites.
    - Location 2 (Banning WWTP) is the runner-up for striking a balance of reducing flows lost out to the Indio Subbasin while reducing MT exceedances relative to the baseline.
    - Location 4 (Smith Creek Cabazon) ranks third for its ability to minimize MT exceedances when both CWD and MBMI increase pumping.
    - Location 1 (Robertson's Banning Plant) ranks fourth for its ability to raise groundwater levels in the basin without losing flow to the Indio Subbasin.
- Appendix A of the INTERA report[1] details the uncertainty of how recharge may propagate from the shallow aquifer system to the deeper aquifer system. Due to the uncertainty in vertical permeability characteristics in the unsaturated zone between the shallow and deep aquifers throughout the Subbasin, it is recommended that additional field investigations be performed to assess the subsurface geologic properties at the proposed recharge locations to ensure maximal efficiency and benefit from the recharge basins.

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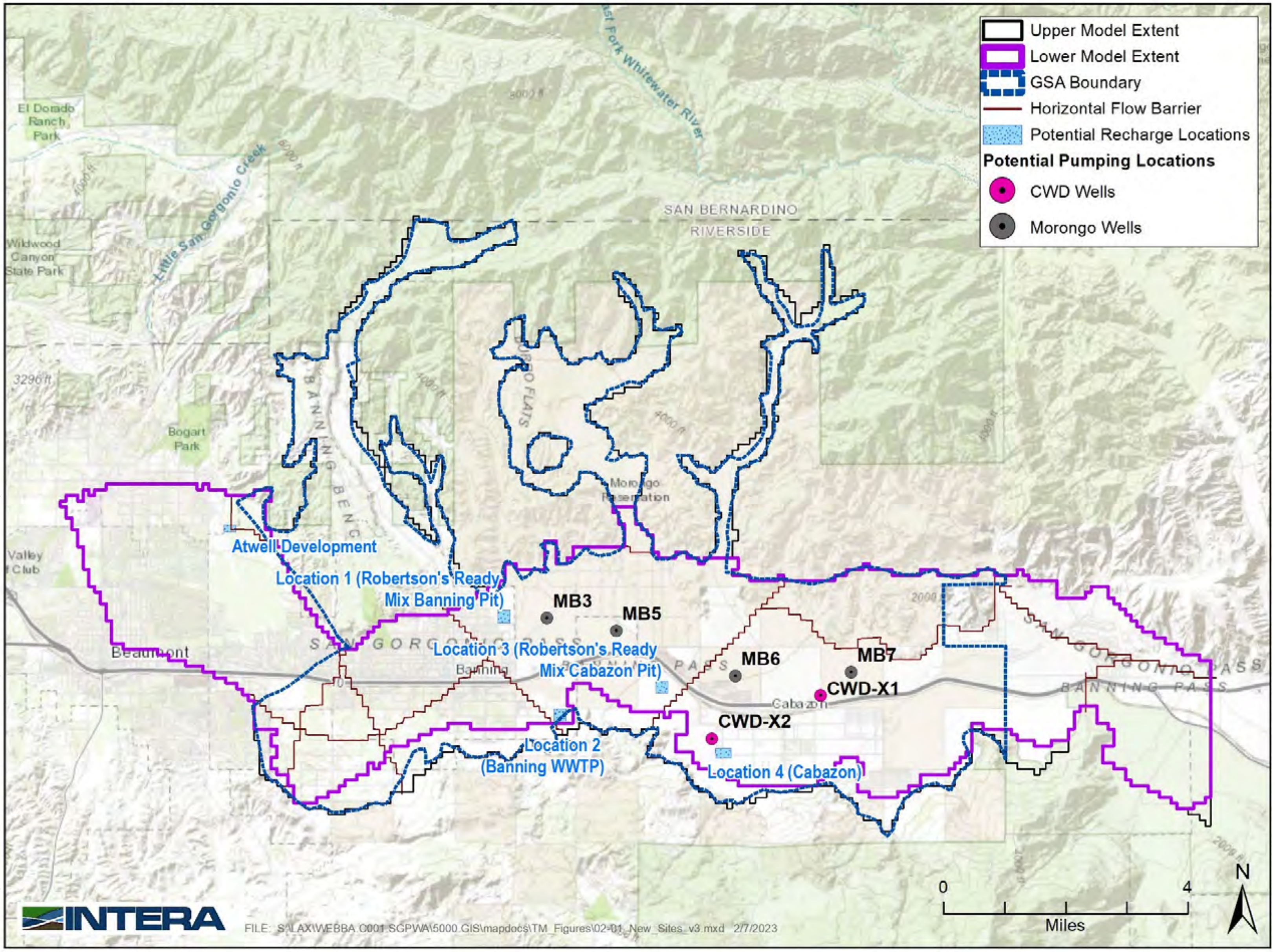
[1] The INTERA report and its appendices are located in Appendix B of this report.



Source: INTERA, Groundwater Modeling Analysis of Potential Recharge Locations in the San Gorgonio Pass Subbasin, April 2023

ALBERT A. WEBB ASSOCIATES

SAN GORGONIO PASS WATER AGENCY
BACKBONE WATER SYSTEM FEASIBILITY STUDY
CABAZON SUBBASIN GROUNWATER MODEL EVALUATION
W.O. No.: 2022-0025

FIGURE 4-1

H:\2022\22-0025\Drawings PDF\Fig 4-1 Four Cabazon Subbasins.pdf

Section 5 Pipe Alignment Development

5.1 Utility Research and Data Collection

WEBB contacted Underground Service Alert (USA) for this study to obtain a list of USA member contacts that need to be notified in the Project area prior to Project construction. Utility information was requested when the Project was initiated, and more requests were conducted as more alignment reaches were added to the Project description.

Utility agencies and information received are listed in the following Table 5-1.

Table 5-1 – Utility Research Summary

Utility Company	Letter Sent	Received Plans?
Beaumont Cherry Valley Water District	09/21/22	Plans not provided[1]
City of Beaumont	09/21/22	11/15/22
SoCalGas Distribution	05/16/22	05/26/22
Spectrum Charter	04/07/22	04/12/22
SoCal Edison	04/07/22	09/21/22
Frontier	05/24/22	06/14/22
City of Banning	09/21/22	11/16/22
Morongo Band of Missions Indians	04/30/22	No facilities
SoCalGas Transmission	04/07/22	04/29/22
Sprint	04/07/22	04/25/22
MCI Version Business	04/07/22	04/21/22
AT&T Distribution	04/07/22	No facilities
HP Communications	04/07/22	04/11/22
Kinder Morgan Energy Partners	04/07/22	05/12/22
Level 3 Communications	04/07/22	04/14/22
Questar Line 90 Company	04/07/22	04/29/22
Riverside County Flood Control	04/30/22	04/30/22
Terradax, Inc.	05/12/22	No facilities

5.2 Alignment Assessment Criteria

The alignment options were assessed using the following two criteria:

- Identified impacts on the Project area and community; and
- Construction cost estimate

Four categories of identified impacts were developed and used for in the assessment criteria after specifically investigating the Project area characteristics:

- Community Impact

    a. Entrance of Access Roads
    b. Commercial Mall and/or Business Park
    c. Community Facilities such as School, Library, Community Center, Police Station, and Fire Station

[1] Follow-up with all utilities for their records should be performed during preliminary design phase.

- Traffic Impact
    a. Signaled Intersection
    b. Non-signaled Intersection
    c. Bus Stops

- Major Underground Utility Crossing
    a. Large Storm Drain Crossing
    b. Railroad Crossing
    c. Large Water Transmission Crossing
    d. Gas or Fuel Transmission Crossing
    e. Open Channel Crossing
    f. Utility Relocation

Often, the more the Project involves these constraints, the more restrictions are placed on construction to accommodate residents, business owners, commuters, and public facility users, thus increasing the cost for construction. Major utility crossings will increase project complexity and impact the overall Project schedule adversely. Special mitigation required for compliance with the CDPH standard necessitates extra coordination and additional cost.

5.3 Alignment Development

The results of the groundwater modeling in Section 4, which concluded Groundwater Recharge Locations 3 (Robertson's Cabazon Plant) and 2 (Banning WWTP) as the best recharge locations were used in development of the alignment in addition to the recharge location at Smith Creek Basin.

Development of alternative alignments were based on four (4) pipeline reaches with the starting point at Noble Street with turnouts for the following groundwater recharge basins: Smith Creek Basin, Location 2 (Banning WWTP), and ending at Location 3 (Robertson's Cabazon Plant) (Figure 5-1). Refer to Appendix C for typical street cross sections showing the right-of-way and street widths and existing utilities. The following generally summarizes each pipeline reach and subsequent reach alternatives (Figure 5-1).

- Reach 1[1]; 15,500 linear feet; 36-inch diameter
    - Noble Street
    - Lincoln Street
    - Bellflower Avenue
    - Brookside Ave

[1] Due to potentially narrow utility corridor along Noble Street and Grand Avenue within Beaumont Cherry Valley's service area, an alignment along Cherry Valley Boulevard right of way was evaluated as an alternative. This alternative can be reviewed during preliminary design however there may be improvements by private property owners within the public right of way. Refer to Appendix D for additional information and mapping.

- Reach 2; 30-inch diameter; 21,200 linear feet
    - Highland Springs Avenue
    - Wilson Street (ending at Sunset Avenue)
- Reach 2A; 30-inch diameter; 18,700 linear feet
    - Through Atwell Development
    - Highland Home Road
    - Wilson Street (ending at Sunset Avenue)
- Reach 2B; 30-inch diameter; 12,000 linear feet
    - Highland Springs Avenue
    - Ramsey Street (ending at Sunset Avenue)
- Reach 3; 24-inch diameter; 13,300 linear feet
    - Wilson Street (starting at Sunset Avenue)
    - Wilson Street (ending at Hargrave Street)
- Reach 3A; 24-inch diameter; 3,000 linear feet
    - Hargrave Street (starting at Wilson Street)
    - Hargrave Street (ending at Ramsey Street)
- Reach 3B; 24-inch diameter; 12,200 linear feet;
    - Ramsey Street (starting at Sunset Avenue)
    - Ramsey Street (ending at Hargrave Street)
- Reach 3C; 24-inch diameter; 17,300 linear feet
    - Sunset Avenue
    - Lincoln Street (ending at Hargrave Street)
- Reach 4; 24-inch diameter; 25,000 linear feet
    - Lincoln Street (starting at Hargrave Street)
    - Hathaway Street
    - Westward Avenue
    - I-10 Bypass Road (Alternative 12 Road Alignment)
- Reach 4A; 24-inch diameter; 24,000 linear feet
    - Lincoln Street (starting at Hargrave Street)
    - Hathaway Street
    - Westward Avenue
    - I-10 Bypass Road (Alternative 5 Road Alignment)

After review of available right of way widths, major crossings, traffic, existing utilities, number of access or entrance roads, and surface features, four (4) major alignment alternatives (A thru D) were selected from the proposed connection point beginning at the existing East Branch Extension Pipeline at Orchard Street and Noble Street (west of Noble Creek) to the proposed connection point ending at Location 3 (Robertson's Cabazon Plant). Assessing the four selected alignments was achieved by combining corresponding alternative pipe reaches together.

Reach 4 Pipeline Alignment is based on Riverside County's I-10 Bypass Alternative 12 Road alignment. Due to potentially restrictive easement requirements along this path, Reach 4 Pipeline Alignment will not be included in the Backbone Project's alignment evaluation. Therefore, only Reach 4A Pipeline Alignment, based on Riverside County's I-10 Bypass Alternative 5 Road alignment will be included in the Project's alignment evaluation.

All alignment alternatives have Reach 1 and Reach 4A in common.

5.3.1 Alternative A Alignment

Beginning at the connection point to the existing East Branch Extension Pipeline at Orchard Street and Noble Street, crossing Noble Creek (Figure 5-2), the proposed alignment heads southerly along Noble Street, easterly along Lincoln Street, southerly along Bellflower Avenue, and easterly along Brookside Avenue. A turnout lateral would continue easterly into the Atwell Development for the Smith Creek Basin, then southerly along Highland Springs Avenue, easterly along Wilson Street, southerly along Hargrave Street, crossing the I-10 Freeway overpass, crossing Union Pacific Railroad (UPRR) tracks (using jack and bore trenchless method), easterly along Lincoln Street, southerly along Hathaway Street, easterly along Westward Avenue, easterly along the I-10 Bypass Road (Alternative 5 Road Alignment), northerly along Apache Trail, ending at the proposed Groundwater Recharge Basin Location 3 (Robertson's Cabazon Plant).

Alternative A Alignment comprises of the following pipeline reaches (Figure 5-2):

- Reach 1: 15,500 linear feet of 36-inch diameter waterline
- Reach 2: 21,200 linear feet of 30-inch diameter waterline
- Reach 3: 13,300 linear feet of 24-inch diameter waterline
- Reach 3A: 3,000 linear feet of 24-inch diameter waterline
- Reach 4A: 23,500 linear feet of 24-inch diameter waterline
- Total length of Alternative A Alignment: 76,500 linear feet

The Alternative A Alignment has some impact to residential uses as well as some impact to public facilities and business with traffic control for a mix of mostly residential traffic and some commercial traffic. Community impacts for this alignment may be considered "high" impact. There are several utilities along this alignment, including a proposed 12-inch diameter sewer force main (along Wilson Street between Highland Home Road and Sunset Avenue), twelve major storm drain crossings, and three parallel storm drains along the alignment. Though there are several utilities, due to the street width and right of way, this alignment is considered feasible.

5.3.2 Alternative B Alignment

Beginning at the connection point to the existing East Branch Extension Pipeline at Orchard Street and Noble Street, crossing Noble Creek (Figure 5-3), the alignment heads southerly along Noble Street, easterly along Lincoln Street, southerly along Bellflower Avenue, easterly along Brookside

Avenue, continues easterly into the Atwell Development with a turn out lateral for the Smith Creek Basin, southerly within the proposed streets of the Atwell Development, southerly along Highland Home Road, easterly along Wilson Street, southerly along Hargrave Street, crossing of the I-10 Freeway overpass, crossing UPRR railroad tracks (using jack and bore trenchless method), easterly along Lincoln Street, southerly along Hathaway Street, easterly along Westward Avenue, easterly along the I-10 Bypass Road (Alternative 5 Road Alignment), northerly along Apache Trail, ending at the proposed Groundwater Recharge Basin Location 3 (Robertson's Cabazon Plant).

Alternative B Alignment comprises of the following pipeline reaches (Figure 5-3):

- Reach 1: 15,500 linear feet of 36-inch diameter waterline
- Reach 2A: 18,700 linear feet[1] of 30-inch diameter waterline
- Reach 3: 13,300 linear feet of 24-inch diameter waterline
- Reach 3A: 3,000 linear feet of 24-inch diameter waterline
- Reach 4A: 23,500 linear feet of 24-inch diameter waterline
- Total length of Alternative B Alignment: 74,000 linear feet

Alternative B Alignment has the most impact to residential with some impact to public facilities and business with traffic control with a mix of mostly residential traffic and some commercial traffic. Community and residential impacts for this alignment may be considered high impact overall include the area within the future Atwell Development. There are several utilities along this alignment, including a proposed 12-inch diameter sewer force main (along Wilson Street between Highland Home Road and Sunset Avenue), ten major storm drain crossings, and three parallel storm drains along the alignment. Though there are several utilities, due to the street width and right of way, this alignment is considered feasible, however further coordination with the Atwell Development would need to be conducted before finalizing this alignment.

5.3.3 Alternative C Alignment

Beginning at the connection point to the existing East Branch Extension Pipeline at Orchard Street and Noble Street, crossing Noble Creek (Figure 5-4), the alignment heads southerly along Noble Street, easterly along Lincoln Street, southerly along Bellflower Avenue, easterly along Brookside Avenue, a turnout lateral would continue easterly into the Atwell Development for the Smith Creek Basin, then southerly along Highland Springs Avenue, easterly along Ramsey Street, southerly along Hargrave Street, crossing of the I-10 Freeway overpass, crossing UPRR railroad tracks (jack and bore), easterly along Lincoln Street, southerly along Hathaway Street, easterly along Westward Avenue, easterly along the I-10 Bypass Road (Alternative 5 Road Alignment), northerly along Apache Trail, ending at the proposed Groundwater Recharge Basin Cabazon Location 3 (Robertson's Cabazon Plant).

Alternative C Alignment comprises of the following pipeline reaches (Figure 5-4):

- Reach 1: 15,500 linear feet of 36-inch diameter waterline
- Reach 2: 10,500 linear feet[2] of 30-inch diameter waterline

[1] Reach 2A's alignment would need to be further coordinated with the Atwell Development's street plans. The length of this reach may increase as a result of final street plans.

[2] Partial Reach 2 along Highland Springs Avenue between Brookside Avenue and Wilson Street.

- Reach 2B: 12,000 linear feet of 30-inch diameter waterline
- Reach 3B: 13,200 linear feet of 24-inch diameter waterline
- Reach 4A: 24,000 linear feet of 24-inch diameter waterline
- Total length of Alternative C Alignment: 75,200 linear feet

Alternative C Alignment has the most impact to public facilities and business with some impact to residential with traffic control with a mix of mostly commercial traffic and some residential traffic. Commercial impacts for this alignment may be considered high impact. There are several utilities along this alignment, including, a large diameter high pressure gas transmission line (along Ramsey Street between Highland Springs Avenue and Hargrave Street), seven major storm drain crossings, and two parallel storm drains along the alignment. Though there are several utilities, due to the street width and right of way, this alignment is considered feasible. Ramsey Street has an old 12-inch-thick concrete layer[1], approximately 12-inch underneath the existing pavement, therefore additional effort, such as saw cutting and demolition of this layer may be required to when it is encountered.

5.3.4 Alternative D Alignment

Beginning at the connection point to the existing East Branch Extension Pipeline at Orchard Street and Noble Street, crossing Noble Creek (Figure 5-5), the alignment heads southerly along Noble Street, easterly along Lincoln Street, southerly along Bellflower Avenue, easterly along Brookside Avenue, a turnout lateral would continue easterly into the Atwell Development for the Smith Creek Basin, then southerly along Highland Springs Avenue, easterly along Wilson Street, southerly along Sunset Avenue, crossing of the I-10 Freeway overpass, crossing UPRR railroad overpass, easterly along Lincoln Street, southerly along Hathaway Street, easterly along Westward Avenue, easterly along the I-10 Bypass Road (Alternative 5 Road Alignment), northerly along Apache Trail, ending at the proposed Groundwater Recharge Basin Cabazon Location 3 (Robertson's Cabazon Plant).

Alternative D Alignment comprises of the following pipeline reaches (Figure 5-5):

- Reach 1: 15,500 linear feet of 36-inch diameter waterline
- Reach 2: 21,200 linear feet of 30-inch diameter waterline
- Reach 3C: 17,300 linear feet of 24-inch diameter waterline
- Reach 4A: 23,000 linear feet[2] of 24-inch diameter waterline
- Total length of Alternative D Alignment: 77,000 linear feet

Alternative D Alignment has the least impact to public facilities, business, and residential with traffic control with a mix of mostly commercial traffic and some residential traffic. The impacts along Lincoln Street for this alignment may be considered low to medium impact as the frontage along Lincoln Street is not fully developed. There are several utilities along this alignment, including a proposed 12-inch diameter sewer force main (along Wilson Street between Highland Home Road and Sunset Avenue and along Sunset Avenue to Ramsey Street) a 30-inch high pressure gas transmission line (along Lincoln Street between Sunset Avenue to San Gorgonio

[1] City of Banning, March 21, 2023 meeting.

[2] Partial Reach 4A deducted portion along Hargrave Avenue.

Avenue), seven major storm drain crossings, three parallel storm drains along the alignment, and a 24-inch recycled water pipeline (along Lincoln Street between Sunset Avenue and Hathaway Street). Based on these utilities, as well as typical water distribution and sewer collection, and the narrow street width and right of way, this alignment is considered the least feasible. However, the crossing UPRR railroad at Sunset Avenue could be performed opened trench in lieu of jack and before method.

5.3.5 Recommended Alignment

Alternative A Alignment (Section 5.3.1, Figure 5-2) was selected as the recommended alignment. Though this alternative has a higher public impact, the traffic tends to be more residential and construction activities can be limited to lower traffic times. Additionally, pipeline placement should be alleviated with the wider street width along Wilson Street.

5.4 Interstate 10 Bypass Road

The Riverside County Transportation Department (RCTD or “County”) proposes to construct a new road to provide a missing link between the City of Banning and the unincorporated community of Cabazon for the purposes of:

- Accommodate local trips on a local roadway;
- Provide an alternate route between Banning and Cabazon in the event of a closure on the I-10;
- Improve public safety and emergency response access;
- Provide a safe route for pedestrians and bicyclists; and
- Provide a connection from Cabazon to Banning that does not require an at-grade crossing of the railroad tracks.

The Final Environmental Impact Report (EIR) for the County’s I-10 Bypass Road project was certified by the Riverside County Board of Supervisors on December 7, 2021 and Preferred Alternative 12 will facilitate the work moving forward to seek funding for final design, right of way (including an easement from the Morongo Band of Mission Indians), utility relocation, and construction. (www.rcprojects.org/i10bypass)

This feasibility study originally evaluated the alignment of the County Preferred Alternative 12; however, the right-of-way constraints posed to SGPWA have led to this study evaluating the alignment offered by County Alternative 5 (see Figure 5-6). In addition to avoiding right-of-way constraints, Alternative 5 has just one crossing of Smith Creek instead of two creek crossings for Alternative 12. According to the County’s *I-10 Bypass Project: Banning to Cabazon Alternatives Screening Analysis* (ASA) *Administrative Draft* (Sept. 2016), because the alignment of County Alternative 5 avoids most of the delineated waters of Smith Creek, additional cutting into the hillside of more than 150 feet in height would typically be required for a road alignment. However, cuts may be much less for pipeline construction and pipeline maintenance road. In addition, this route would impact occupied habitat of Los Angeles Pocket Mouse (LAPM), which is a sensitive mammal species of the Western Riverside County MSHCP (ASA, p. 2-21). However, LAPM is not considered a sensitive species on Tribal Lands or within the Coachella Valley MSHCP and does not require mitigation within those jurisdictions (ASA, p. 4-15). Acreage impacts to LAPM habitat from the Project's pipeline alignment would have to be calculated and mitigation for impacts to occupied LAPM habitat within the Western Riverside County MSHCP as determined in coordination with the regulatory agencies.

5.5 Pipeline Construction Phasing

5.5.1 Phase 1

Phase 1 of pipeline construction would consist of approximately 15,500 linear feet of 36-inch diameter steel pipeline (150 psi) beginning at the connection point to the existing East Branch Extension Pipeline at Orchard Street and Noble Street, crossing Noble Creek (Figure 5-2), the alignment heads southerly along Noble Street, easterly along Lincoln Street, southerly along Bellflower Avenue, easterly along Brookside Avenue, a turnout lateral would continue easterly into the Atwell Development for the Smith Creek Basin.

5.5.2 Phase 2

Phase 2 of pipeline construction would consist of the Cherry Valley Pump Station Bypass Pipeline, see Sections 8 and 11 for details.

5.5.3 Phase 3

Phase 2 of pipeline construction would consist of approximately 21,200 linear feet of 30-inch diameter steel pipeline (250 psi) beginning at the connection point at the end of Phase 1 at Highland Springs Avenue and Brookside Avenue, then southerly along Highland Springs Avenue, easterly along Wilson Street ending at Sunset Avenue.

5.5.4 Phase 4

Phase 3 of pipeline construction would consist of approximately 16,600 liner feet of 24-inch diameter steel pipeline (250 psi) beginning at the connection point at the end of Phase 2 at Sunset Avenue, easterly along Wilson Street, southerly along Hargrave Street ending just north of the I-10 Freeway overpass.

5.5.5 Phase 5

Phase 4 of pipeline construction would consist of approximately 23,500 linear feet of 24-inch diameter steel pipeline (250 psi) beginning at the connection point at the end of Phase 3, then southerly crossing of the I-10 Freeway overpass and crossing UPRR railroad tracks (jack and bore), easterly along Lincoln Street, southerly along Hathaway Street, easterly along Westward Avenue, easterly along the I-10 Bypass Road (Alternative 5 Road Alignment), northerly along Apache Trail, ending at the proposed Groundwater Recharge Basin Location 3 (Robertson's Cabazon Plant).

5.6 Jurisdictions and Permits

The public agencies located in the Project area include:

- City of Beaumont
- City of Banning
- County of Riverside
- Caltrans
- Cabazon Water District
- Beaumont-Cherry Valley Water District
- Union Pacific Railroad
- Riverside County Flood Control & Water Conservation District
- Morongo Band of Mission Indians

In addition to public agencies, typical utilities include:

- Water
- Sewer
- Recycled Water
- Gas Transmission and Distribution
- Electrical Transmission and Distribution
- Communications and Fiber Optics
- Channels and Storm Drain Culverts

There are a number of approvals that would be required with the recommended alignment, most notably are the following:

- Caltrans – Encroachment Permit for interstate crossings
- UPRR – Encroachment Permit / License for crossing
- City of Beaumont – Encroachment Permit for use of public right-of-way
- County of Riverside – Encroachment Permit for use of public right-of-way
- RCFC&WCD – Easement or Encroachment Permit for channel crossing
- DDW – Permit for major water transmission pipeline
- DOSH – Underground Tunneling Classification

5.7 Easements

Portions of the recommended Alternative A Alignment that are outside of public rights-of-way will require acquisition of easements on private property, particularly along portions of Reach 4A (I-10 Bypass Road Alt. 5 Road Alignment). A majority of Reach 4A is located on private property, therefore temporary construction easements and permanent easements are required to construct and maintain this portion of the Project.

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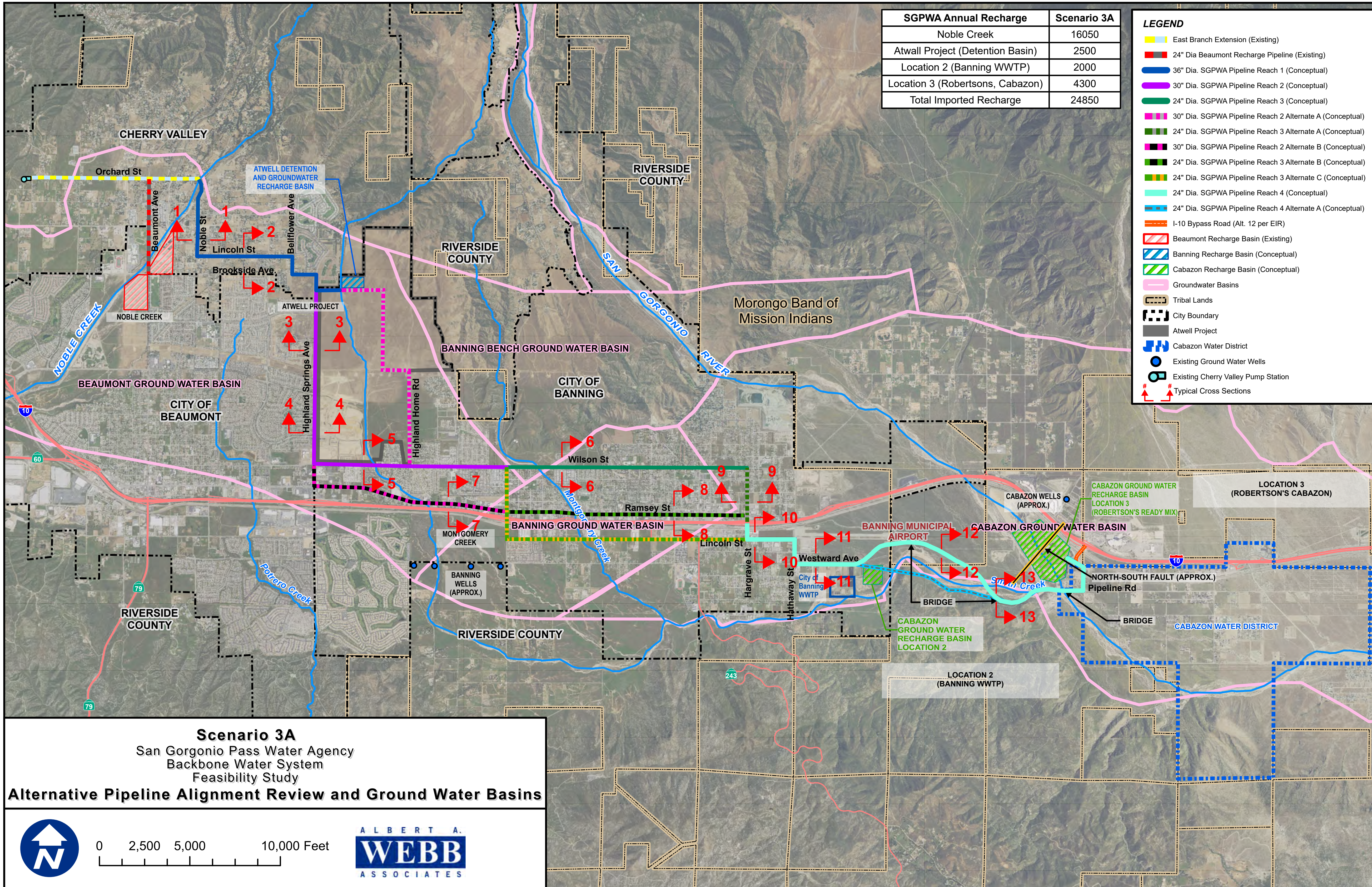
FIGURE 5-1



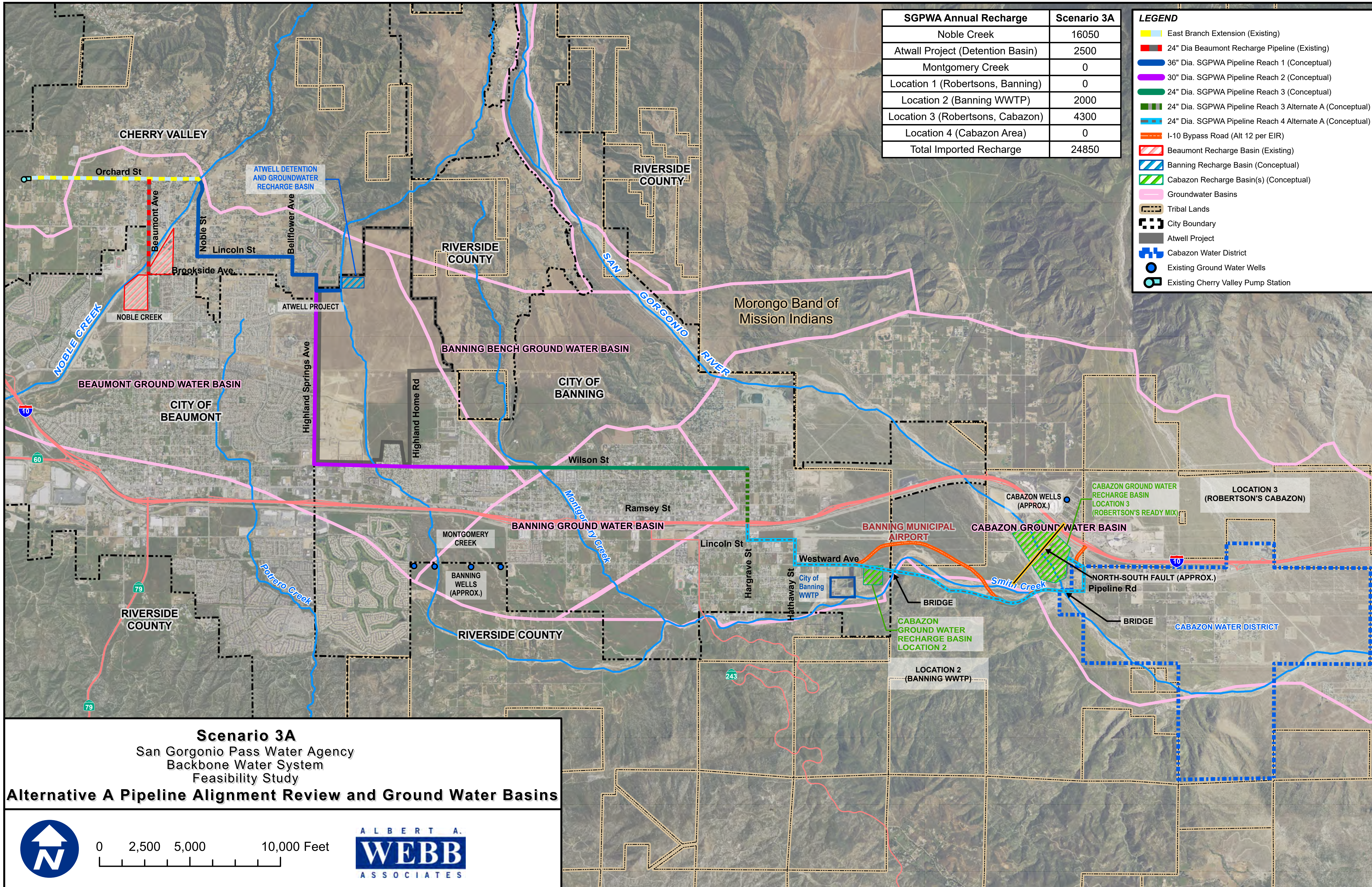
SGPWA Annual Recharge	Scenario 3A
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	4300
Total Imported Recharge	24850

Scenario 3A
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Alternative Pipeline Alignment Review and Ground Water Basins

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 5-1 Scenario 3A.aprx Map created 04 May 2023

FIGURE 5-2



SGPWA Annual Recharge	Scenario 3A
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	4300
Location 4 (Cabazon Area)	0
Total Imported Recharge	24850

Scenario 3A

San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study

Alternative A Pipeline Alignment Review and Ground Water Basins

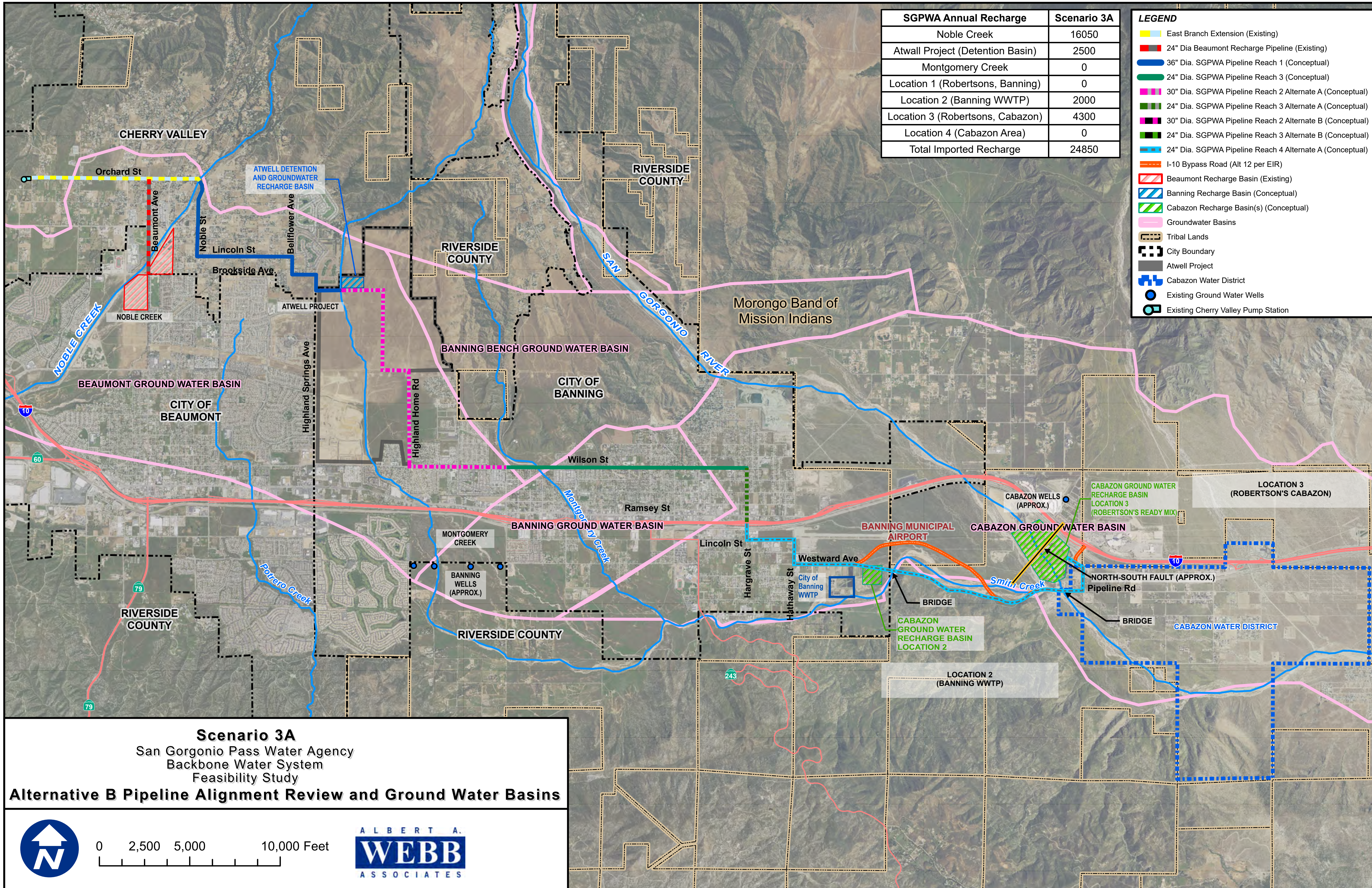
0 2,500 5,000 10,000 Feet

ALBERT A. WEBB ASSOCIATES

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 5-2 Alternative A Alignment.aprx Map created 04 May 2023

FIGURE 5-3



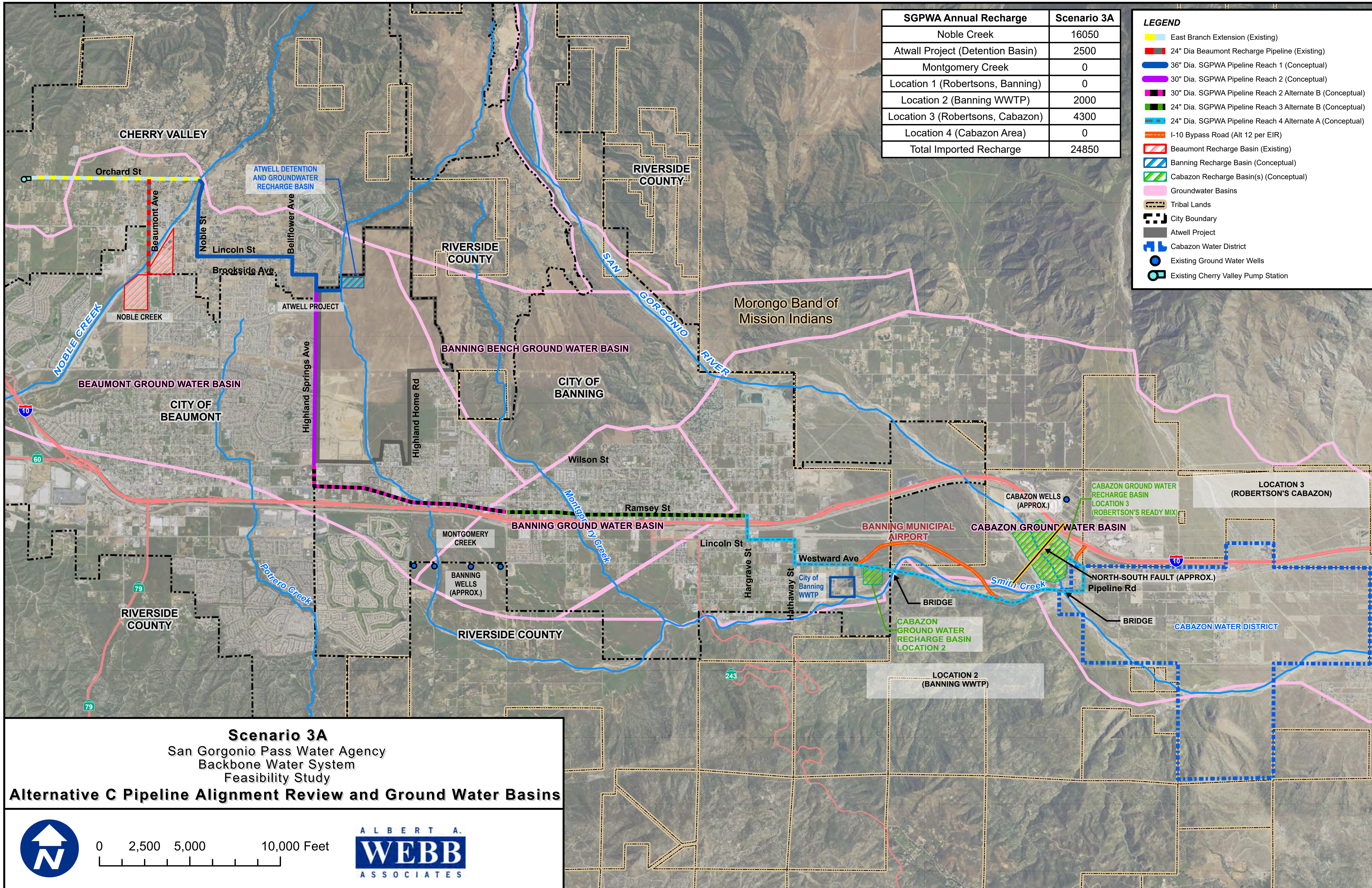
SGPWA Annual Recharge	Scenario 3A
Noble Creek	16050
Atwell Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	4300
Location 4 (Cabazon Area)	0
Total Imported Recharge	24850

Scenario 3A
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Alternative B Pipeline Alignment Review and Ground Water Basins

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 5-3 Alternative B Alignment.aprx Map created 04 May 2023

FIGURE 5-4



SGPWA Annual Recharge	Scenario 3A
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	4300
Location 4 (Cabazon Area)	0
Total Imported Recharge	24850

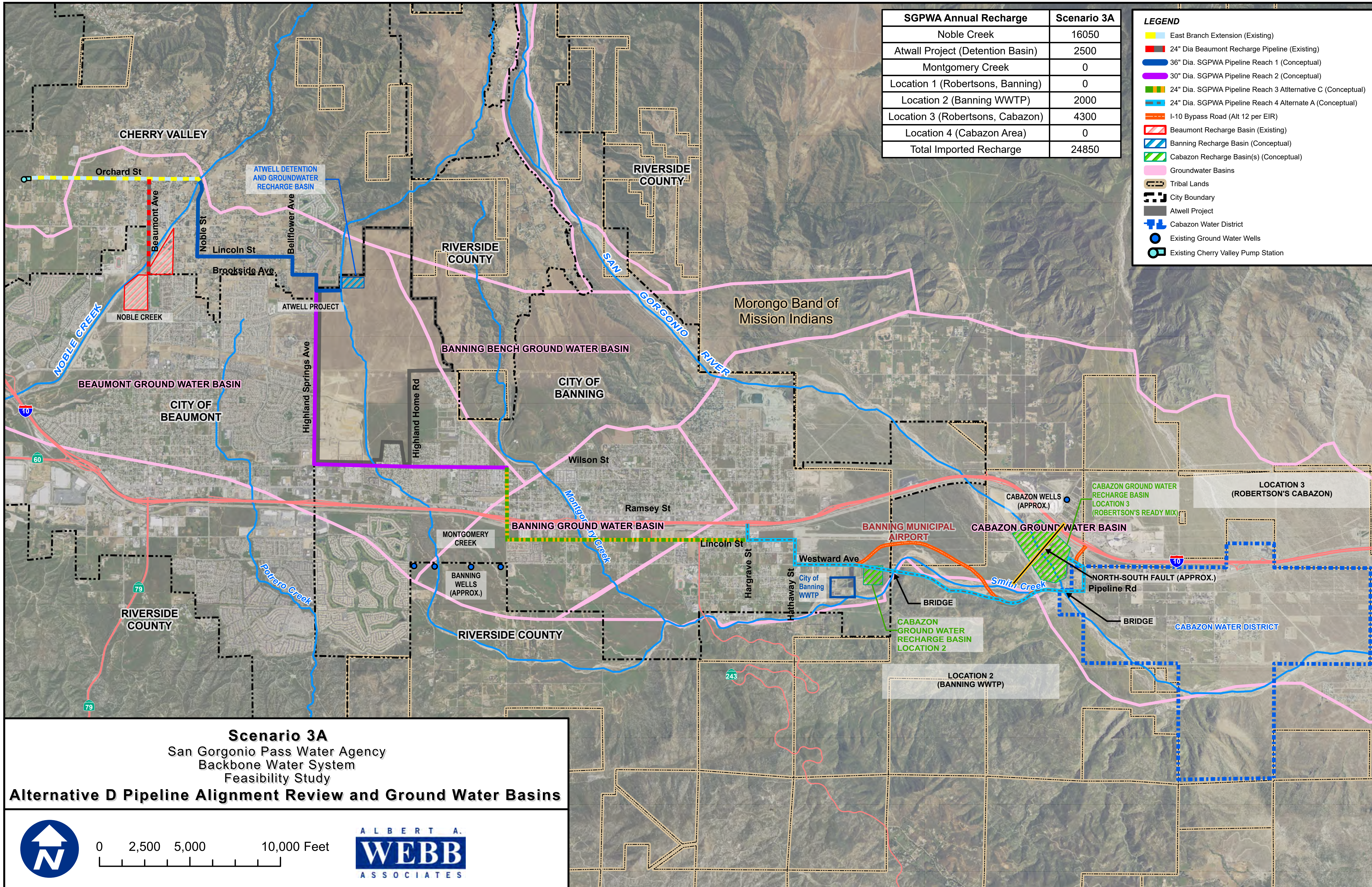
Scenario 3A

San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study

Alternative C Pipeline Alignment Review and Ground Water Basins

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 5-4 Alternative C Alignment.aprx Map created 04 May 2023



SGPWA Annual Recharge	Scenario 3A
Noble Creek	16050
Atwall Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	4300
Location 4 (Cabazon Area)	0
Total Imported Recharge	24850

Scenario 3A

San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study

Alternative D Pipeline Alignment Review and Ground Water Basins

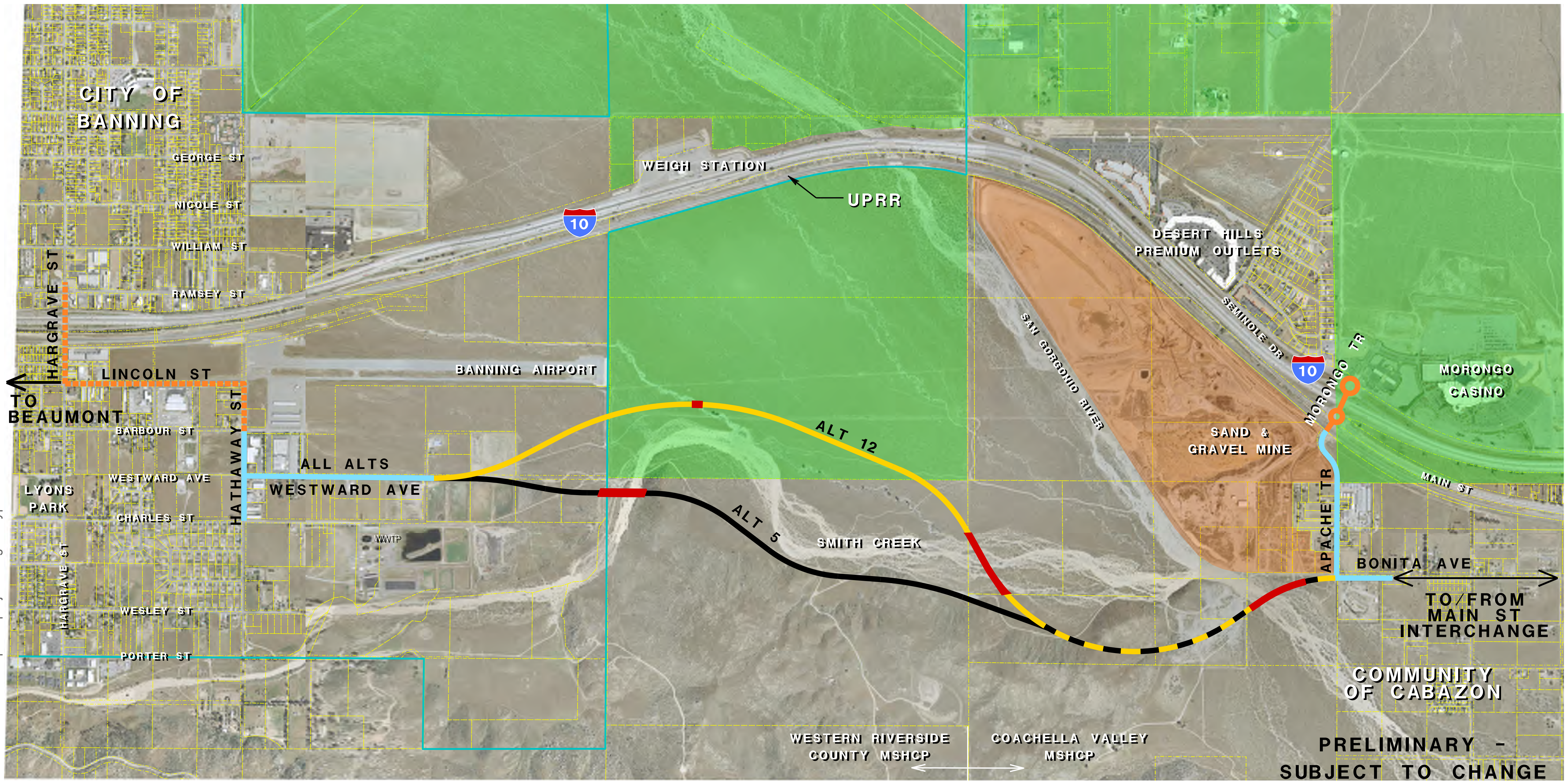
0 2,500 5,000 10,000 Feet

ALBERT A. WEBB ASSOCIATES

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\PRO\Fig 5-5 Alternative D Alignment.aprx Map created 04 May 2023

I-10 Bypass-Banning to Cabazon Preliminary Alternatives For Environmental Review



Source: Website: https://rcprojects.org/10bypass

LEGEND

- ALL ALTERNATIVES
- NO CHANGES PROPOSED
- BRIDGES
- CITY LIMITS
- INDIAN TRIBAL LAND

N.T.S.
12/21/17

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Section 6 Hydraulic Analysis

6.1 Pipeline Design Criteria and Sizing

The basis of pipeline flow rates was determined in Sections 3 and 4 of this report. Section 4 determined that Groundwater Recharge Location 3 (Robertson's Cabazon Plant) and Location 2 (Banning WWTP), were ideal candidates for groundwater recharge basins for the Cabazon Basin. Therefore, water conveyance Scenario 3 in Section 3 was modified to Scenario 3A to include flows to Groundwater Recharge Location 2 (Banning WWTP). Table 6-1 summarizes the flow rates to be conveyed to each groundwater recharge basin.

Table 6-1 – Groundwater Basin Recharge Rates

Recharge Basin	Annual Recharge (AFY)(1)
Noble Creek Basins (existing)	16,050
Smith Creek Basin	2,500
Location 2 (Banning WWTP)	2,000
Location 3 (Robertson's Cabazon Plant)	4,300
Total Imported Recharge	**24,850**(2)

(1) AFY = acre-feet per year.
(2) 24,850 AFY equates to 34 cubic feet per second (cfs). The Cherry Valley Pump Station capacity is 52 cfs.

The recommended maximum velocity for a transmission main is 6 feet per second (fps) with a maximum head loss of 3.5 ft./1,000 ft. of pipeline. Minimum pressure criteria for the pipeline was assumed to be the minimum pressure needed to convey the flows from the Cherry Valley Pump Station to the discharge points at each recharge basin. No limit on the maximum pressure was set as the pipeline will be constructed with the appropriate pressure class and split into pressure-reduced zones with pressure regulating valves along the alignment.

As shown in Table 6-1, the total annual recharge rate of the Project is estimated at 24,850 AFY, which equates to 34 cfs[1]. Because the Cherry Valley Pump Station capacity is 52 cfs, and the current flow rate is 22 cfs, the Cherry Valley Pump Station has current capacity to pump the annual recharge rate of 34 cfs[2]. The pipeline flow criteria for the Project will be based on the total annual recharge rate. Flow rates within each reach are based on the total flow rate minus the discharge amount at each recharge basin. Pipeline reach flow rates and proposed pipeline sizes are presented on Figure 6-1 and summarized in the following Table 6-2.

[1] This is an initial baseline rate for the purposes of groundwater recharge modeling and should not be considered the maximum pipeline conveyance capacity. Based on the pipeline sizing and a maximum of water velocity of 6 fps (feet per second) in the pipeline, the maximum pipeline capacity is approximately (a) 42 cfs (36-inch dia.), (b) 29 cfs (30-inch dia.), and (c) 18 cfs (24-inch dia.).

[2] Additional evaluation can be conducted for pipeline and storage capacity for the future Brookside West recharge basin.

Table 6-2 – Pipeline Flow Conveyance Rates

Pipeline Reaches	Pipeline Conveyance (cfs)	Pipe Diameter (inch)	Pipe Velocity (fps)
Existing EBX Pipeline(1)	34	36	4.9
Proposed Reach 1 Pipeline (36-inch Dia., 15,500 linear feet)	12	36	1.7
Proposed Reach 2 Pipeline (30-inch Dia., 21,200 linear feet)	9	30	1.8
Proposed Reach 3 Pipeline (24-inch diameter; 13,300 linear feet)	9	24	2.8
Proposed Reach 4A Pipeline (24-inch Dia., 24,000 linear feet)(2)	6	24	1.9

cfs = cubic feet per second; fps = feet per second

(1) EBX = Existing 36-inch diameter East Branch Extension, located downstream of the Cherry Valley Pump Station. Additional conveyance capacity may be available by a connection to the existing 54-inch diameter East Branch Extension upstream of the Cherry Valley Pump Station, also known as Reach 5, Bypass Pipeline. See Section 8 of this report for details.

(2) RCTC I-10 Bypass Alternative 5 alignment.

6.2 Condensed Profiles

A condensed profile as shown on Figure 6-2 was prepared for the recommended alignment based on available elevation data.[1] The ground surface elevations range from 1,850 ft. at the Groundwater Recharge Location 3 (Robertson's Cabazon Plant) to 2,900 ft. at the Noble Creek Crossing Connection. The condensed profile indicates that the pipeline should be split into three pressure zones (PZ) summarized as follows:

- PZ1: The first pressure zone would match the grade at the Cherry Valley Pump Station of approximately 3,100 ft.
- PZ2: The second pressure zone at approximately 2,700 ft., near the grade at Sunset Avenue and Wilson Street.
- PZ3: The third pressure zone at approximately 2,300 ft., near the grade at Lincoln Street and Hathaway Street.

Splitting the project into three pressure zones will also have the advantage of keeping the pipeline class at either 150 or 250 psi.

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[1] Elevation and topography data was sourced from Infraworks 2021, OpenStreetMap, Open Database License.

6.3 Terminus Reservoir

In review of the condensed profile in Figure 6-2, the placement of a terminus reservoir would be located as such to maintain proper pumping head conditions at a hydraulic grade elevation of approximately 3,100 feet. If a terminus reservoir is required by SGPWA, the following design and property parameters should be considered:

- Site property evaluation;
- Pipeline lateral alignment to feed the reservoir;
- Hydraulic analysis for reservoir sizing; and
- Separate environmental review and evaluation.

A possible location would be north of the Noble Creek Crossing, at the end of the EBX pipeline near the intersection of Orchard Street, Avenue San Timoteo, and Noble Street (Figure 6-1).

The proposed terminus reservoir may not be required when implementing the Bypass Pipeline (Section 8) which consists of the turnout connection to State Water Project East Branch Extension Pipeline and a pipeline bypassing the Cherry Valley Pump Station. Therefore, due to the uncertain use of this facility, the project cost the terminus reservoir was not developed.

6.4 Pressure Reducing Stations

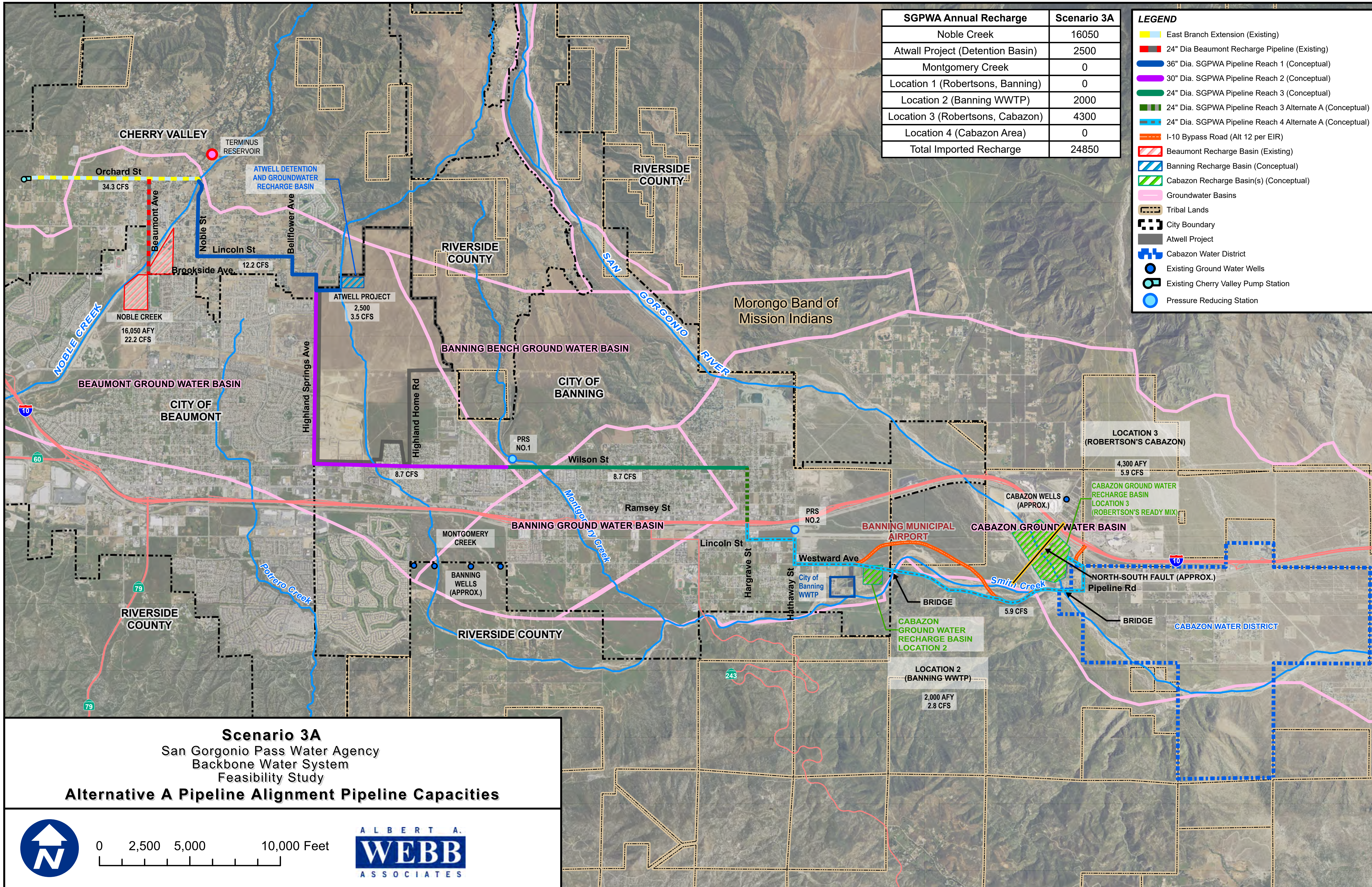
As shown in the condensed profile in Figure 6-2, approximately 8.7 cfs (4,000 gallons per minute [gpm]) pass through each proposed pressure reducing station (PRS) reducing the pressure by 400 ft. (173 psi). Due to the high pressure drop required, additional evaluation is needed to determine the proper parameters of the pressure reducing valve, trim requirements, and valve configuration. This project may benefit from hydroelectric facility to reduce pressure and generate power, however further studies should be conducted such as (a) capital and operational cost analysis, (b) site location(s) evaluation, (c) hydraulic review. Based on this flow rate and pressure drop, a 16-inch diameter Cla-Val valve with 16-inch diameter flow meter is recommended for each PRS. The proposed 16-inch diameter Cla-Val has a maximum capacity of 9,000 gpm (20 cfs) to 11,000 gpm (24 cfs). The velocities within the proposed 24-inch diameter pipeline at these flow rates would be 6 fps to 8 fps. Therefore, the capacity of the Cla-Val can accommodate higher flows within the capacity of the proposed pipeline.

Two preliminary locations for the proposed PRS's were selected. The selection criteria included for the minimum PRS site an area of 50 ft. x 15 ft. The pressure reducing valve and meter are proposed to be located within underground vaults to minimize visual impact with the control panel and communications antenna above ground (see Figure 6-3). The following Table 6-3 summarizes the locations of the two proposed PRS's. Refer to Figure 6-1 for overall locations of both Pressure Reducing Stations.

Table 6-3 – Preliminary Pressure Reducing Station Locations

Pressure Reducing Station	Preliminary Location	Figure No.
PRS No. 1	Sunset Avenue and Wilson Street	Figure 6-4
PRS No. 2	Lincoln Street and Hathaway Street	Figure 6-5

FIGURE 6-1



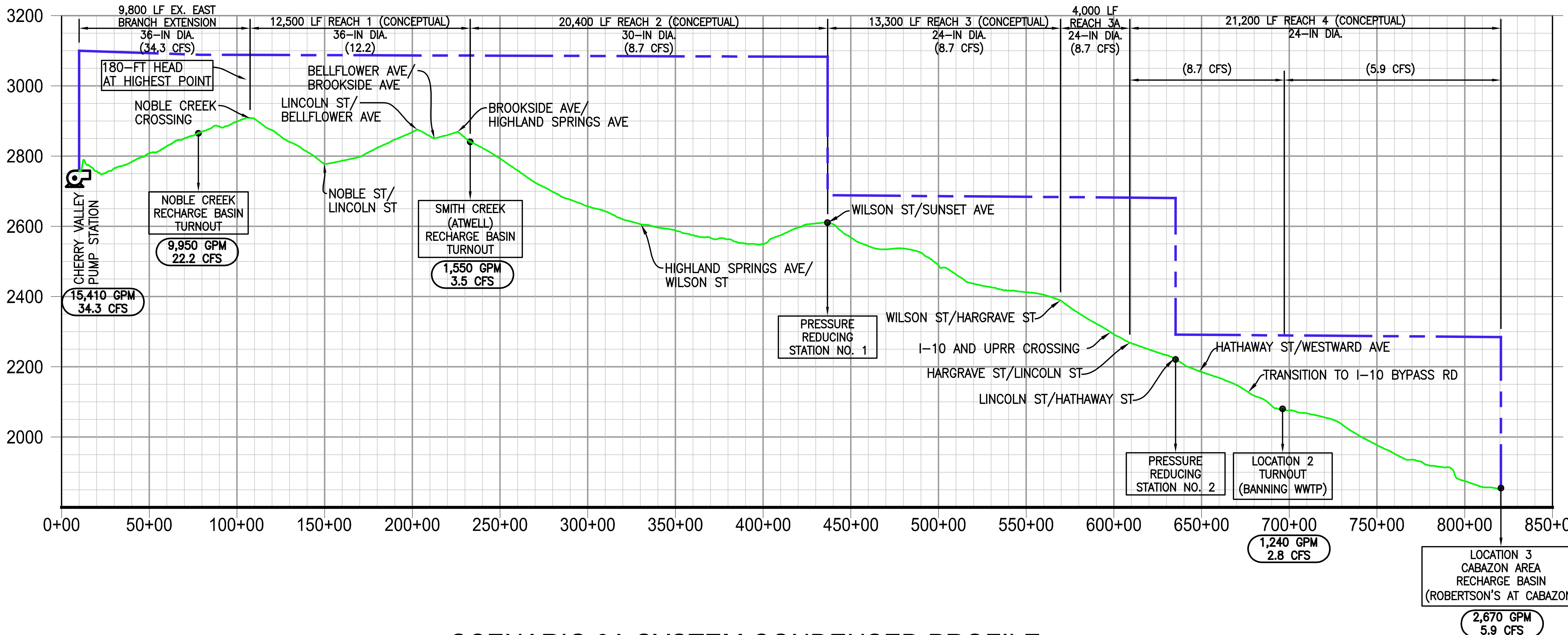
SGPWA Annual Recharge	Scenario 3A
Noble Creek	16050
Atwell Project (Detention Basin)	2500
Montgomery Creek	0
Location 1 (Robertsons, Banning)	0
Location 2 (Banning WWTP)	2000
Location 3 (Robertsons, Cabazon)	4300
Location 4 (Cabazon Area)	0
Total Imported Recharge	24850

Scenario 3A
San Gorgonio Pass Water Agency
Backbone Water System
Feasibility Study
Alternative A Pipeline Alignment Pipeline Capacities

Sources: Riverside Co. 2022 Aerial 2020

H:\2022\22-0025\GIS\Pipeline Capacities.aprx Map created 22 May 2023

FIGURE 6-2



SCENARIO 3A SYSTEM CONDENSED PROFILE

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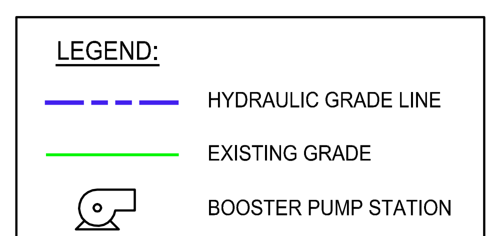

SAN GORGONIO PASS WATER AGENCY

BACKBONE WATER SYSTEM
FEASIBILITY STUDY

ALBERT A. WEBB ASSOCIATES

ENGINEERING CONSULTANTS
3788 McCRAY STREET
RIVERSIDE CA. 92506
PH. (951) 686-1070
FAX (951) 788-1256

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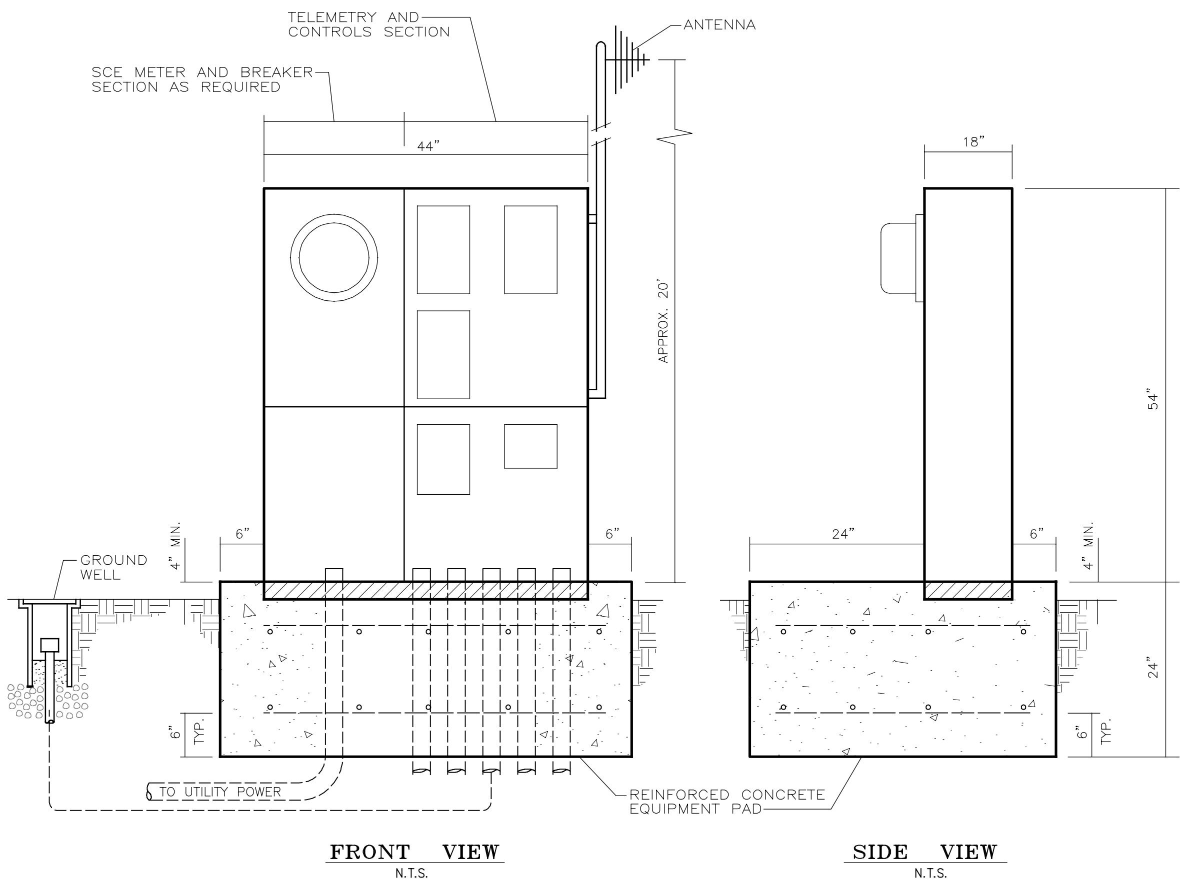
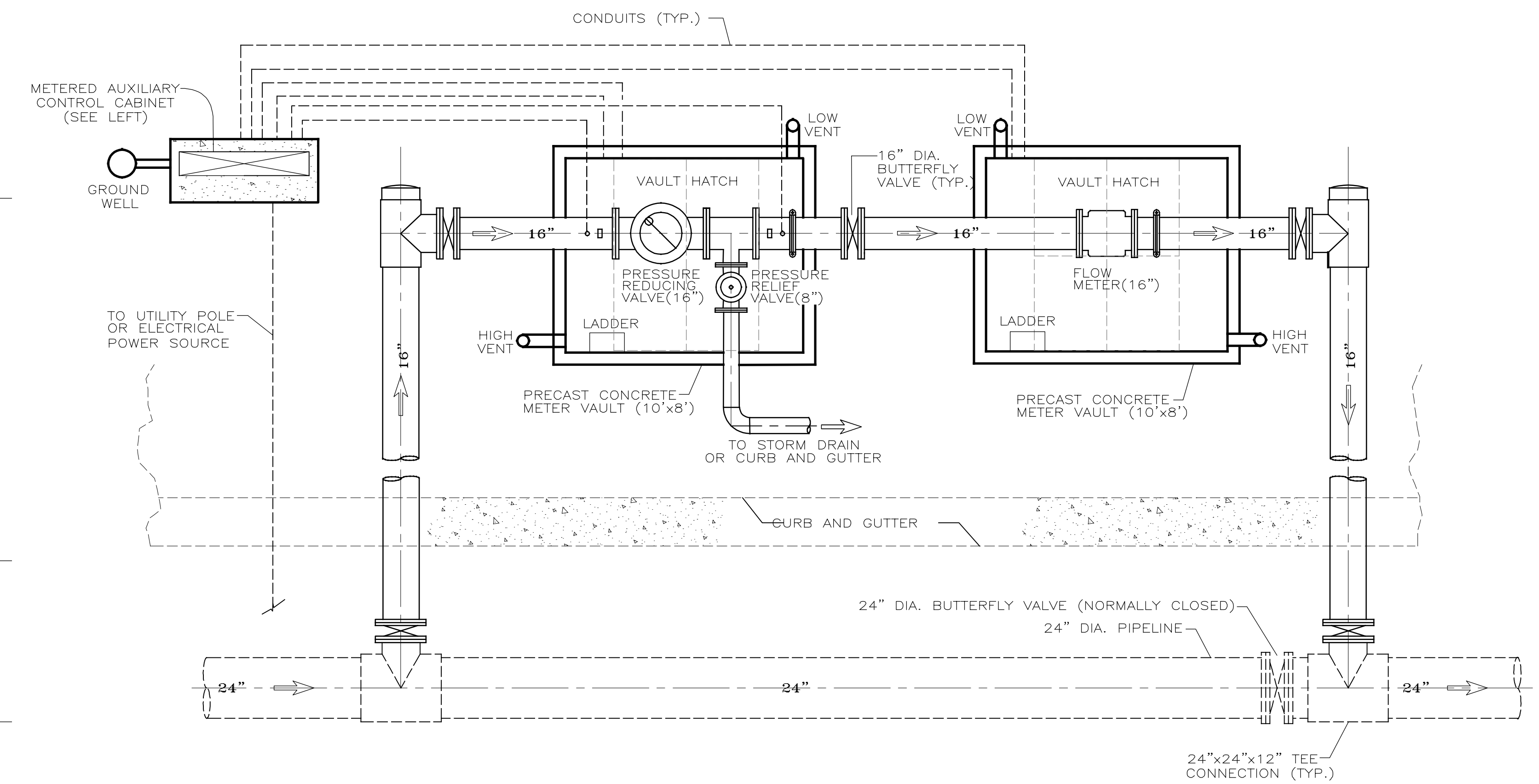
FIGURE 6-3



METERED AUXILIARY CONTROL CABINET

NOT TO SCALE



PRESSURE REDUCING STATION PLAN VIEW LAYOUT

NOT TO SCALE

SAN GORGONIO PASS WATER AGENCY			
BACKBONE WATER SYSTEM FEASIBILITY STUDY PRESSURE REDUCING STATIONS			
SCALE	ALBERT A. WEBB ASSOCIATES	CIVIL ENGINEERS 3788 McCRAY ST. RIVERSIDE CA. 92506 (951) 686-1070	W.O. 2022-0025
DATE			SHEET 6-3
DESIGNED			
CHECKED			
PLN CK REF:	H:\2022\22-0025\Drawings\Exhibits\Figure PRS.dwg		DWG. NO. 2022-0025
F.B.			

FIGURE 6-4

ALBERT A. WEBB ASSOCIATES

SAN GORGONIO PASS WATER AGENCY
BACKBONE WATER SYSTEM FEASIBILITY STUDY
PRESSURE REDUCING STATION NO. 1 LOCATION
W.O. No.: 2022-0025

H:\2022\22-0025\Drawings PDF\Fig 6-4 PRS 1.pdf

FIGURE 6-5

ALBERT A. WEBB ASSOCIATES

SAN GORGONIO PASS WATER AGENCY
BACKBONE WATER SYSTEM FEASIBILITY STUDY
PRESSURE REDUCING STATION NO. 2 LOCATION
W.O. No.: 2022-0025

H:\2022\22-0025\Drawings PDF\Fig 6-5 PRS 2.pdf

Section 7 Pipeline Material and Appurtenances

7.1 Pipe Class

The proposed pipeline is split into three pressure zones. Therefore, it is anticipated that Pressure Class 150 and 250 welded steel pipe will make up the majority of the pipeline alignment. The exact split between the two pipe pressure classes will be determined upon the final design phase with elevation data determined by field survey and design. The pipe class will affect pipeline appurtenances such as flanges, valves, fittings, etc.

7.2 Coating and Lining

It is anticipated that the coating and lining of the proposed pipeline will be standard cement mortar coating and lining per AWWA standards for welded steel pipe. The final determination should be determined by the geotechnical investigation and corrosion assessment to be conducted during the project design phase. Additional corrosion protection may be required in locations where corrosive soils are identified, where high groundwater is anticipated, where existing impressed current systems may impact the proposed pipeline or where the proposed pipeline must cross under or over existing facilities.

7.3 Thrust Protection

It is anticipated that thrust protection for the proposed pipeline will be addressed with welded steel joints throughout the entire pipeline. Thrust calculations are to be prepared and welding limits determined for all vertical and horizontal bends and at connection points, blow offs, and mainline valves during final design.

7.4 Mainline Valves

Mainline valves are proposed for the pipeline at a minimum interval of 3,500 linear feet of pipeline. Mainline valves are proposed on the upstream and downstream side of any major crossing (e.g., freeway, railroad, or channel) to ensure the pipeline can be isolated in the event of a failure at one of the crossings. Valves within the lower pressure areas (Class 150) will be full diameter butterfly valves, specified for the appropriate pressure rating. Valves with higher pressures located in Reach 1 (36-inch diameter) will be smaller 30-inch diameter double or triple offset butterfly valves with reducers to ensure a tight shutoff. Valves with higher pressures located in Reach 2 and beyond will have a valve size to match pipe size and will also have double or triple offset butterfly valves to ensure a tight shutoff.

7.5 Air Valves

At all high points and at locations down gradient from main line valves, air/vacuum valves will be required. Air valves are to be placed at major high points to ensure adequate air is both released and allowed in the pipeline when filling, draining, and to release any entrapped air in the system during normal operations. The following Table 7-1 summarizes air valve sizing for this project.

Table 7-1 – Air Valve Sizing

Pipeline Diameter	Air Valve Size
36-inch	8-inch
30-inch	6-inch
24-inch	4-inch

(1) Air valve sizing is preliminary and final sizing to be determined during final design phase.

Smaller air valves may be warranted at some intermediate high points. Heavy steel protective covers as shown in Figure 7-1 for all air valves are recommended near traffic areas to reduce the possibility that the valves are sheared off in the event of a traffic collision. The air valves will be located behind the curb/gutter and as far away from traffic as practical. Final sizing and location of the air valves are to be determined during final design phase when the design profile is prepared.

7.6 Blow-Offs

At all low points and at locations up gradient from mainline valves, blow-offs will be required to flush the pipeline at the low points and dewater the pipeline when required. The recommended blow-off size will be based on the size of the mainline to ensure adequate flow from the pipeline when draining and flushing the pipeline. The following Table 7-2 summarizes the blow-off sizing for this project.

Table 7-2 – Blow-Off Sizing

Pipeline Diameter	Blow-Off Size
36-inch	8-inch
30-inch	6-inch
24-inch	6-inch

(1) Blow-Off valve sizing is preliminary, final sizing to be determined during final design phase.

It is recommended that blow-offs are located in below-grade vaults (Figure 7-2) to protect them from damage and deter un-authorized access to the water. Blind flanges will be installed within the vaults which can be removed, and a short pipe stub installed to facilitate dewatering. The vaults will be located near the edge of the pavement or behind the curb and gutter. The exact location will be determined in the final design phase.

7.7 Corrosion Mitigation Measures

Corrosion test stations are anticipated for the entire pipeline alignment and for any casings required for major crossings. Distance between the corrosion test stations will be approximately 1,000 linear feet, however final spacing will be determined by the corrosion engineer. All unwelded joints will be bonded with jumpers to ensure electrical conductivity between the pipe segments. Insulated flange kits are anticipated to be installed at each mainline valve to separate the pipe segments. As part of final design, a corrosion engineer is to be engaged to review the corrosion potential and provide specific recommendations for this project and to address the following minimum topics.

7.7.1 Soil Corrosivity Potential

The corrosion engineer will review the data obtained from the geotechnical investigation to determine the soil corrosivity potential. The corrosion engineer will recommend any changes to the standard pipe coating material for the project, review the corrosion devices including the corrosion test stations, pipe bonding, special coatings, and insulating flanges.

7.7.2 Stray Currents and Existing Impressed Current Systems

There is a potential for corrosion from stray currents coming from impressed current systems on other pipelines along the alignment (such as large diameter, high pressure gas transmission mains). The corrosion engineer will review available data including the utility research along the proposed alignment, perform a field inspection of the proposed alignment and perform any field tests necessary to determine the potential for stray currents. If stray currents are identified, appropriate measures will be implemented which may include additional insulation protection at crossings or tape wrapped coating of the pipeline for a prescribed distance.

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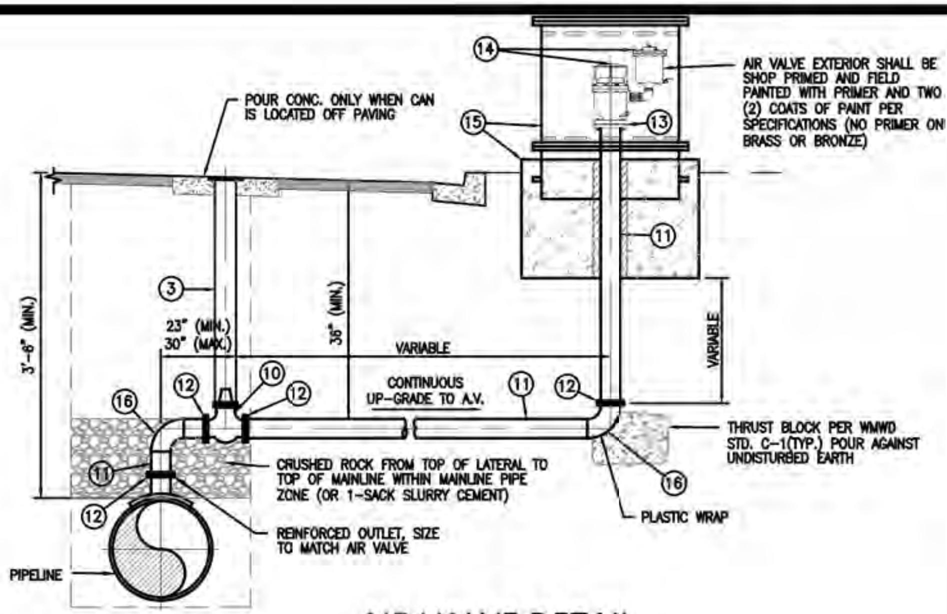
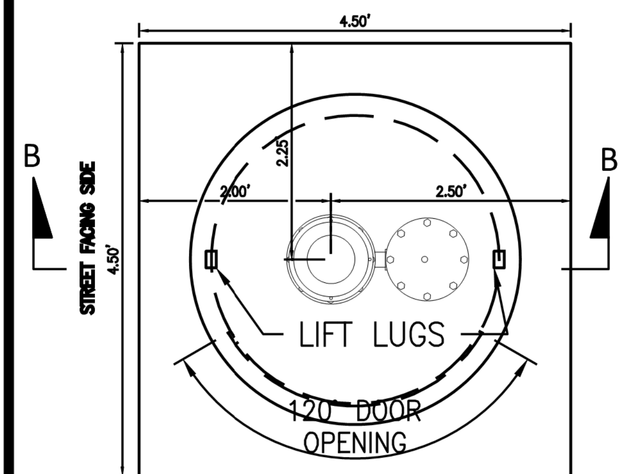
FIGURE 7-1



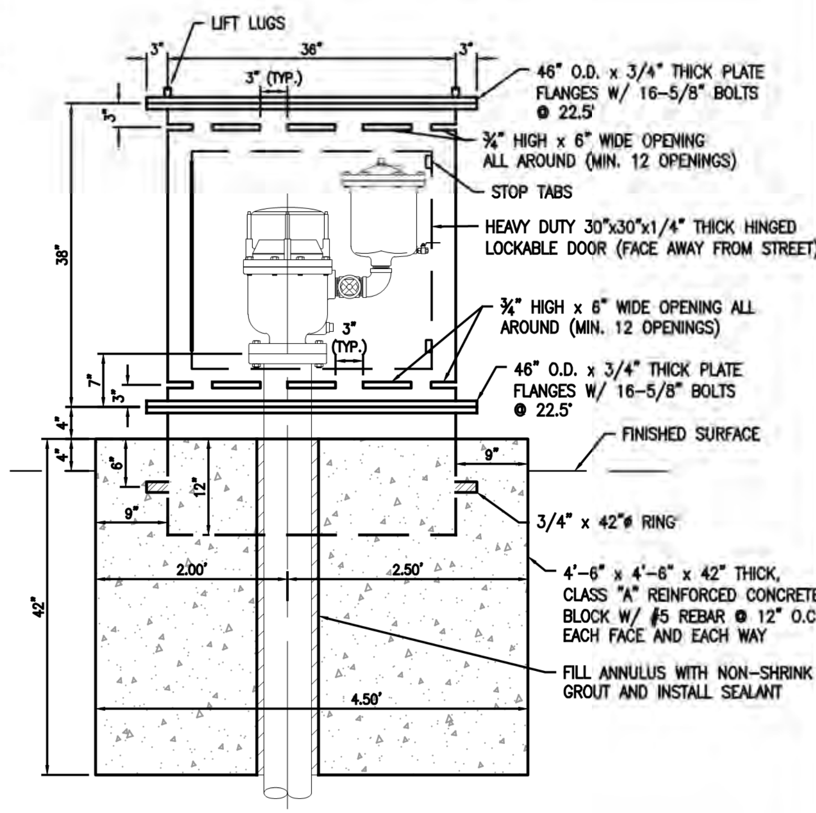
AIR VALVE DETAIL
NOT TO SCALE

CONSTRUCTION NOTES

ITEM	DESCRIPTION
3	VALVE BOX ASSEMBLY PER JCSD STD. B-1
10	GATE VALVE
11	STEEL PIPE TO MATCH AIR VALVE SIZE, STD. WT. GA. CML WSP
12	300 LB. SLIP-ON FLANGE (SHIP LOOSE FOR FIELD WELDING)
13	300 LB. SLIP-ON FLANGE TO MATCH ON AIR VALVE
14	HEAVY DUTY APCO SERIES 1800 DUAL COMBINATION AIR RELEASE VALVE, OR APPROVED EQUAL, PER SPECIFICATIONS, MINIMUM PRESSURE CLASS OF AV TO MATCH CLASS OF WATERMAIN. (SIZE TO BE DETERMINED)
15	HEAVY WEIGHT STEEL ENCLOSURE PER DETAIL 5 HEREON
16	5 PC A.W.W.A. 90° FLG'D. BEND, STD. WT., CML WSP OR 90° STD. WT. CML WSP BEND



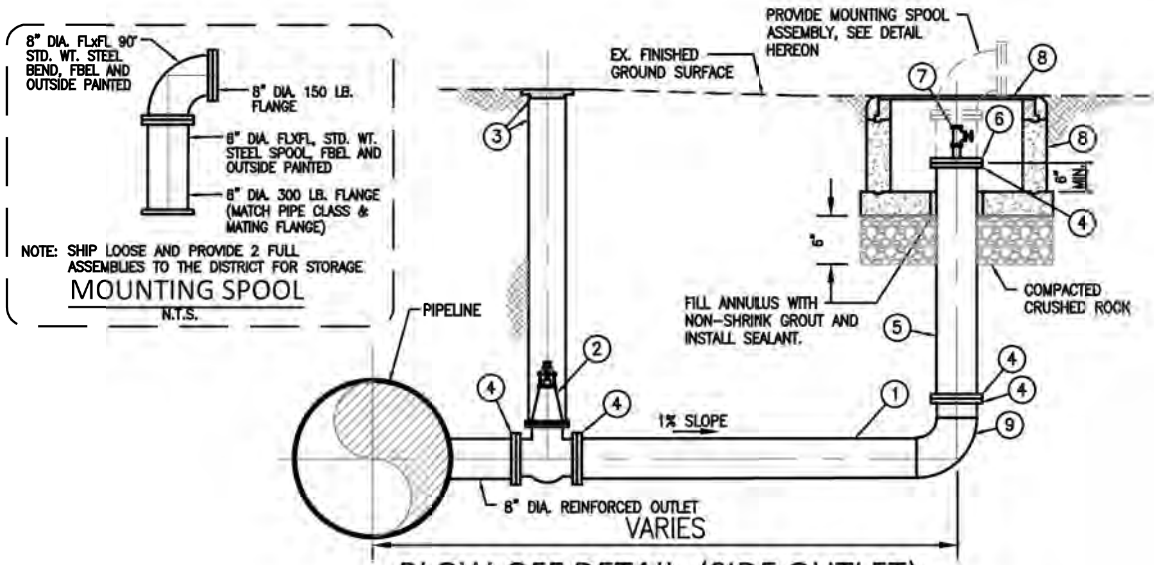
PLAN



SECTION B-B

AIR VALVE ENCLOSURE DETAIL 5 / --
NOT TO SCALE

LOCATION:	AIR VALVE DETAILS	DESIGNED:
ADDRESS:	ALBERT A. WEBB ASSOCIATES ENGINEERING CONSULTANTS 3788 McCRAY STREET RIVERSIDE CA. 92506 PH. (951) 686-1070 FAX (951) 788-1256	CHECKED:
		DATE:
		SCALE: N.T.S.

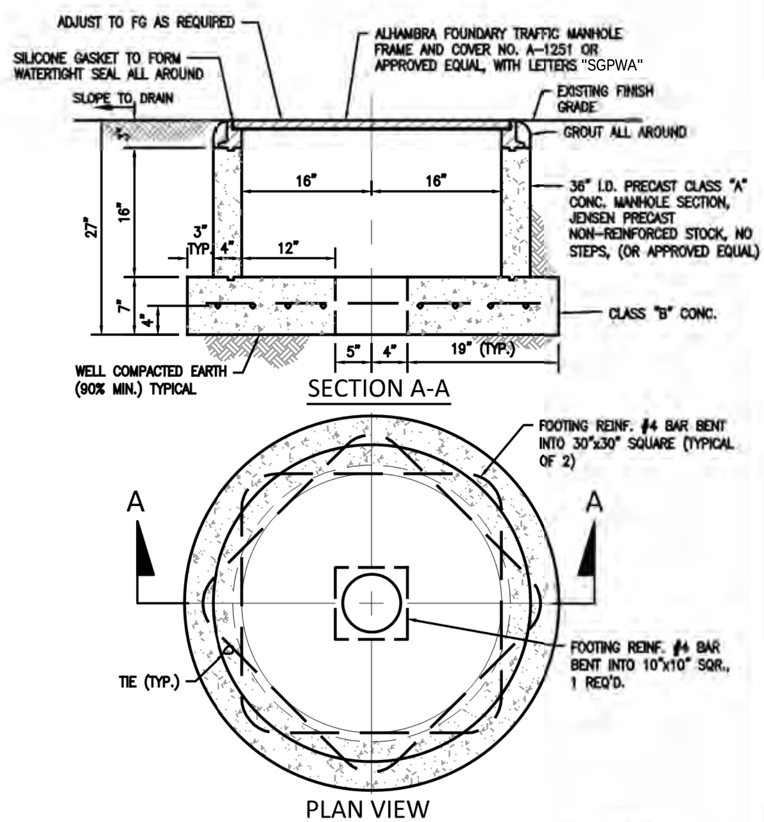


BLOW-OFF DETAIL (SIDE OUTLET)

NOT TO SCALE

CONSTRUCTION NOTES

ITEM	DESCRIPTION
1	8" DIA. CML & CMC WELDED STEEL PIPE, STD. WT.
2	8" DIA. TRIPLE VALVE (CLASS 300)
3	VALVE BOX ASSEMBLY PER JCSD STD. B-1. PAINT N.C. VALVE COVERS "RED".
4	A.S.A. 300 LB. SLIP-ON FLANGES.
5	8" DIA. MINIMUM CML & CMC PIPELINE (STANDARD WEIGHT)
6	8" DIA. 300 LB. BLIND FLANGE W/ 1-1/2" THREADED OUTLET
7	1-½"ø MODEL T-FP-600A-LF NIBCO LEAD-FREE BRASS BALL VALVE, FULL PORT, NPTxNPT; 300 PSI RATING OR APPROVED EQUAL. PROVIDE 1-½" NPTxHOSE THREAD BRASS ADAPTOR AND CAP
8	BLOW-OFF MANHOLE, FRAME & COVER PER DETAIL 2 HEREON



BLOW-OFF MANHOLE DETAIL 2/--

NOT TO SCALE

LOCATION:	BLOW OFF VALVE DETAILS	DESIGNED:
ADDRESS:	ALBERT A. WEBB ASSOCIATES — ENGINEERING CONSULTANTS, 3788 McCRAY STREET, RIVERSIDE CA. 92506, PH. (951) 686-1070, FAX (951) 788-1256	CHECKED:
		DATE:
		SCALE: N.T.S.

Section 8 Connection Upstream of Cherry Valley Pump Station

8.1 Bypass Alignment Development and Assessment

SGPWA is in a unique position to partner with Danny Thomas Ranch Park to provide a recharge basin within the Park's proposed water feature. A portion of the EBX Pipeline (54-inch diameter) upstream of the Cherry Valley Pump Station runs through the Park's property providing SGPWA a possible location for a pipeline outlet to connect the EBX to the proposed Project, therefore bypassing the Cherry Valley Pump Station (CVPS). This conceptual bypass alignment (Figure 8-1) is incorporated into the recommended Alternative A Alignment (see Figure 5-2).

Beginning at the connection point to the existing EBX Pipeline with a proposed 48-inch diameter outlet[1] (Figure 8-2) within a parcel owned by Riverside County, the alignment heads southerly and easterly, then southerly within various parcels owned by Riverside County along an existing driveway, easterly along Cherry Valley Boulevard and connecting to the proposed Project pipeline at Noble Street. For a description of the remaining portion of the Bypass Pipeline Alternative Alignment, refer to Alternative A Alignment described in Section 5 of this report.

The Bypass Pipeline Alternative consists of the following pipeline reaches (Figure 8-1):

- Reach 5A: 12,000 linear feet of 48-inch diameter waterline
- Reach 5B: 2,800 linear feet of 36-inch diameter waterline
- Reach 1: 12,900 linear feet of 36-inch diameter waterline
- Reach 2: 21,200 linear feet of 30-inch diameter waterline
- Reach 3: 13,300 linear feet of 24-inch diameter waterline
- Reach 3A: 3,000 linear feet of 24-inch diameter waterline
- Reach 4A: 23,500 linear feet of 24-inch diameter waterline
- Total length of the Bypass Pipeline Alternative Alignment: 88,700 linear feet

SGPWA should coordinate the proposed project improvements that are located on properties owned by Riverside County with consideration of the future Danny Thomas Ranch Park. The Reach 5 (Bypass Pipeline) portion within Cherry Valley Boulevard has minimal impact to residential uses; however, it has elevated impact to businesses. Impact from the Project pipeline installation to Beaumont High School along Cherry Valley Boulevard is considered high. For a description of the remaining portion of the Bypass Pipeline Alternative Alignment, refer to Alternative A Alignment described in Section 5 of this report.

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[1] Due to potential high velocities (approximately 16 fps or greater) through the existing 20-inch diameter outlet, the existing 20-inch outlet cannot be used for this application. A proposed 48-inch diameter outlet provides for recommended velocities range of 4 fps to 5 fps.

8.2 Hydraulic Analysis and Pipe Sizing

The flow rates summarized in Section 6 of this report are applied to the CVPS Bypass Alternative Alignment. For the pipeline design criteria, refer to Section 6 of this report. Table 8-1 summarizes the minimum flow rates to be conveyed to each groundwater recharge basin through the bypass pipeline.

Table 8-1 – Minimum Groundwater Basin Recharge Rates

Groundwater Recharge Basin	Annual Recharge (AFY)
Noble Creek Basins (existing)	16,050
Proposed Smith Creek Basin at Atwell Development	2,500
Proposed Location 2 (Banning WWTP)	2,000
Proposed Location 3 (Robertson's Cabazon Plant)	4,300
Total Imported Recharge	**24,850**

AFY = acre feet per year
Source: October 2023 San Gorgonio Pass Backbone Pipeline Recharge Report, Provos & Pritchard, p.12 (Appendix A)
(1) 24,850 AFY equates to 34 cfs (cubic feet per second).

The available capacity of the existing 54-inch diameter EBX pipeline is 64 cfs (based on pipeline velocity of 4 fps). The Cherry Valley Pump Station capacity is 52 cfs. To maximize the potential conveyance capacity of the bypass pipeline during peak periods, a 48-inch diameter pipeline is recommended, which will provide a capacity of 50 cfs (4 fps pipeline velocity) to 63 fps (5 fps pipeline velocity). This size would only need to extend to the existing 24-inch diameter Beaumont Recharge Pipeline at the intersection of Beaumont Avenue and Cherry Valley Boulevard, after which would reduce to 36-inch diameter.

Proposed pipeline flow rates within each reach are based on the total flow rate minus the discharge amount at each recharge basin. The flow rates are based on the peak flow of 63 cfs with each discharge point prorated up to peak. Pipeline reach flow rates and proposed pipeline sizes presented in Figure 8-1 are summarized in the following Table 8-2. These are initial baseline rates for the purposes of groundwater recharge modeling and should not be considered the maximum pipeline conveyance capacity. Based on the pipeline sizing and a maximum of water velocity of 6 fps (feet per second) in the pipeline, the maximum pipeline capacity is approximately (a) 75 cfs (48-inch dia.), (b) 42 cfs (36-inch dia.), (c) 29 cfs (30-inch dia.), and (d) 18 cfs (24-inch dia.). A pipeline size of 54-inch diameter is needed to achieve 100 cfs conveyance capacity with 6 fps pipeline velocity.

Table 8-2 – Pipeline Flow Conveyance Rates

Pipeline Reaches	Pipeline Conveyance (cfs)	Pipe Diameter (inch)	Pipe Velocity (fps)
Reach 5 Pipeline(1)	63	48	5.0
Reach 1 Pipeline	22	36	3.1
Reach 2 Pipeline	15.8	30	3.2
Reach 3 Pipeline	15.8	24	5.0
Reach 4 Pipeline	10.7	24	3.4

cfs = cubic feet per second; fps = feet per second.
(1) Reach 5 is the Cherry Valley Pump Station Bypass conceptual pipeline.

8.3 Condensed Profile

A condensed profile as shown in Figure 8-3 was prepared for the recommended Alignment "A" based on available elevation data.[1] The ground surface elevations range from 1,850 ft. at Location 3, Robertson's Cabazon Plant to 2,880 ft. at the intersection of Lincoln Street and Bellflower Avenue. At the intersection of Lincoln Street and Bellflower Avenue the pipeline pressure is approximately 32 psi. The condensed profile indicates that the pipeline should be split into three pressure zones summarized as follows:

- The first pressure zone to be matching the grade at the connection to the existing 54-inch EBX Pipeline upstream of the Cherry Valley Pump Station of approximately 2,970 ft.
- The second pressure zone at approximately 2,560 ft., near the grade at 8th Street and Wilson Street.
- The third pressure zone at approximately 2,120 ft., near the grade at the proposed Location 2 (Recharge Basin at Banning WWTP).

Splitting the project into three pressure zones will also have the advantage of keeping the pipeline class at either 150 psi or 250 psi.

8.4 Turnout Connection to EBX Pipeline

The proposed method of connecting the Project to the existing 54-inch EBX Pipeline is to construct a new 48-diameter outlet along the EBX pipeline within the property of the future Danny Thomas Ranch Park. Based on the flow rate and pressure drop[2] a 36-inch diameter flow control Cla-Val[3] valve with 36-inch diameter flow meter is recommended. The location for the proposed turnout includes the minimum site area of 25 ft. x 70 ft. The flow control valve and flow meter are

[1] Elevation and topography data was sourced from Infraworks 2021, OpenStreetMap, Open Database License.

[2] Pressure drop through the proposed 48-inch diameter outlet and turnout is approximately 9-feet.

[3] Maximum capacity of 36-inch diameter Cla-Val is 33,500 gpm (75 cfs) to 50,000 gpm (111 cfs). Additional evaluation can be conducted for pipeline and storage capacity for the future Brookside West recharge basin.

proposed to be located within underground vaults to minimize visual impact to the public with the control panel and communications antenna above ground.

Refer to Section 6 regarding pressure reducing station details and configuration which would be a similar configuration for flow control. Two preliminary locations for the proposed PRS's were selected as summarized in the following Table 8-3.

Table 8-3 – Pressure Reducing Station Locations for CVPS Bypass Alternative Alignment

Pressure Reducing Station	Location
PRS No. 1	8th Street and Wilson Street
PRS No. 2	Proposed Recharge Location 2 (Banning WWTP)

8.5 Jurisdictions and Permits

The public agencies in the project area[1] includes:

- City of Beaumont
- County of Riverside
- Beaumont Cherry Valley Water District
- RCFC&WCD

Typical utilities include:

- Water
- Sewer
- Recycled Water
- Gas Transmission and Distribution
- Electrical Transmission and Distribution
- Communications and Fiber Optics
- Channels and Storm Drain Culverts

There are a number of permits required, most notably are the following:

- City of Beaumont – Encroachment Permit for use of public right-of-way
- County of Riverside – Encroachment Permit for use of public right-of-way
- DDW – Permit for major water transmission pipeline

8.6 Easements

The Reach 5 portion of the CVPS Bypass Alternative Alignment will require acquisition of easements on private property, particularly at the connection to the existing 54-inch EBX pipeline and the beginning of Reach 5. Much of the beginning of Reach 5 is located on property owned by Riverside Country, therefore temporary construction easements and permanent easements are required to construct and maintain this portion of the project.

[1] For the CVPS Bypass Alternative, Reach 5 portion only, for the remaining portion, refer to Section 5, Alternative A Alignment.

8.7 Pump Station Expansion Alternative

As an alternative to constructing the CVPS Bypass, WEBB performed a cursory review of an expansion of the CVPS. The capacity expansion was assumed to be an additional 5,400 gpm (12 cfs) which would require approximately 120-horsepower. Based on the current ENR Index, an estimated planning unit price per horsepower of $18,000 was applied, thus bringing the cost for the additional capacity to an estimated $4.5 million.[1]

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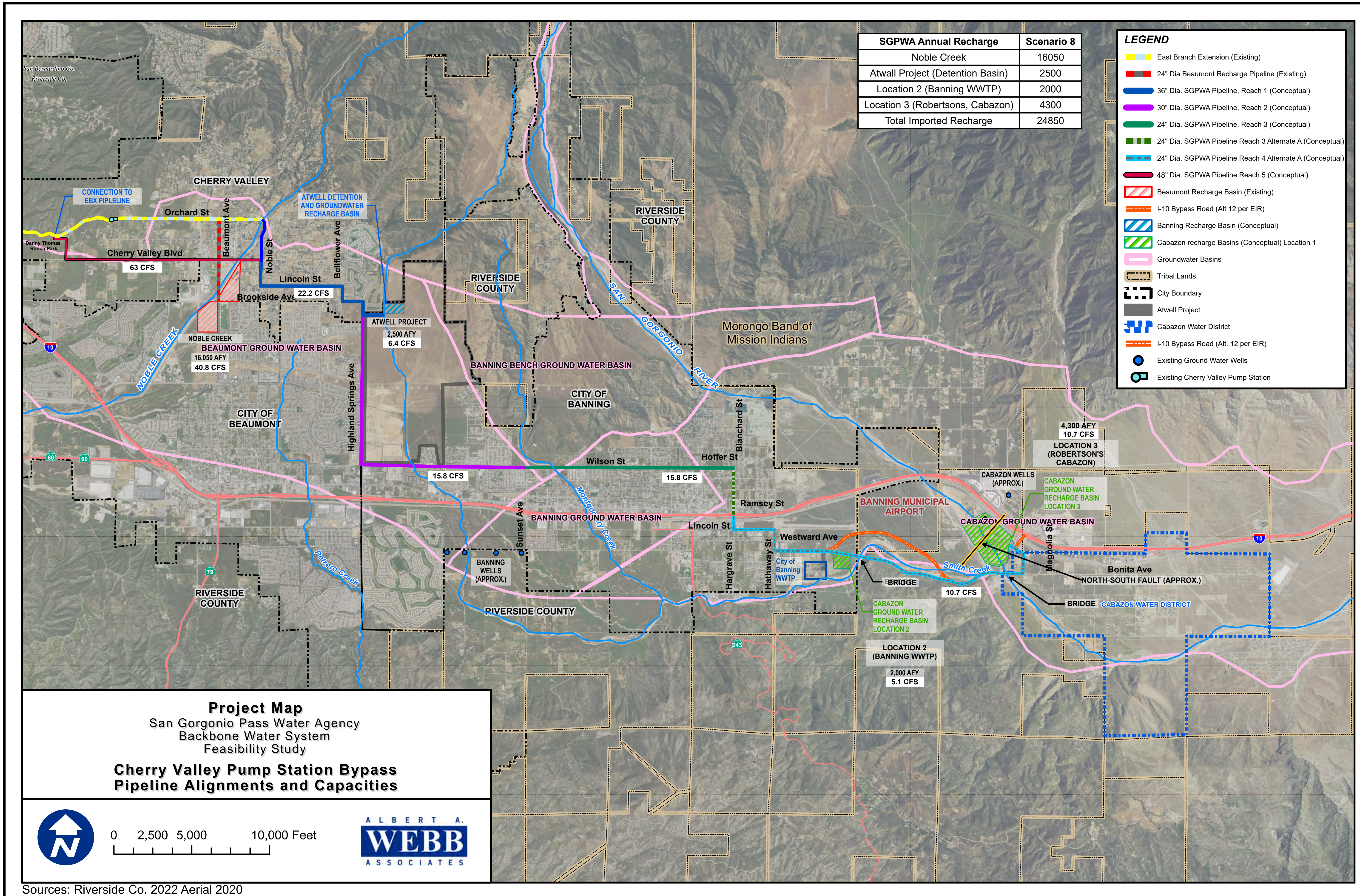
[1] July 2023 Engineering News Record (ENR) Los Angeles Cost Index (ENR =15,146.62). The project costs were determined by using a 1.4 multiplier on the construction cost estimates in order to include construction costs; construction contingencies; design engineering including plans and specifications; environmental design and construction surveying; geotechnical services; contract administration; field inspection; etc. Escalation and costs associated with right-of-way and/or land acquisition are excluded. The cost estimates are considered Class 3 (Budget Level) per the AACE (Association for Advancement of Cost Engineering) and therefore the range around the estimates is approximately minus 15% on the low end to plus 20% on the high end. This evaluation does not include feasibility review, property cost, and emergency standby generator sizing, electrical and service upgrade.

FIGURE 8-1



H:\2022\22-0025\GIS\CV BPS Pypass Pipe Capacities.aprx Map created 04 May 2023

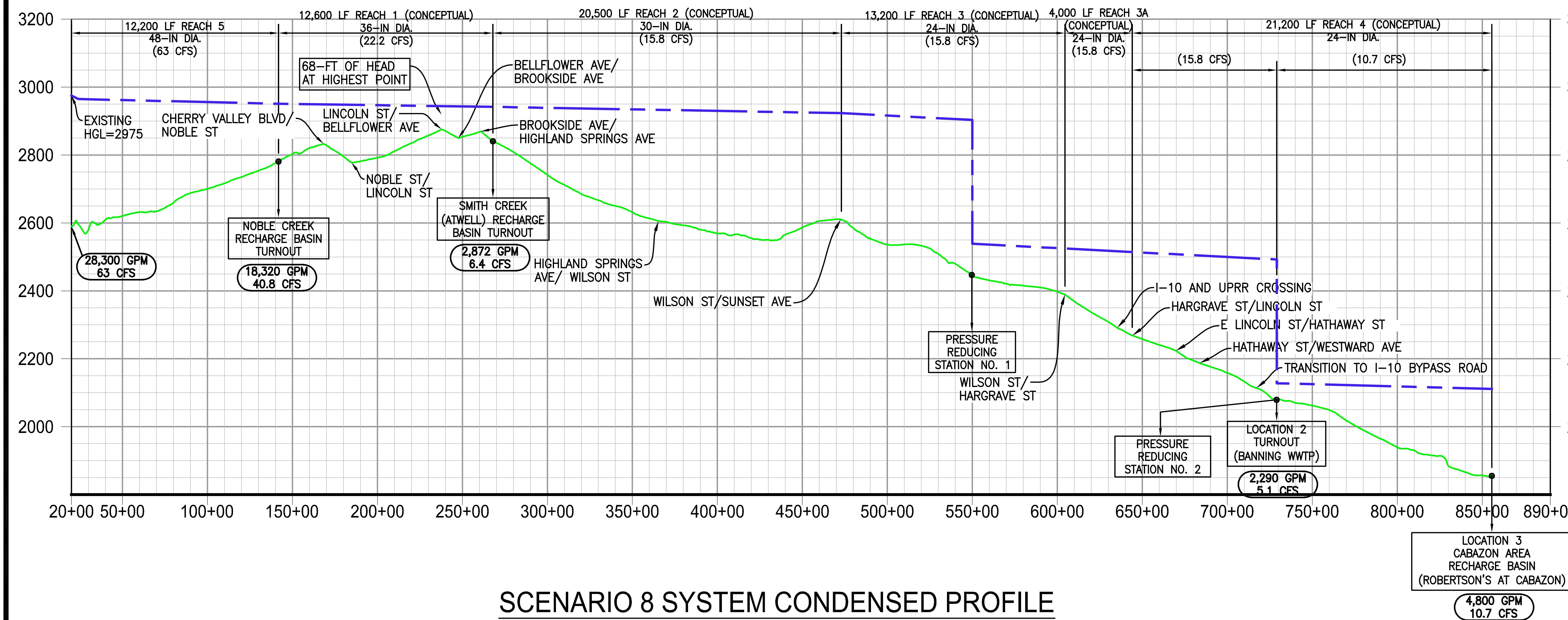
FIGURE 8-2

ALBERT A. WEBB ASSOCIATES

SAN GORGONIO PASS WATER AGENCY
BACKBONE WATER SYSTEM FEASIBILITY STUDY
CHERRY VALLEY PUMP STATION BYPASS
W.O. No.: 2022-0025

H:\2022\22-0025\Drawings PDF\Fig 8-2 CVPS Bypass Conn.pdf

FIGURE 8-3



SCENARIO 8 SYSTEM CONDENSED PROFILE

NOT TO SCALE

LEGEND:

- HYDRAULIC GRADE LINE
- EXISTING GRADE
- BOOSTER PUMP STATION

SAN GORGONIO PASS WATER AGENCY

BACKBONE WATER SYSTEM FEASIBILITY STUDY

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Section 9 CEQA Compliance

The California Environmental Quality Act (CEQA) (Public Resources Code 21000-21189) and the CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387) is a statewide environmental law enacted in 1970. CEQA generally requires government agencies to consider the environmental consequences of their discretionary actions[1] before committing to a project.

Based on the Project information described herein, Webb expects the Project will not have significant and unavoidable environmental impacts that could not be mitigated sufficiently to less than significant. Therefore, an Initial Study and Mitigated Negative Declaration (IS/MND) could provide the appropriate level of analysis of the Project's potential environmental impacts. Because the Project consists of new infrastructure, including a pipeline greater than one mile in length, there are no categorical or statutory classes of CEQA exemptions applicable to the Project as proposed. To support the analysis in an IS/MND, it is recommended that the Agency have technical studies prepared, including for example, cultural and paleontological resources assessments, biological habitat assessments and plant/animal species surveys, and air quality/greenhouse gas emissions modeling. Please refer to the environmental constraints technical memorandum located in Appendix E. Additionally, SGPWA would have to initiate and complete the AB 52 Tribal Consultation process for government-to-government consultation between the Agency and any Tribe's that requested consultation per Public Resources Code section 21080.3.1(b) regarding the Project and potential impacts to tribal cultural resources. An IS/MND includes a 30-day public comment period; however, if a clean water or drinking water State Revolving Fund grant is pursued, then the State Water Board has a 35-day public comment period. In the event Project impacts cannot be mitigated to less than significant, then an Environmental Impact Report (EIR) is needed.

However, pending approval by DWR, the Project may be eligible for the CEQA suspension in Executive Order N-7-22, Action 13, which states:

> *With respect to recharge projects under either Flood-Managed Aquifer Recharge or the Department of Water Resources Sustainable Groundwater Management Grant Program occurring on open and working lands[2] to replenish and store water in groundwater basins that will help mitigate groundwater conditions impacted by drought,[3] for any (a) actions taken by state agencies, (b) actions taken by a local agency where the Department of Water Resources concurs that local action is*

[1] §15357: "Discretionary actions" means a project which requires the exercise of judgment or deliberation when the public agency decides to approve or disapprove a particular activity, as distinguished from "ministerial actions" where the public agency merely has to determine whether there has been conformity with applicable fixed standards (i.e., statues, ordinances, or regulations) and no personal judgment is involved by the public official as to the wisdom or manner of carrying out the project.

[2] "Open lands" include those lands that are native or largely undeveloped from agricultural or industrial practices. Open lands can include flood bypasses, natural areas, wildlife preserves, or existing managed wetlands. "Working lands" include those lands that were developed for agricultural or other industrial practices. Working lands can include active or fallowed agricultural lands, gravel and sand operations, open storage fields, or other similar working landscapes.

[3] To "mitigate groundwater conditions impacted by drought," projects should include the replenishment of groundwater resources to the subsurface, for the purpose of storage, temporary or otherwise. Drought impacts to groundwater conditions would include lowering of groundwater levels that may have occurred due to lack of sufficient natural recharge, with a particular emphasis on impacts to shallow aquifers. For projects to be eligible for the CEQA suspension, they must be initiated while the Executive Order Action 13 is still in effect, and project applicants must submit the Self-Certification Form.

required, and (c) permits necessary to carry out actions under (a) or (b), Public Resources Code, Division 13 (commencing with section 21000) and regulations adopted pursuant to that Division are hereby suspended to the extent necessary to address the impacts of the drought. The entities implementing these directives shall maintain on their websites a list of all activities or approvals for which these provisions are suspended.

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Section 10 Cost Estimate

Construction and project costs are provided herein for three proposed groundwater recharge basins (Smith Creek Basin, Location 2 [Banning WWTP], and Location 3 [Robertson's Cabazon Plant]) as well as the Alternative A pipeline alignment, CVPS Bypass Alternative, and proposed pressure reducing stations. The construction and project costs have been adjusted based on the July 2023 Engineering News Record (ENR) Los Angeles Cost Index (ENR = 15,146.62).

The project costs were determined by using a 1.4 multiplier (rounded to the nearest $10,000) on the construction cost estimates in order to include construction costs; construction contingencies; design engineering including plans and specifications; environmental; design and construction surveying; geotechnical services; contract administration; field inspection; etc. Escalation and costs associated with right-of-way and/or land acquisition are excluded. The cost estimates are considered Class 3 (Budget Level) per the Association for Advancement of Cost Engineering (AACE) and therefore the range around the estimates is approximately minus 15% on the low end to plus 20% on the high end.

Property acquisition for various Project facilities such as recharge basins, pressure reducing stations, turnouts, and pipeline easements were not included in the cost evaluations.

10.1 Groundwater Recharge Basins

This cost estimate includes mobilization and demobilization, clearing, over-excavation and recompaction, grading and earthwork, spillways and outlet structures, onsite and offsite piping and valves, energy dissipators, and driveways.

10.1.1 Smith Creek Basin at Atwell Development

Basin Sizing assured a 25-acre site for 66 AF of storage volume. Table 10-1 presents the construction and Project cost estimates for the proposed Groundwater Recharge Basin at Smith Creek Basin within the Atwell Development.

Table 10-1 – Cost Estimates of Groundwater Recharge Basin at Smith Creek Basin (Atwell Development)

Item No.	Item Description	Estimated Construction Cost(1)
1	Mobilization, Clearing, Miscellaneous, SWPPP	$200,000
2	Over excavation and Recompaction (80,000 CY)	$2,400,000
3	Excavation and Grading (100,000 CY)	$1,500,000
4	Spillways, RCPs, Outlet Structures, Rip Rap	$230,000
5	Driveway, Stairs, Catch Basins, Manholes, Splash wall	$100,000
6	PVC Pipe (12" to 24"), Inlet structures, Valves, Meters	$600,000
7	20-percent contingency	$1,010,000
	Total Estimated Construction Cost	**$6,040,000**
	Total Estimated Project Cost	**$8,460,000**

SWPPP = Storm Water Pollution Prevention Plan; RCP = reinforced concrete pipe; CY = cubic yards
(1) Rounded to the nearest $1,000.

10.1.2 Recharge Location 2 (Banning WWTP)

Basin sizing assumed a 25-acre site for a 66 AF storage volume. Table 10-2 presents the construction and project cost estimates for the proposed Groundwater Recharge Basin near Banning Wastewater Treatment Plant.

Table 10-2 – Cost Estimates of Groundwater Recharge Basin at Location 2 (Banning WWTP)

Item No.	Item Description	Estimated Construction Cost(1)
1	Mobilization, Clearing, Miscellaneous, SWPPP	$200,000
2	Over excavation and Recompaction (80,000 CY)	$2,400,000
3	Excavation and Grading (100,000 CY)	$1,500,000
4	Spillways, RCPs Outlet Structures, Rip Rap	$230,000
5	Driveway, Stairs, Catch Basins, Manholes, Splash wall	$100,000
6	PVC Pipe (12” to 24”), Inlet structures, Valves, Meters	$600,000
7	20-percent contingency	$1,010,000
	Total Estimated Construction Cost	**$6,040,000**
	Total Estimated Project Cost	**$8,460,000**

SWPPP = Storm Water Pollution Prevention Plan; RCP = reinforced concrete pipe; CY = cubic yards
(1) Rounded to the nearest $1,000.

10.1.3 Recharge Location 3 (Robertson’s Cabazon Plant)

Basin sizing assumed a 50-acre site for 132 AF storage volume. Table 10-3 presents the construction and project cost estimates for the proposed Groundwater Recharge Basin at Robertsons Ready Mix Cabazon Mine.

Table 10-3 – Cost Estimates Groundwater Recharge Basin at Location 3 (Robertson’s Cabazon Mine)

Item No.	Item Description	Estimated Construction Cost(1)
1	Mobilization, Clearing, Miscellaneous, SWPPP	$350,000
2	Earthwork and Grading(2)	$750,000
3	Spillways, RCPs, Outlet Structures, Rip Rap	$450,000
4	Driveway, Stairs, Catch Basins, Manholes, Splash wall	$200,000
5	PVC Pipe (12” to 24”), Inlet structures, Valves, Meters	$1,300,000
6	20-percent contingency	$610,000
	Total Estimated Construction Cost	**$3,660,000**
	Total Estimated Project Cost	**$5,120,000**

SWPPP = Stormwater Pollution Prevention Plan; RCP = reinforced concrete pipe
(1) Rounded to the nearest $1,000.
(2) Site is already excavated this cost is for miscellaneous earthwork and grading.

10.2 Pipeline

10.2.1 Alternative A Alignment

This cost estimate includes all pipeline related work: mobilization and demobilization; construction and installation of 36-inch diameter, 30-inch diameter, and 24-inch diameter CML/CMC (cement mortar lined/cement mortar coated) water pipeline and appurtenances; connections to existing pipeline facilities; various jack and bores and casing pipes when crossing Caltrans, channels, and UPRR rights-of-way; all valves, appurtenances, and facilities; traffic control; and site and pavement restoration. Table 10-4 presents the construction and project cost estimates for the proposed Alternative A Alignment pipeline.

Table 10-4 - Cost Estimates of Alternative A Alignment

Item No.	Item Description	Estimated Construction Cost(1)
1	36-inch steel CML/C including fittings (15,500 LF) (2)	$10,462,500
2	30-inch steel CML/C including fittings (21,200 LF) (2)	$12,720,000
3	24-inch steel CML/C including fittings (39,800 LF) (2)	$20,895,000
4	Jacking and boring with steel casing for UPRR	$750,000
5	Steel casing pipe for Caltrans	$500,000
6	Smith Creek Channel Crossings for Reach 4A	$3,000,000
7	Traffic Control	$600,000
8	Pavement Restoration	$10,400,000
9	20-percent contingency	$11,870,000
	Total Estimated Construction Cost	**$71,197,500**
	Total Estimated Project Cost	**$99,680,000**

CML/C = CML/CMC = cement mortar lined / cement mortar coated; UPRR = Union Pacific Railroad;
(1) Rounded to the nearest $1,000.
(2) Includes valves, fittings, and appurtenances.

10.2.2 CVPS Bypass Alternative Alignment Reach

This cost estimate includes all pipeline related work: mobilization and demobilization; construction and installation of 48-inch diameter CML/CMC water pipeline and appurtenances; connections to existing pipeline facilities; turnout facility; all valves, appurtenances, and facilities; traffic control; and site and pavement restoration. Table 10-5 presents the construction and project cost estimates for the proposed Reach 5 portion only of the CVPS Bypass Alternative Alignment pipeline, including the connection and turnout to the existing EBX pipeline.

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Table 10-5 – Cost Estimates of Bypass Pipeline Alternative Reach 5 Portion

Item No.	Item Description	Estimated Construction Cost(1)
1	48-inch steel CML/C including fittings (12,000 LF)(2)	$10,800,000
2	36-inch steel CML/C including fittings (2,800 LF)(2)(3)	$1,890,000
3	Construct 48-inch outlet to existing 54-inch EBX(4)	$250,000
4	Flow Control, Metering, Turnout Facility(5)	$750,000
5	Traffic Control	$150,000
6	Trench and Pavement Restoration	$900,000
7	Grind and Cap Pavement	$1,100,000
8	20-percent contingency	$3,170,000
	Total Estimated Construction Cost	**$19,010,000**
	Total Estimated Project Cost	**$26,610,000**

CML/C = cement mortar lined/cement mortar coated; EBX = East Branch Extension;
(1) Rounded to the nearest $1,000.
(2) Includes valves, fittings and appurtenances.
(3) This portion of the Bypass Pipeline could be upsized to 48-inch diameter and cost would be adjusted. However, this evaluation should be performed with the potential of upsizing the entire Backbone Pipeline all the way to Cabazon Water District.
(4) Upgrade to the existing 20-inch diameter nozzle per Department of Water Resources standards.
(5) Turnout facility per Department of Water Resources standards.

10.3 Pressure Regulating Facilities

This cost estimate includes all onsite and offsite related work: mobilization and demobilization; construction and installation of below and above grade piping and valves; Cla-Val valve and flow meter; electrical service, control, and SCADA; offsite pipelines and connections to the mainline pipe facilities; traffic control; and onsite and offsite pavement improvements and restoration. Table 10-6 presents the construction and project cost estimates for the proposed Pressure Reducing Station (PRS) No. 1 and 2.

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Table 10-6 – Cost Estimates Pressure Reducing Stations

Item No.	Item Description	Estimated Construction Cost(1)
1	16-inch steel CML/C and connections to mainline pipe(2)	$400,000
2	Cla-Val, valves, meter, fittings, pipe, vaults for PRS No. 1	$170,000
3	Cla-Val, valves, meter, fittings, pipe, vaults for PRS No. 2	$170,000
4	Electrical, controls, SCE service, SCADA for PRS No. 1	$80,000
5	Electrical, controls, SCE service, SCADA for PRS No. 2	$80,000
6	Traffic Control, trench, backfill, paving, site improvements	$100,000
7	Testing, integration, startup	$80,000
8	20-percent contingency	$220,000
	Total Estimated Construction Cost	**$1,300,000**
	Total Estimated Project Cost	**$1,820,000**

CML/C = cement mortar lined/cement mortar coated; PRS = pressure reducing station; SCE = Southern California Edison

(1) Rounded to the nearest $1,000.

(2) Includes valves, fittings, and appurtenances.

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Section 11 Recommended Project

11.1 Recommended Project

A summary of the Recommended Project is a follows:

11.1.1 Backbone Pipeline

The Backbone Pipeline will be a 36-inch, 30-inch, and 24-inch diameter welded steel transmission pipeline and will be constructed in four phases from west to east. Phase 1 (36-inch diameter) will be from the intersection of Orchard Street and Noble Street to approximately 1,000-feet south of the intersection of Brookside Avenue and Highland Springs Avenue. Phase 2 (30-inch diameter) will be from the end of Phase 1 to the intersection of Wilson Street and Sunset Avenue. Phase 3 (24-inch diameter) will be from the end of Phase 2 to the east of the City of Banning's WWTP at the end of Charles Street. Phase 4 (24-inch diameter) will be from the end of Phase 3 to the Robertson's Ready Mix Cabazon Mine at Apache Trail. The estimated total length of Backbone Pipeline is 76,500 linear feet.

11.1.2 Terminus Reservoir

A terminus storage reservoir is recommended to facilitate delivering water if the Backbone Pipeline is selected for construction. The recommended location of the terminus reservoir is north of the intersection of Orchard Street and Noble Street where the elevation would allow the system to maintain the proper pumping head conditions of 3,100 feet. Further evaluation is recommended to better define this project such as, hydraulic review for reservoir sizing, site and property location evaluation, pipeline lateral alignment, separate environmental review, and project cost analysis.

The proposed terminus reservoir may not be required when implementing the Bypass Pipeline which consists of the turnout connection to State Water Project East Branch Extension Pipeline and a pipeline bypassing the Cherry Valley Pump Station. Therefore, due to the various unknows as well as uncertain use, the terminus reservoir may be deferred or removed from the project.

11.1.3 Pressure Reducing Stations

Two pressure reducing stations are proposed to adjust the pressures within the pipeline to normal operational pressures. The pressure reducing stations are anticipated to split the hydraulic gradient and lower the pressure of the pipeline at lower elevations east of Sunset Avenue and Wilson Street and east Hathaway Street and Lincoln Street.

11.1.4 Groundwater Recharge Basins

Three groundwater recharge basins are proposed to allow SGPWA to deliver State Water Project Water to their service area and allow their stakeholders store the water for future use. The first groundwater recharge basin is proposed to be located east of the intersection of Brookside Avenue and Highland Springs Avenue within the Smith Creek Detention Basin (to be converted to recharge facility) within the Atwell Development with an approximate area of 25 acres. The second groundwater recharge basin is proposed to be located along either Charles Street or Westward Avenue, east of the City of Banning Wastewater Treatment Plant (WWTP) with an approximate area of 25 acres. The third groundwater recharge basin is proposed to be located west of Apache Trail, north of Pipeline Road within the Robertson's Ready Mix, Cabazon Mine with an approximate area of 50 acres.

11.1.5 Cherry Valley Pump Station Bypass Pipeline

The Cherry Valley Pump Station Bypass Pipeline will be a 48-inch and 36-inch diameter welded steel transmission pipeline and will be constructed in as a separate phase from the Backbone Pipeline project. The portion sized as 48-inch diameter will be from the Danny Thomas Ranch Park (north of Cherry Valley Boulevard) to the intersection of Cherry Valley Boulevard and Beaumont Avenue and is proposed to connection to the existing 24-inch diameter Beaumont Recharge Pipeline at the intersection of Cherry Valley Boulevard and Beaumont Avenue. The portion sized as 36-inch diameter will be from the intersection of Cherry Valley Boulevard and Beaumont Avenue to the intersection of Cherry Valley Boulevard and Noble Street and it proposed to connect to the proposed Backbone Pipeline. The estimated total length of Cherry Valley Pump Station Bypass Pipeline is 14,800 linear feet. Coordination with DWR will be required regarding the connection to the existing 54-inch diameter EBX pipeline.

As an option, SGPWA may consider upgrading the Cherry Valley Pump Station, however the evaluation herein this report does not include review for feasibility, property availability or costs, electrical service upgrade, or standby generator. Further as the CVPS Bypass Pipeline could convey water bypassing the CVPS thus providing saving on pumping cost, a present worth analysis should be conducted as part of this evaluation.

11.2 Project Phasing

Due to the complexity and cost, the project's implementation was phased in order to maximize investments made by SGPWA. The phases have been developed to give flexibility to SGPWA to fund and construct the facilities in a way that addresses their greatest needs. A conceptual schedule has been developed and included as Figure 11-1 showing the current plan for how the project will be implemented over the next 10 years. The timing and sequencing may change over time due to changing water availability and demands, funding availability, or other circumstances. The phases are described below:

11.2.1 Phase 1

Phase 1 consists of approximately 12,900 LF of 36-inch diameter steel pipeline from the intersection of Orchard Street and Noble Street (connection point to the existing East Branch Extension) to approximately 1,000-feet south of the intersection of Brookside Avenue and Highland Springs Avenue (Reach 1, Alternative Alignment A, Figure 6-1). This will require approximately 2,000 LF of 24-inch diameter lateral connection to the Smith Creek Detention Basin within the Atwell Development (Figure 6-1). Phase 1 also consists of the construction of the conversion of the Smith Creek Detention for use as a groundwater recharge basin. The construction of this phase allows for the conveyance of water and recharge within the recharge basin.

11.2.2 Phase 2 (Bypass Pipeline)

Phase 2 consists of approximately 12,000 LF of 48-inch steel pipeline and 2,800 LF of 36-inch steel pipeline from the future Danny Thomas Ranch Park, north of Cherry Valley Boulevard to connect to the proposed Backbone Project pipeline at Noble Street (Reach 5, Bypass Pipeline Alignment, Figure 8-1). Phase 2 also consists of upsizing to a 48-inch nozzle and constructing the Turnout Connection to the existing 54-inch diameter East Branch Extension Pipeline, bypassing the Cherry Valley Pump Station (Figure 8-2). The construction of this phase allows for the potential greater conveyance deliveries further westerly within SGPWA's service area.

11.2.3 Phase 3

Phase 3 consists of approximately 21,200 LF of 30-inch steel pipeline from the end of Phase 1 to the intersection of Wilson Street and Sunset Avenue. (Reach 2, Alternative Alignment A, Figure 6-1). Phase 3 also consists of the construction of PRS No. 1 at the intersection of Wilson Street and Sunset Avenue (Figure 6-1 and 6-4). The construction of this phase allows for the conveyance of water further westerly within SGPWA's service area.

11.2.4 Phase 4

Phase 4 consists of approximately 25,800 LF of 24-inch diameter steel pipeline from the end of Phase 3 to the intersection of Lincoln Street and Hargrave Street. (Reach 3 and a portion of Reach 4, Alternative Alignment A, Figure 6-1). Phase 4 also consists of the construction of PRS No. 2 at the intersection of Lincoln Street and Hathaway Street (Figure 6-1 and 6-5) and the construction of the Cabazon Groundwater Recharge Basin Location 2 near the City of Banning Wastewater Treatment Plant (WWTP). The construction of this phase allows for the conveyance of water further westerly within SGPWA's service area as well as recharge within the recharge basin for the Cabazon Groundwater Basin.

11.2.5 Phase 5

Phase 5 consists of approximately 14,000 LF of 24-inch diameter steel pipeline from the end of Phase 4 to Apache Trail (remaining Reach 4, Alternative Alignment A, Figure 6-1). Phase 5 also consists of the construction of the Cabazon Groundwater Recharge Basin Location 3 at the Robertson's Ready Mix Cabazon Mine. The construction of this phase allows for the conveyance of water further westerly within SGPWA's service area as well as recharge within the recharge basin for the Cabazon Groundwater Basin.

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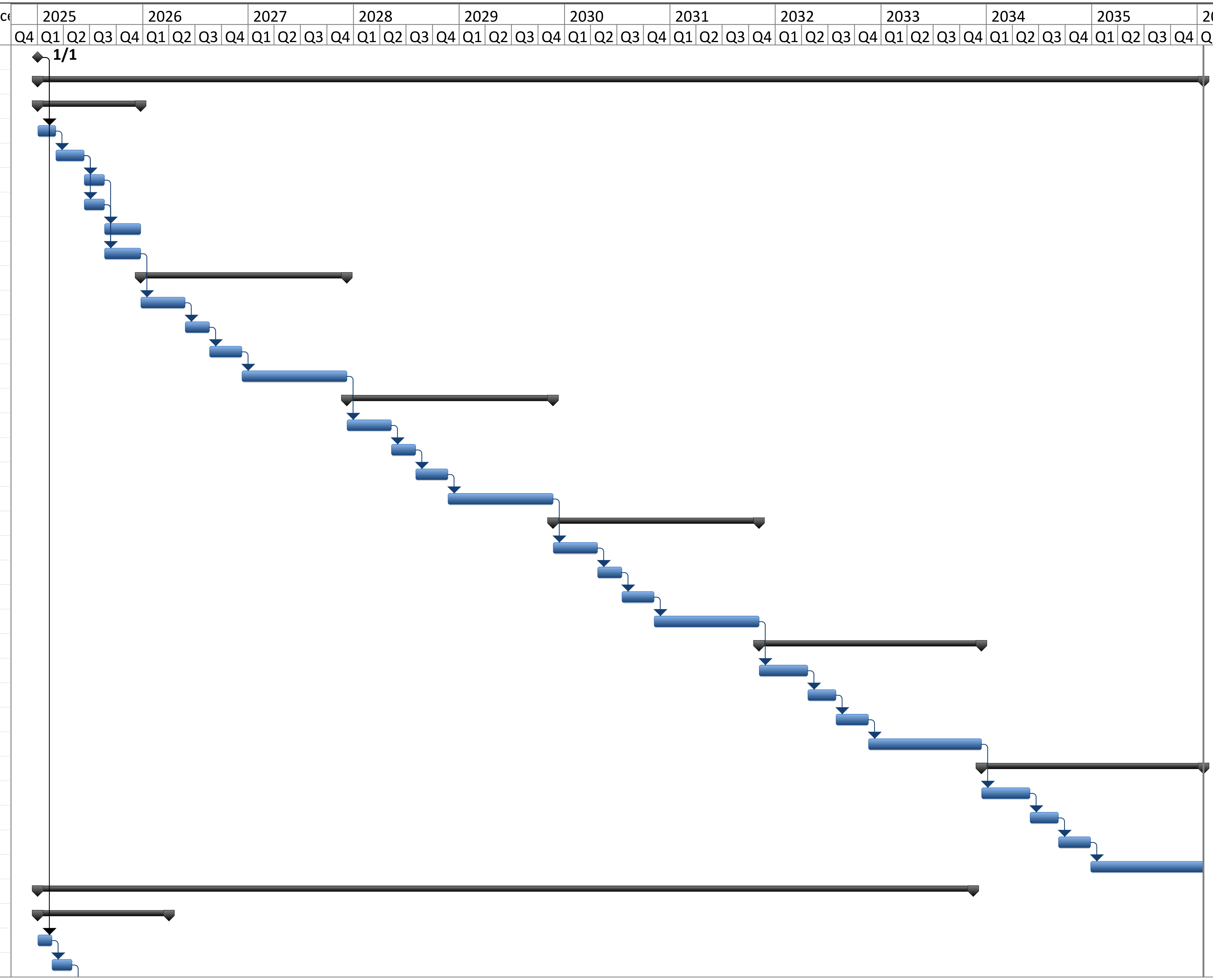
San Gorgonio Pass Water Agency
Backbone Facilities Project Schedule

FIGURE 11-1

ID	Task Name	Duration	Start	Finish	Predece
1	**Agency Authorization**	**0 days**	**1/1/25**	**1/1/25**	
2	**Backbone Pipeline and Pressure Stations**	**2885 days**	**1/1/25**	**1/22/36**	
3	**Preliminary Design Report**	**255 days**	**1/1/25**	**12/23/25**	
4	Site Topo Survey and Aerial Mapping	9 wks	1/1/25	3/4/25	1
5	Utilities Research	14 wks	3/5/25	6/10/25	4
6	Pothole	10 wks	6/11/25	8/19/25	5
7	Geotechnical and Corrosion Investigation	10 wks	6/11/25	8/19/25	5
8	Preliminary Design Report	18 wks	8/20/25	12/23/25	7
9	Environmental CEQA Process	18 wks	8/20/25	12/23/25	6,7
10	**Backbone Pipeline Phase 1**	**510 days**	**12/24/25**	**12/7/27**	
11	Design	22 wks	12/24/25	5/26/26	9
12	Permitting	12 wks	5/27/26	8/18/26	11
13	Bidding Award Contracts	16 wks	8/19/26	12/8/26	12
14	Construction	52 wks	12/9/26	12/7/27	13
15	**Backbone Pipeline Phase 2 (Bypass Pipeline)**	**510 days**	**12/8/27**	**11/20/29**	
16	Design	22 wks	12/8/27	5/9/28	14
17	Permitting	12 wks	5/10/28	8/1/28	16
18	Bidding Award Contracts	16 wks	8/2/28	11/21/28	17
19	Construction	52 wks	11/22/28	11/20/29	18
20	**Backbone Pipeline Phase 3**	**510 days**	**11/21/29**	**11/4/31**	
21	Design	22 wks	11/21/29	4/23/30	19
22	Permitting	12 wks	4/24/30	7/16/30	21
23	Bidding Award Contracts	16 wks	7/17/30	11/5/30	22
24	Construction	52 wks	11/6/30	11/4/31	23
25	**Backbone Pipeline Phase 4**	**550 days**	**11/5/31**	**12/13/33**	
26	Design	24 wks	11/5/31	4/20/32	24
27	Permitting	14 wks	4/21/32	7/27/32	26
28	Bidding Award Contracts	16 wks	7/28/32	11/16/32	27
29	Construction	56 wks	11/17/32	12/13/33	28
30	**Backbone Pipeline Phase 5**	**550 days**	**12/14/33**	**1/22/36**	
31	Design	24 wks	12/14/33	5/30/34	29
32	Permitting	14 wks	5/31/34	9/5/34	31
33	Bidding Award Contracts	16 wks	9/6/34	12/26/34	32
34	Construction	56 wks	12/27/34	1/22/36	33
35	**Ground Water Recharge Basins**	**2315 days**	**1/1/25**	**11/15/33**	
36	**Preliminary Design Report**	**325 days**	**1/1/25**	**3/31/26**	
37	Site Topo Survey and Aerial Mapping	7 wks	1/1/25	2/18/25	1
38	Utilities Research	10 wks	2/19/25	4/29/25	37

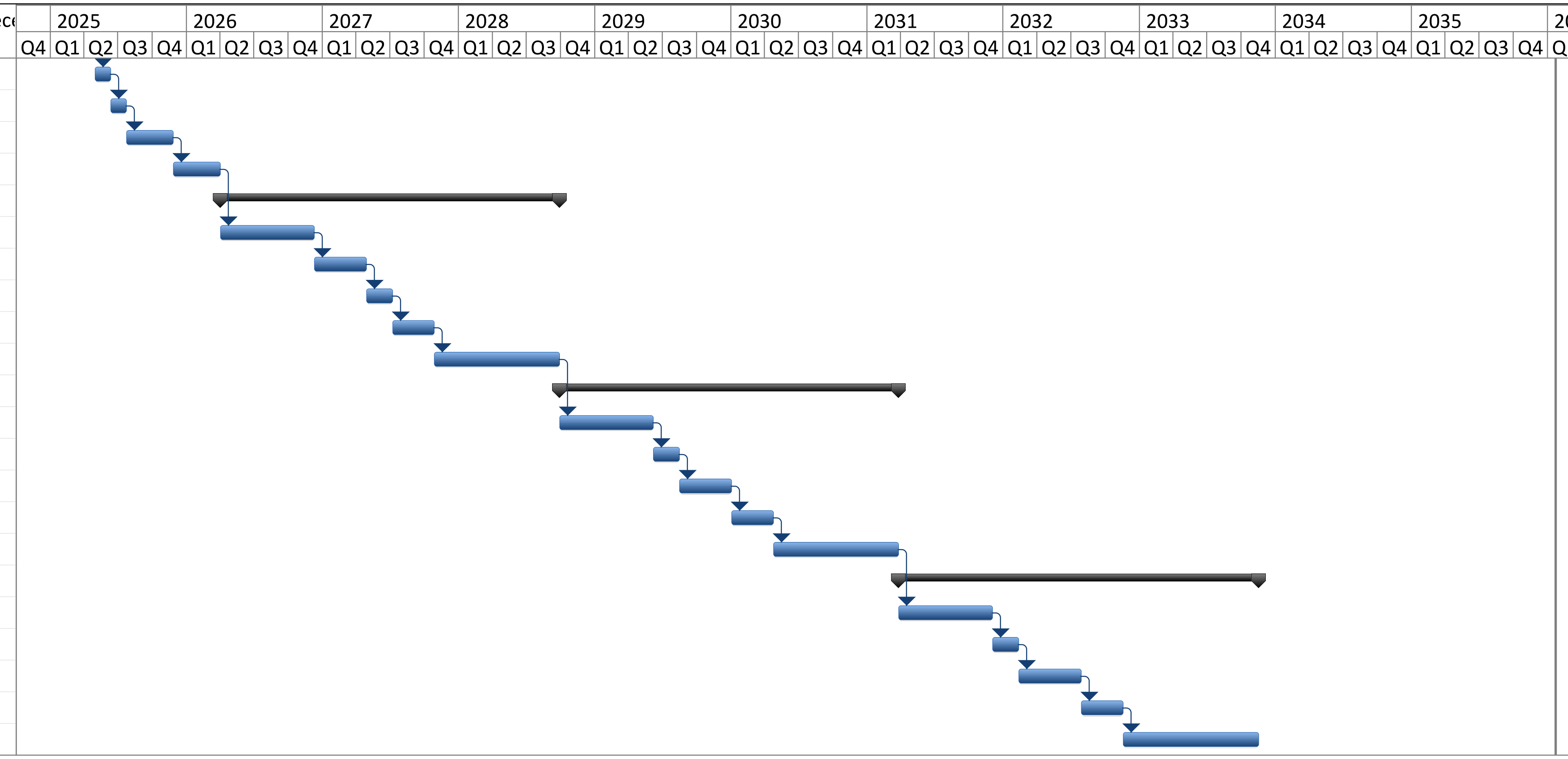


May 24, 2023

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

San Gorgonio Pass Water Agency
Backbone Facilities Project Schedule

ID	Task Name	Duration	Start	Finish	Predece
39	Pothole	6 wks	4/30/25	6/10/25	38
40	Geotechnical Investigation	6 wks	6/11/25	7/22/25	39
41	Preliminary Design Report	18 wks	7/23/25	11/25/25	40
42	Environmental CEQA Process	18 wks	11/26/25	3/31/26	41
43	**Recharge Basin Smith Creek at Atwell**	**650 days**	**4/1/26**	**9/26/28**	
44	Property Acquition	36 wks	4/1/26	12/8/26	42
45	Design	20 wks	12/9/26	4/27/27	44
46	Permitting	10 wks	4/28/27	7/6/27	45
47	Bidding Award Contracts	16 wks	7/7/27	10/26/27	46
48	Construction	48 wks	10/27/27	9/26/28	47
49	**Recharge Basin Banning WWTP Location 2**	**650 days**	**9/27/28**	**3/25/31**	
50	Property Acquition	36 wks	9/27/28	6/5/29	48
51	Permitting	10 wks	6/6/29	8/14/29	50
52	Design	20 wks	8/15/29	1/1/30	51
53	Bidding Award Contracts	16 wks	1/2/30	4/23/30	52
54	Construction	48 wks	4/24/30	3/25/31	53
55	**Recharge Basin Robertson's Ready Mix Loc 3**	**690 days**	**3/26/31**	**11/15/33**	
56	Property Acquition	36 wks	3/26/31	12/2/31	54
57	Permitting	10 wks	12/3/31	2/10/32	56
58	Design	24 wks	2/11/32	7/27/32	57
59	Bidding Award Contracts	16 wks	7/28/32	11/16/32	58
60	Construction	52 wks	11/17/32	11/15/33	59



May 24, 2023

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

Section 12 Next Steps

The following subjects are major items to be addressed as follow-up work for the project.

12.1 Participating Agencies

San Gorgonio Pass Water Agency should work with participating agencies (Figure 2-1) for project implementation, budgeting, and schedule:

- Banning Heights Mutual Water Company
- City of Banning Water Department
- Mission Springs Water District
- Beaumont Cherry Valley Water District
- Yucaipa Valley Water District
- Cabazon Water District
- High Valley Water District

12.2 Site Acquisition

San Gorgonia Pass Water Agency will need to acquire easements or properties within various parcels for the proposed project facilities.

12.2.1 Backbone Pipeline Easements along Reach 4A

12.2.2 Pressure Reducing Stations

- Pressure Reducing Station No.1
- Pressure Reducing Station No. 2

12.2.3 Groundwater Recharge Basins

- Recharge Bason at Smith Creek Detention Basin (Atwell Development)
- Recharge Basin Location 2 (City of Banning WWTP)
- Recharge Basin Location 3 (Robertson's Cabazon Mine)

12.2.4 Cherry Valley Pump Station Bypass Pipeline Easements

12.2.5 Cherry Valley Pump Station Bypass Turnout

12.3 Crossings and Alignment Permitting/ Right-of-Way

Coordination with Caltrans, the railroads, and the flood control district should be initiated as early as possible in the next phase of work. Project elements such as design, installation methods, and geotechnical reports will be required for permit application packages.

- Phase 1
  - Noble Creek Crossing – Riverside County
  - Noble Street – Riverside County Transportations
  - Lincoln Street – Riverside County Transportations
  - Bellflower Avenue – Riverside County Transportations
- Phase 2
  - Connection to East Branch Extension – Department of Water Resources
  - Cherry Valley Boulevard – Riverside County Transportations
  - Noble Creek Crossing – Riverside County
  - Noble Street – Riverside County Transportations
- Phase 3
  - Highland Springs Avenue – City of Beaumont (west side)
  - Highland Springs Avenue – City of Banning (east side)
  - Wilson Street – City of Banning, Riverside County Flood Control
- Phase 4
  - Wilson Street – City of Banning, Riverside County Flood Control
  - Hargrave Street – City of Banning
  - I-10 Crossing – Caltrans
  - Railroad Crossing – UPRR
  - Lincoln Street – City of Banning
- Phase 5
  - Hathaway Street – City of Banning
  - Westward Avenue – City of Banning
  - Pipeline Road – Riverside County Transportation
  - Apache Trail – Riverside County Transportation

12.4 Geotechnical Investigation

For the pipeline portion of the project, a comprehensive geotechnical investigation will need to be performed on the recommended alignment. Special analyses will be required at all freeway and railroad crossings to determine the feasibility of jack and bore methods or other similar types of trenchless construction. Investigation should also include presence of rock and paving thickness and determination of any groundwater.

For the groundwater recharge basins, the project geotechnical investigation should also include grading and overexcavation and compaction requirements.

12.5 Soil Corrosive Evaluation

A comprehensive soil corrosion evaluation of the proposed pipeline will need to be performed on the recommended alignment. Assessment of the soil corrosivity potential, stray current determination, and recommended corrosion protection facilities will be included in this evaluation. As some parts of the project will be near utilities such as gas transmission mains and fuel oil lines, additional evaluation is needed to determine the mitigation measures needed to address impressed currents in these facilities.

12.6 Survey

Perform site survey of the project alignment and facility sites to develop preliminary design.

12.7 Potholing and Utilities

Perform potholing of existing utilities to confirm preliminary corridor.

12.8 Preliminary Design Phase

Prior to final design, perform a preliminary design and summary report to confirm the details, location, and sizing of the project.

12.9 CEQA Process

When SGPWA determines that it has a well-defined Project in a Preliminary Design Report (PDR) and preliminary engineering plans, such that a finite project description can be prepared, the CEQA process can begin. The first step is typically getting the technical studies, primarily biological surveys and cultural/paleontological resources surveys underway. The recommended species surveys are listed in the environmental constraints report located in Appendix E. Assuming the Agency prepares an IS/MND, the CEQA process, including public review and response to public comments, takes about 12 –18 months.

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Section 13 References

ASA	September 2016. *I-10 Bypass Project: Banning to Cabazon Alternative Screening Analysis (ASA) Administrative Draft.* (Available at https://rcprojects.org/i10bypass)
GSP	January 2022. *San Gorgonio Pass Subbasin Groundwater Sustainability Plan*. Provost & Pritchard and INTERA. (Available at www.sgpgsas.org)
Intera 2023	April 2023, *Technical Memorandum: Groundwater Modeling Analysis of Potential Recharge Locations in the San Gorgonio Pass Subbasin*. INTERA, Inc.
Intera 2021	December 10, 2021. *San Gorgonio Pass Subbasin Numerical Models – Construction, Calibration, Predictive Modeling and Sensitivity/Uncertainty Analysis.* INTERA Inc. (located in Appendix D of the San Gorgonio Pass Groundwater Sustainability Plan).
P&P	October 2022. *San Gorgonio Pass Backbone Pipeline Recharge Report.* Provost & Pritchard.

Appendix A

San Gorgonio Pass Backbone Pipeline Recharge Report

Prepared by Provost & Pritchard Consulting Group, October 2022

ALBERT A. WEBB ASSOCIATES

San Gorgonio Pass Water Agency

San Gorgonio Pass Backbone Pipeline Recharge Report

Beaumont, CA
October 2022

Prepared for:
San Gorgonio Pass Water Agency
1210 Beaumont Ave
Beaumont, California 92223

Prepared by:
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Table of Contents

List of Figures

List of Tables

Abbreviations

AF .... acre-feet
BCVWD .... Beaumont-Cherry Valley Water District
cfs .... cubic feet per second
CWD .... Cabazon Water District
DWR .... Department of Water Resources
IRWMP .... Integrated Regional Water Management Plan
MBMI .... Morongo Band of Mission Indians
SGP GSP .... San Gorgonio Pass Groundwater Sustainability Plan
SGP .... San Gorgonio Pass
SGPWA .... San Gorgonio Pass Water Agency
UWMP .... Urban Water Management Plan
WSR .... Water Supply Reliability Study
WWTP .... Wastewater Treatment Plant

1 Introduction

The proposed San Gorgonio Pass Backbone Pipeline would provide additional distribution capacity for imported water (primarily from the State Water Project) to the San Gorgonio Pass Water Agency (SGPWA). The pipeline would distribute imported supplies from the current terminus of the California Aqueduct East Branch Extension at Noble Creek. The pipeline would distribute imported SGPWA to water users including the Beaumont-Cherry Valley Water District (BCVWD), the City of Banning, Cabazon Water District (CWD), and potentially the Morongo Band of Mission Indians (MBMI). In all cases, the imported water supply for these parties would be delivered to recharge basins to provide supplemental groundwater supply. The imported water would not be treated for direct deliveries.

The purpose of this report is to describe the assumptions used for sizing of the Backbone Pipeline, including identification of water supply needs, characterization of water supply availability, quantification of needed conveyance capacity, location and size of groundwater recharge facilities, and assumptions used for groundwater model simulations.

2 Water Demands

Four entities in SGPWA have existing or potential water supply needs for imported water from the proposed Backbone Pipeline. The water supply needs for these four entities – BCVWD, the City of Banning, CWD and MBMI – are described and quantified below.

2.1 Beaumont-Cherry Valley Water District

BCVWD provides supply for the City of Beaumont and nearby semi-rural communities. BCVWD provides water to its customers from groundwater pumping that is based on a combination of local surface water runoff, imported surface water, and groundwater reuse. The amount of groundwater pumping is managed by a watermaster in the adjudicated Beaumont Groundwater Basin. Estimates of current and projected water supplies and demands for BCVWD were taken from their 2020 Urban Water Management Plan (UWMP). The BCVWD UWMP includes consideration of increased water conservation requirements and practices that have been implemented over recent years, as well as including other potential water supply sources such as surface water runoff capture and recycled water. Based on BCVWD's 2020 UWMP, their imported water supply needs are projected to increase from 12,216 AF for 2025 levels to 16,050 AF for the 2045 level.

2.2 City of Banning

The City of Banning provides pumped groundwater supplies to its service area. The primary source of this groundwater is pumping in the Banning Canyon and the Banning Bench (along the San Gorgonio River) which serves a large part of the City of Banning and is recharged with local surface water and imported recharge from the Whitewater River. The City of Banning also pumps from other groundwater storage units in its service area, including the Beaumont Basin, the Banning Storage Unit, and the Cabazon Storage Unit. Recharge in the Beaumont Basin, and potentially the Banning Storage Unit, is provided by natural local runoff, return flows from local water use, and imported water recharge at Noble Creek facilities. The projected water supplies are sufficient to meet the City's water demand, including consideration of water conservation measures, and other potential water supply sources such as surface water capture and recycled water. Based on the City of Banning's 2020 UWMP, their imported water supply is projected to increase from 250 AF for 2025 levels to 2,500 AF for the 2045 level.

2.3 Cabazon Water District

CWD, located adjacent to the community of Cabazon, provides pumped groundwater to residential customers in its service area. The pumped groundwater is supported by local recharge from miscellaneous natural sources along with return flows from local water use. Because it serves fewer than 3,000 customers and provides less than 3,000 acre-feet of water supply, CWD is not required to prepare an UWMP.

Current use by CWD was estimated in the San Gorgonio Pass Groundwater Sustainability Plan (SGP GSP) as approximately 500 AF. Based on potential additional development within the CWD service area, CWD recently estimated that its water demands could increase to between 6,400 and 3,200 acre-feet, depending on the demand level. An approximate estimate of 4,800 acre-feet per year in demands was identified by CWD for capacity-planning purposes. CWD's existing groundwater supply of 500 AF is included in the SGP GSP, which was identified as being a sustainable amount of groundwater use. Deducting the projected CWD water use for the existing 500 AF of groundwater pumping, the additional imported water supplies required for maintaining sustainable groundwater conditions are estimated to be 4,300 AF (4,800 AF less 500 AF) in 2045.

2.4 Morongo Band of Mission Indians

The MBMI provides water for residential customers on its reservation as well as for miscellaneous commercial and industrial operations. MBMI's water supply is provided by local natural recharge, diversions from upstream watersheds on Potrero Creek and Millard Creek, and return flows from local water use. The MBMI, as a federally recognized tribe, is not required to provide water use forecasts, and have not provided forecasts of their water use.

The 2018 SGP Integrated Regional Water Management Plan (IRWMP) Water Supply Reliability Study (WSR) identified current level (2020) MBMI demands as 1,831 AF, which were projected to increase to 2,500 AF by 2040. The increased demands of 700 AF (2,500 less 1,800) for 2040 are assumed to be supported by additional supply imports. In addition to the 2040 projected demands of 2,500 AF from the WSR, additional potential development may be possible on the MBMI reservation lands. In the absence of available water use forecasts from the MBMI, an approximate estimate was developed, based on the amount of MBMI land that seems developable and is generally adjacent to transportation infrastructure. Based on these approximate judgements by non-MBMI entities, it appears that there could be the potential for an additional 3,800 AF of additional demand that could require additional imported water supply. Together with the 700 AF of additional 2040 level demands, the total MBMI projected demand is estimated as 4,500 AF. This information represents an engineering judgment that has not been endorsed by the MBMI and may not accurately represent their plans. This information is being provided to the MBMI and will be updated in the future if MBMI requests a change.

2.5 Total Water Demands

Based on the various sources described above, the total average imported water demands for the identified service areas at an approximately 2045 level of development are 27,350 AF.

3 Water Supply Availability and Conveyance Capacity

The average imported amounts identified above, cumulatively totaling 27,350 acre-feet would be made available from a variety of sources, including the SGPWA State Water Project (SWP) contract supplies. In addition to a portion of the SGPWA Table A contract amount of 17,300 AF, other potential imported water supply studies include: participation in the Sites Reservoir Project in the Sacramento Valley, participation in the DWR Delta Conveyance Project, use of purchased Nickel water, and purchase of SWP Table A amounts on a long-term or intermittent basis from other SWP contractors.

All the imported water supply sources have varying periods of availability that can differ somewhat depending on the project. The proposed Backbone Pipeline would need to have adequate capacity to distribute these water supply as available, which would include many periods of non-use and result in significantly higher required capacities as compared to the average delivered amounts. To estimate the capacity needs for the imported water supplies, the SWP Table A amounts have been used as a pattern of availability. These would be directly representative of the SGPWA Table A amounts as well as any purchases of Table A from other SWP contractors. Additionally, the SWP delivery pattern would also be generally representative of the pattern of availability from other water supply sources from the Sacramento-San Joaquin watershed.

The monthly SWP delivery pattern was taken from the Department of Water Resources (DWR) 2021 SWP Delivery Capability Report studies based on the CALSIM-3 model. The SGPWA Table A amounts and Carryover Storage from this study quantified the SGPWA annual average supply as an average of 9,500 acre-feet over the 1922-2015 operations period. **Figure 3-1** shows annual average SWP deliveries of both Table A Amounts and Carryover water. If the 9,500 acre-feet of SWP water was deliveries was provided on a continuous basis, it would have an average delivery of amount of 13.1 cubic feet per second (cfs).

The amount of supplemental water supply needed for the new SGP Backbone Pipeline (the total of increased forecasted use by the City of Banning, CWD and MBMI) totals 11,300 AF per year. Assuming no outages and continuous deliveries, 11,300 AF per year is equivalent to an average capacity of 15.6 cfs. The ratio of additional water supply to the SWP available supply is about 1.19 (11,300 AF/Year to 9,500 AF/Year). As described below, this 1.19 ratio was applied to the characteristics of the SWP water supply to SGPWA to derive estimates of conveyance requirements for the SGP Backbone Pipeline.

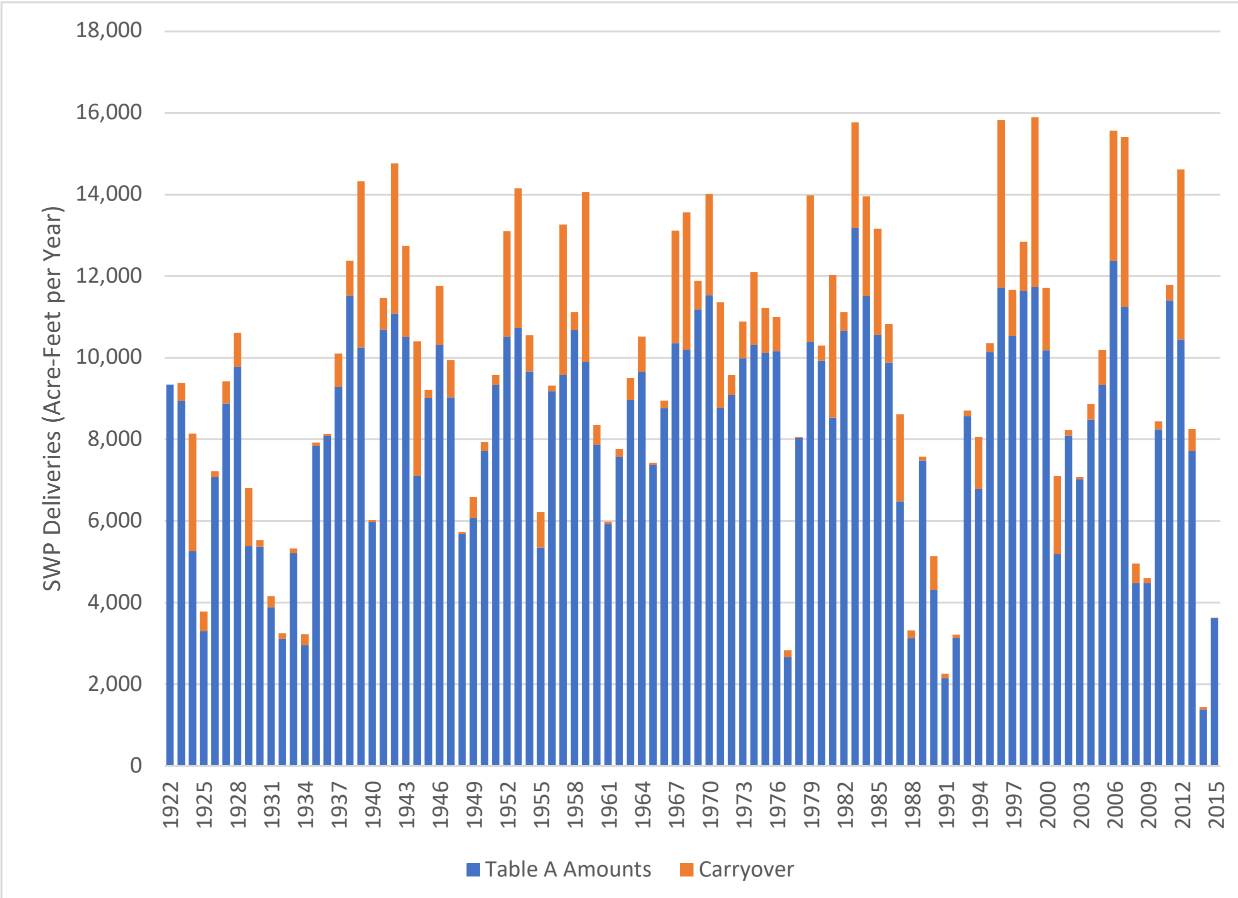

Figure 3-1: Total SGPWA SWP Table A Amounts and Carryover Water Deliveries

As shown by **Figure 3-1**, the SWP water supply varies considerably from year to year, and there are other variations from month to month within years. The monthly delivery amounts for SGPWA from the DWR CALSIM-3 operations study were ranked by amount and are plotted in **Figure 3-2**. As shown in **Figure 3-2**, SWP deliveries for SGPWA vary from several occurrences of 0 cfs to a maximum of 55.2 cfs. However, most of the deliveries are lower than 30 cfs.

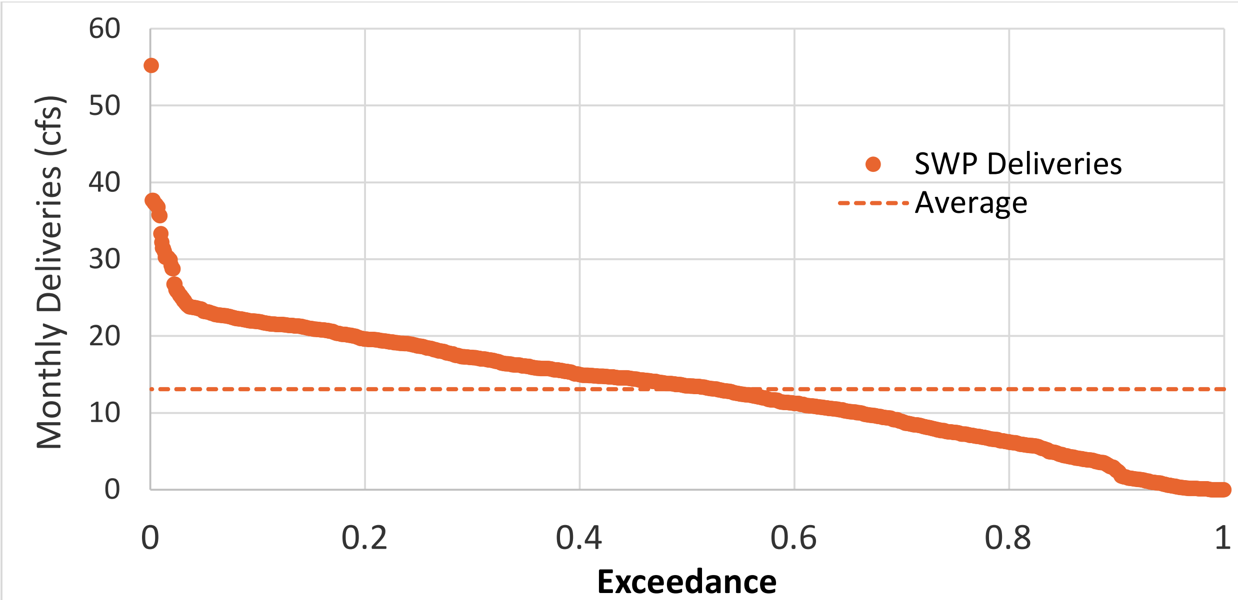

Figure 3-2: Exceedance Total SGPWA SWP Table A Amounts and Carryover Water for 17,300 AF Table A Amounts

Scaling for the ratio of proposed Backbone Pipeline demands to SGPWA baseline SWP deliveries of 1.19, the conveyance capacity needed for 11,300 AF of annual SWP deliveries is 15.6 cfs, which could be considered a theoretical lower bound for the Backbone Pipeline capacity. **Figure 3-3** shows the distribution of available SWP monthly supplies (based on SWP Delivery Capability Report CALSIM-3 simulations) that is scaled to the equivalent of a 11,300 AF average supply.

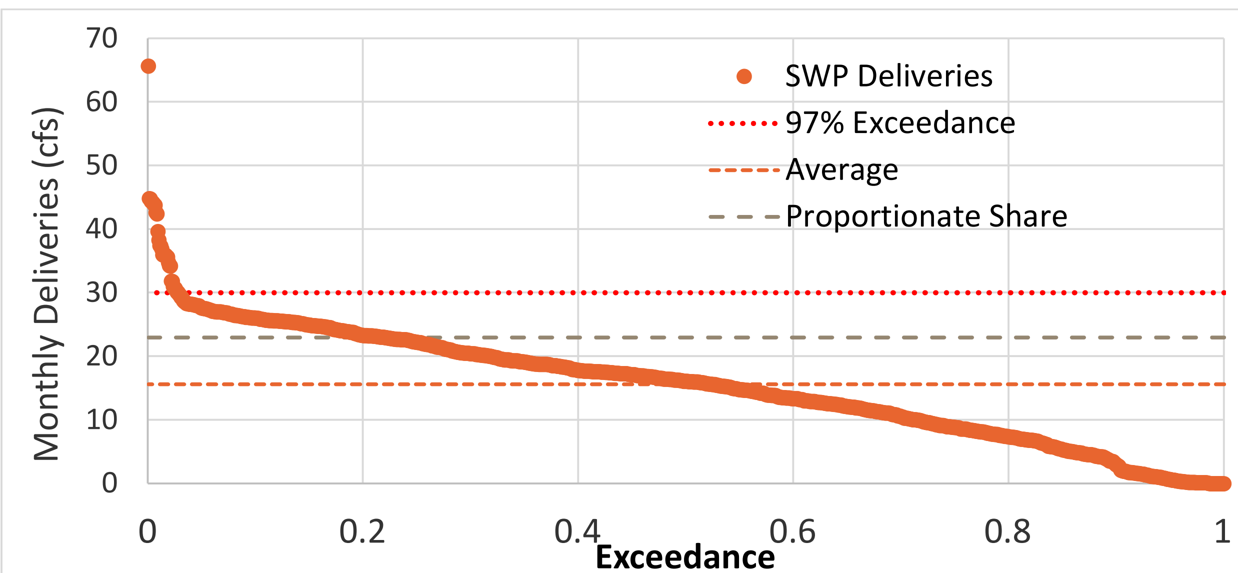

Figure 3-3: Exceedance SGPWA Total SWP Supply Scaled For 11,300 AF/Year Average Supplies

Figure 3-3 shows that the potential available water supply would exceed the average delivery amount of 15.6 cfs about fifty percent of the time. While there is some capability for managing the raw water supply to match this capacity, a Backbone Pipeline with this size would likely forego significant amounts of water supply and, due to the variability in available supply, would not be capable of providing the required water supplies on a long-term basis.

For the proposed 11,300 AF annual deliveries on the schedule estimated by DWR, a conveyance facility with a capacity sized to 30 cfs would mean that capacity for water supply deliveries would be limited instantaneously about three percent of the time. However, the amounts that would not be deliverable at these occurrences would be relatively small (generally less than 15 cfs, or about 900 AF) for a very small number of months. In actual operation, other management tools (such as upstream storage) would be available to temporarily store supplies during periods of restricted available capacity that could be delivered during preceding or subsequent periods with available capacity. A size of 30 cfs is used for this analysis as an upper bound of the capacity needed for the Backbone Pipeline.

An additional consideration in sizing the Backbone Pipeline is the capacity of the East Branch Extension of the California Aqueduct. The East Branch Extension has a capacity of 52 cfs at the Cherry Valley Pipeline as it supplies the existing Noble Creek recharge basins and the proposed SGP Backbone Pipeline. In addition to the water users on the proposed SGP Backbone Pipeline, BCVWD has projected average needs for imported water supply of about 16,050 acre-feet, which converts to an average supply of 22.2 cfs. Based on average imported water supply needs, BCVWD's share of total capacity would be about 59% (22.2 cfs/ (22.2 cfs + 15.6 cfs)) and the SGP Backbone Pipeline share would be 41%, which is equivalent to 21 cfs. As shown in **Figure 3-3**, a SGP Backbone Pipeline capacity of 21 cfs would be capable of conveying available water supplies about 72% of the time. For purposes of this evaluation, the 21-cfs capacity for the SGP Backbone Pipeline based on a proportionate share of the East Branch Extension total capacity is considered to be a lower bound for required capacity.

In summary, based on the variation in available water supply and available capacity in the existing East Branch Extension of the California Aqueduct, the SGP Backbone Pipeline should have a capacity of between 21 cfs and 30 cfs. For the purposes of this initial evaluation of needed recharge capability, an assumed recharge rate of 25 cfs for the 11,300 AF/Year long-term supplemental water supply has been assumed. Given the Backbone Pipeline has a capacity of 25 cfs, it would be able to directly supply available SWP supplies about 85 percent of the time and would require some upstream supply management the remaining 15 percent of the time.

4 Groundwater Recharge Facilities

Groundwater recharge facilities in SGPWA are currently available at the BCVWD Noble Creek recharge facilities and the nearby SGPWA Brookside Recharge Facility. These groundwater recharge facilities are located adjacent to Noble Creek, near the terminus of the East Branch Extension. BCVWD's Noble Creek recharge basins have a wetted recharge bottom area of 22.77 acres, including Phases I and II. Recharge amounts at the basins were estimated to be as much as 14,000 acre-feet per year on an ongoing basis, which is equivalent to a rate of about 1.7 AF/Acre. SGPWA's Brookside Recharge Facility was completed in 2020 and has recharge basins with an area of 20 acres. The facility was designed for an infiltration rate of 2 acre-feet per acre, with a maximum flow rate of 20 cfs. The Noble Creek and Brookside Recharge facilities provide supplemental water supplies directly to the Beaumont Groundwater Basin and also may supply water to the Banning Storage Unit indirectly by subsurface flows. Additional recharge facilities are being considered near Noble Creek and at other locations in the Beaumont Groundwater Basin to meet supplemental water supply needs for BCVWD and the City of Banning.

The water supply needs in the Banning and Cabazon Storage Units would require additional conveyance facilities (such as the San Gorgonio Pass Backbone Pipeline) in addition to new recharge facilities. **Table 4-1** summarizes the groundwater storage units that would be served by the East Branch extension and the SGP Backbone Pipeline, the agencies that would be supplied, the alternative recharge facilities that could be used, and the recharge facility total capacity.

Table 4-1: Groundwater Storage Units and Proposed Recharge Facilities

Groundwater Storage Units and Proposed Recharge Facilities					
Storage Unit	2045 Annual Supplemental Water Demand (AF)	Agency Supplied	Groundwater Recharge Facilities	Recharge Capacity (cfs)	Recharge Area (Acres)
Beaumont	16,050	BCVWD	Noble Creek/Brookside	TBD	TBD
Banning	2,500[1]	City of Banning	Noble Creek/Brookside, Atwell	11.5	14
		City of Banning	Atwell, Montgomery Creek	11.5	14
Cabazon	4,500	Morongo Band of Mission Indians	Robertson's Location 1	20.6	26
	4,300	CWD	Robertson's Location 2, City of Banning Location 3, Cabazon Location 4	19.8	25

In developing the recharge assumptions shown in **Table 4-1**, an assumption has been made that long-term recharge rates at developed facilities would be approximately 1 acre-foot per acre. This assumption was made as a basis for conservative design. To the extent that the 1 acre-foot per acre assumption is conservative, it provides the capability for operational flexibility by allowing for periodic recharge basin outages for treatment and restoration of recharge rates. **Figure 4-1** shows the surface recharge characteristics for the study area. Based on **Figure 4-1**, the surface soils for the various Cabazon storage unit recharge facilities have similar surface

[1] City of Banning 2,500 acre-feet demand not differentiated between Banning and Beaumont Storage Unit. The 2,500 acre-feet demand is not additive for the Banning and Beaumont Storage Units

infiltration rates to those near the Noble Creek recharge facilities. The surface infiltration rates are not an absolute indication of recharge potential and actual operational recharge rates could be affected by other factors such as aquifer transmissivity and subsurface layers of low permeability material. For purpose of this initial evaluation, the mapped surface infiltration rates are being used as an indicator that recharge is feasible. Other site-specific evaluations would be useful to confirm that subsurface conditions would also support recharge.

The potential recharge facilities identified in **Table 4-1** provide alternatives that were evaluated for effectiveness using groundwater modeling as described later in **Chapter 5**. The options for each agency that are identified would be separate alternatives for an agency, with only one of the options to be identified as the preferred option.

For City of Banning demands in the Beaumont Basin and Banning Storage Unit, recharge facility options include the existing (or expanded) recharge basins adjacent to Noble Creek, use of storm detention facilities in the Atwell Project and releases to Montgomery Creek near Highland Home Road. The BCVWD facilities and Brookside Recharge facilities have been described previously and could be supplemented by additional recharge basins to the west of the study area, near Noble Creek, Little San Gorgonio Creek, or at other sites adjacent to the SWP East Branch Extension alignment.

The Atwell Detention Basin is planned, which has a primary purpose of providing stormwater detention for the Atwell Project. This Detention Basin is being considered for purposes of water supply recharge as it is located near the proposed SGP Backbone Pipeline alignment and its stormwater detention purposes would be limited to short periods of local rainfall. The project is assumed to be available for non-storm periods for water supply recharge, which would be the great majority of the time. While it would require some minimal additional conveyance facilities to be put to this use, the Atwell Detention Basin is located closer to some additional City of Banning projected uses in the Beaumont Basin and Banning Storage Unit. Recharge at the Atwell Detention Basin is expected to provide improved groundwater level conditions in the Banning Storage Unit as compared to existing recharge sites adjacent to Noble Creek.

The final recharge site identified for City of Banning supplemental water supply needs is recharge in the Montgomery Creek channel. This recharge mechanism would involve releases from the proposed SGP Backbone Pipeline into the Montgomery Creek channel in the vicinity of Highland Home Road. The exact location of any releases would be subject to additional review of local conditions and the alignment of the SGP Backbone Pipeline. This recharge project would release water into the Montgomery Creek channel during dry periods with no storm runoff. Based on initial review, surface soils in the vicinity of this project appear to have poor infiltration characteristics and a large surface area would be required for this recharge. The channel itself is relatively narrow and would have a relatively small recharge area. Based on the poor infiltration characteristics and the limited area for recharge, this alternative appears to have a low probability for implementation and is proposed to be deferred unless the groundwater modeling indicates a major increase in pumping water levels in City of Banning groundwater wells from recharge at the Noble Creek sites and the Atwell Detention Basin.

The identified recharge areas in the Cabazon Storage Unit would supply different agencies in the Cabazon Storage Unit. The site adjacent to the City of Banning Wastewater Treatment Plant (WWTP) would potentially provide water for City of Banning water needs in the adjacent Banning Storage Unit. This site is labelled as Location 2 in **Figure 4-1**. The Banning WWTP site could also supply additional groundwater for Cabazon Water District and the MBMI. Because the proposed SGP Backbone Pipeline alignment would pass near the Banning WWTP in any case, and there is anticipated to be unused infiltration capability in the existing basins, this would be a low-cost recharge alternative. The concern for the utility of this recharge site is that it is located several miles away from the location of the proposed supplemental water needs. The groundwater modeling described below would evaluate the effectiveness of recharge at the Banning WWTP recharge site for meeting Cabazon WD and MBMI supplemental water needs.

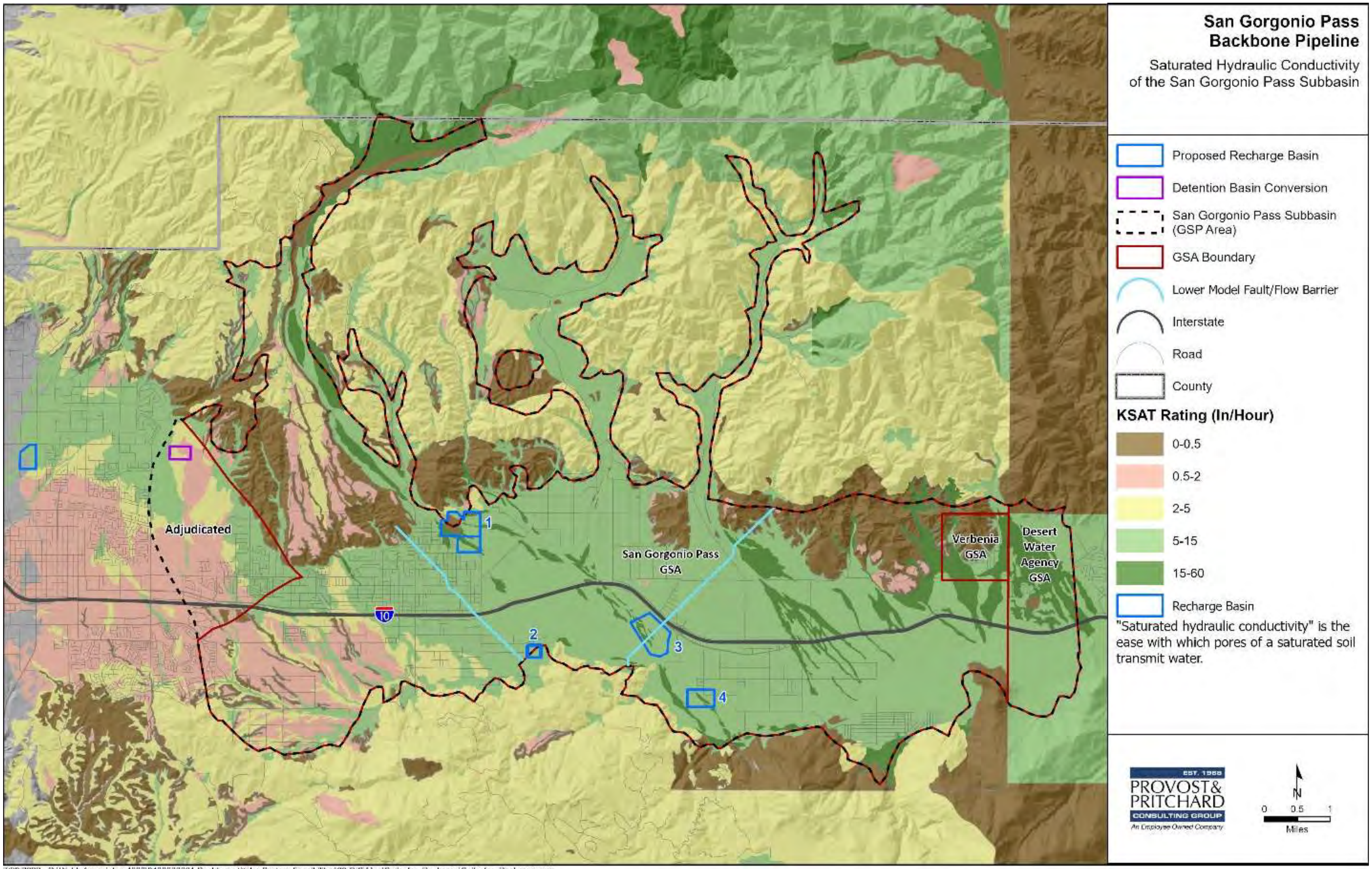

Figure 4-1: Surface Infiltration Rates for San Gorgonio Pass Backbone Service Area

The Robertson's Ready Mix Banning Pit (Location 1) is the proposed recharge site for supplemental supplies for MBMI. Based on surface infiltration rates and observation of the gravel pit, this is expected to be a location with very good recharge rates. An approximately 16-acre recharge basin is proposed, which would be sited somewhere in the Banning Pit at a location that would not interfere with Robertson's Ready Mix planned gravel extraction operations. Based on initial discussions, the Banning Pit has a relatively limited life and may be able to incorporate some recharge facilities in 10 to 15 years. Ideally, the 16-acre recharge facility would be located along the eastern side of the Banning South Pit to avoid subsurface rock structures along the northwest side of the Banning West Pit associated with the groundwater basin boundary. While most directly providing water supplies for MBMI needs, recharge at Location 1 is also expected to provide some improvement in groundwater levels for CWD supplemental demands.

Robertson's Ready Mix also has an active gravel extraction facility further east at its Cabazon Pit, which is labelled Location 3 in **Figure 4-1**. Gravel extractions at the Cabazon Pit are likely to continue for a considerably longer period than for the Banning Pit, likely several decades. As with the Banning Pit, surface infiltration rates at the Cabazon Pit are shown to be very high and this location is expected to be a good location for recharge. A 25-acre recharge basin is proposed for development somewhere within the Cabazon Pit footprint. While surface materials are not shown to vary over the Cabazon Pit location, a potential subsurface fault has been identified by the US Geological Survey that is included in the San Gorgonio Pass Groundwater Model and bisects the Cabazon Pit on a southwest to northeast alignment. A monitoring well on the southwest side of the Cabazon Pit shows groundwater levels that are more than 450 feet below the ground surface. The well logs for this monitoring well show a large proportion of permeable material such as sand and gravel that should have high permeability for groundwater recharge. Unusually, piezometric levels in different vertical zones show an upward gradient, with piezometric levels in the deepest zone (980-1000 feet depth) at levels of about 30 feet higher than shallower zones. The upward hydraulic gradient could be upwelling of groundwater due to subsurface flow constraints or the presence of a fault.

The final identified groundwater recharge site is at the general location shown as Location 4 on **Figure 4-1**. The site would need to be purchased and could be located within some radius of the identified Location 4 based on cost and other considerations. Based on the surface infiltration characteristics in **Figure 4-1**, all the surface sites within a mile of the site have high infiltration characteristics and would be expected to have good groundwater recharge capability. Based on available information on the location of the Cabazon-1 fault, Location 4 is located downgradient of the fault and recharge at that location would directly improve groundwater conditions at existing and potential CWD wells. There would likely be increased costs associated with groundwater recharge basins at Location 4 (as compared to Location 3) due to the need for property purchase and additional conveyance length.

5 Groundwater Modeling Assumptions

Groundwater modeling analysis will be conducted to determine the potential effectiveness of providing additional water supplies with facilities located at alternative sites in SGPWA. Groundwater model analysis has been identified that will evaluate a base condition for 2045 with supplemental water supply only at Noble Creek that will then be compared with alternatives that provide supplemental recharge at various locations. A summary of the potential scenarios and the assumptions that are used for the scenarios is shown in **Table 5-1**.

Table 5-1: Model Input Assumptions

Table 5-1 Model Input Assumptions		Scenarios						
		1	2	3	4	5	6	7
Local Runoff/Precipitation		2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level
Pumpage/Water Use (Assumption/Source)								
	Beaumont Cherry Valley WD	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045
	City of Banning	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045	UWMP 2045
	Cabazon WD	Historic	Historic	Proj. 2070	Historic	Proj. 2070	Proj. 2070	Proj. 2070
	Morongo Band of Mission Indians	IWMP 2040	IWMP 2040	IWMP 2040	Proj. 2070	IWMP 2040	Proj. 2070	Proj. 2070
Model Area Pumping (Acre-Feet)								
	Beaumont Cherry Valley WD	15,227	15,227	15,227	15,227	15,227	15,227	15,227
	City of Banning	13,467	13,467	13,467	13,467	13,467	13,467	13,467
	Cabazon WD	500	500	4,800	500	4,800	4,800	4,800
	Morongo Band of Mission Indians	2,500	2,500	2,500	6,300	2,500	6,300	6,300
	Total Model Area Pumping	31,694	31,694	35,994	35,494	35,994	39,794	39,794
Indio Basin Recharge (Description)								
	DWA/CVWD	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level	2030-Level
San Gorgonio Pass Average Annual Recharge (Acre-Feet)								
	Noble Creek	18,550	16,050	16,050	16,050	16,050	16,050	16,050
	Atwell Project (Detention Basin)	0	2,500	2,500	2,500	2,500	2,500	2,500
	Montgomery Creek	0	0	0	0	0	0	0
	Location 1 (Robertsons, Banning)	0	0	0	4,500	0	4,500	4,500
	Location 2 (Banning WWTP)	0	0	0	0	4,300	0	2,000
	Location 3 (Robertsons, Cabazon)	0	0	4,300	0	0	0	0
	Location 4 (Cabazon Area)	0	0	0	0	0	4,300	2,300
	Total Imported Recharge	18,550	18,550	22,850	23,050	22,850	27,350	27,350

The scenarios and the information that is expected from the model simulations are described below:

5.1 Scenario 1

Base scenario which includes projected 2045 pumping amounts from Urban Water Management Plans for Beaumont-Cherry Valley Water District and the City of Banning. This scenario also includes continued historical level groundwater pumping for other entities in the SGP service area (Cabazon Water District, Mission Springs Water District, etc.) with the exception of MBMI, which is assumed to have pumping increased to 2,500 acre-feet per year consistent with the SGP Integrated Water Management Plan of 2016. Finally, this scenario includes recharge at the existing Noble Creek and Brookside Recharge facilities of an average of 18,550 acre-feet that is assumed to have a SWP source and availability pattern. This scenario would provide a basis for comparison of other scenarios.

5.2 Scenario 2

This scenario would be a slight modification of Scenario 1, with recharge for the City of Banning moved to the proposed detention basin in the Atwell Project. The average 2,500 acre-feet of supplemental water for the City of Banning would be applied to the Atwell Project detention basin, which is closer to City of Banning pumping locations in the Beaumont Basin and the Banning Storage Unit. Recharge at the Noble Creek and Brookside Recharge facilities would be reduced to 16,050 acre-feet per year with the shift of some recharge to the Atwell Project.

5.3 Scenario 3

Scenario 3 would be the first of a sequence of scenarios considering different levels of groundwater pumping and supplemental recharge for the Cabazon Storage Unit. With this scenario, CWD total pumping would be increased to an approximate ultimate build-out level totaling 4,800 AF. Two additional wells for CWD are assumed to be required for the additional pumping. As described previously, the increase in pumping above current levels (4,300 AF/Year) would be supported by additional recharge at new facilities in the Cabazon Storage Unit, which would be located at a site at Location 3, within the Robertson's Ready Mix Cabazon Pit. There would be no assumed increase in use (beyond the 2040 level) by MBMI for development, and no additional recharge specifically for MBMI. The results of this simulation would indicate the effectiveness of recharge at Location 3 in meeting increased CWD pumping.

5.4 Scenario 4

Scenario 4 would be used to show the effectiveness of additional recharge at Location 1, within the Robertson's Ready Mix Banning Gravel Pit. For this scenario, CWD would be kept at historical levels (about 500 AF/Year) and MBMI pumping would be increased by 4,800 AF to 6,300 AF per year. Additional recharge of 4,500 AF/year on an SWP availability schedule would be added for Location 1. Four additional wells are assumed to be added for MBMI pumping at locations along the I-10 corridor. This scenario would show the effectiveness of recharge at Location 1 in providing for additional MBMI use.

5.5 Scenario 5

Scenario 5 would have the additional CWD pumping from Scenario 3, with recharge moved to Location 2, where the City of Banning has its wastewater treatment plant. As with Scenario 3, there would be no additional pumping by MBMI or recharge for that pumping. Location 2 is expected to be less effective in providing supply for CWD than Location 3, however it would require reduced conveyance with corresponding reductions in project costs for the Backbone Pipeline.

5.6 Scenario 6

This scenario would combine the additional pumping in Scenarios 3 and 4 into a combined alternative. Additional pumping (with the additional wells indicated in the descriptions for Scenarios 3 and 4) would be included in the model for both CWD and MBMI. Additional recharge to support increased MBMI pumping would be provided at Location 1 as described for Scenario 3. Additional recharge would also be provided at Location 4, which is located downgradient of the north-south fault in the Cabazon Storage Unit that may be a flow limitation. The results of this modeling analysis would identify where the combination of additional pumping and additional recharge is complementary or negative as compared to the individual scenarios.

5.7 Scenario 7

Scenario 7 would be a slight variation of Scenario 6, with increased pumping and recharge for both CWD and MBMI. The difference between this scenario and Scenario 6 would be that recharge intended for CWD would be split between Locations 2 (2,000 AF/Year) and 4 (2,300 AF/Year), with a corresponding reduction in pipeline size east of Location 2. It is proposed that this scenario would be deferred to the end of the modeling analysis, to allow for possible re-definition in case of unexpected results from prior scenario simulations.

Appendix B

Groundwater Modeling Analysis of Potential Recharge Locations in the San Gorgonio Pass Subbasin

Prepared by INTERA, Inc., April 2023

TECHNICAL MEMORANDUM

Groundwater Modeling Analysis of Potential Recharge Locations in the San Gorgonio Pass Subbasin

Prepared for:

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EXECUTIVE SUMMARY

San Gorgonio Pass Water Agency is evaluating an increase in conveyance capacity through a proposed new pipeline that could be used to deliver imported water to recharge facilities to boost the groundwater supply in the San Gorgonio Pass Subbasin (Subbasin). Considering projections of more frequent and severe droughts and expanded development, it is prudent to consider more recharge in the Subbasin.

The SGP Subbasin includes the Banning Canyon, Banning and Cabazon storage units. The Banning and Cabazon storage units are relatively large aquifers with several hundred thousand acre-feet of groundwater in storage. The storage units have relatively small annual extractions (currently about 8,000 acre-feet). While the annual extractions constitute a relatively small proportion of the total basin storage, the Banning and Cabazon storage units have very large long term storage changes (greater than 200,000 acre-feet) as a result of hydrologic trends and variations in long-term deep percolation. The relatively small incremental variations in groundwater conditions identified by the groundwater model projections should be considered in light of the underlying long-term variations in groundwater conditions and the uncertainty in model predictions.

The SGP Subbasin groundwater model was used to evaluate the potential benefits of recharging at four different locations in the Subbasin (Figure 2.1). Nine scenarios were simulated where pumping from the Morongo Band of Mission Indians and the Cabazon Water District was increased in different configurations in accordance with estimates of their projected increases in groundwater demand. The groundwater model simulations were conducted to show how effective increased recharge at various locations was in offsetting potential pumping increases in the future while also not resulting in large increases in groundwater outflow from the SGP Subbasin.

Specifically, the impact of the potential recharge basins and their respective scenarios were evaluated on the basis of:

- How much groundwater levels were impacted positively, and demonstrated mitigation of drawdown from increased pumping, in the SGP Subbasin
- How much more groundwater flowed out to the Indio Subbasin
- How water levels (at representative monitoring wells) responded to recharge in relation to minimum thresholds (MTs) defined in the groundwater sustainability plan to avoid undesirable results

The recharge site that performed the best and is recommended is Site 3 due to its ability to maintain baseline water levels and minimize exceedance of MTs, while not losing significantly more flow to the Indio Subbasin than scenarios with recharge at other potential sites. The difference in flow out to the Indio Subbasin was not significant in comparison to the total flow (all differences in flow out were less than 5% of the total flow) from the SGP Subbasin to the Indio Subbasin, so this criterion was considered less substantial than the impact on water levels. In general, Sites 3 and 4 performed best to maintain water levels in the areas where pumping increased yet allowed more flow out to the Indio Subbasin, albeit not with significant differences. Sites 1 and 2 performed best to minimize outflow lost to the Indio Subbasin but increased water levels in areas of the Subbasin where there is not significant pumping which is not as beneficial (Figure 2.1). All seven scenarios simulated with additional recharge demonstrated a clear, positive impact on the Subbasin relative to baseline conditions without any additional recharge.

Recharge rates from surficial recharge basins are strongly influenced by the hydraulic permeability of the sediments underlying the proposed recharge basin locations above the deeper aquifer system (where much of the groundwater production occurs). The thickness and permeability of the intermediate vadose zone is an area of uncertainty in the model. Appendix A details the uncertainty of this vertical flow with respect to permeability of the vadose zone that exists between the shallow and deep aquifer systems. Model results show that while the recharge rates vary based on the assumed permeability of the underlying sediments, the relative performance of the different recharge locations for different scenarios remains largely the same; therefore, the conclusions are not impacted by this uncertainty. Due to this uncertainty, site investigations are recommended for any potential recharge site is chosen to ensure the maximum benefit of the recharge is received.

TABLE OF CONTENTS

1.0 INTRODUCTION

The San Gorgonio Pass Water Agency (SGPWA) is currently unable to take full advantage of all of their potential imported water allocations, received primarily from the State Water Project (SWP) [reference]. In addition, the SGP Subbasin would benefit from increased water security as a multi-decadal drought continues to impact water management in the region. As a potential solution to these challenges, SGPWA is proposing a new pipeline, the San Gorgonio Pass Backbone Pipeline (the Backbone), to increase conveyance capacity [reference]. Potential increased demand in the region is projected to be approximately 11,300 acre-feet per year (AFY) (Provost & Pritchard 2022b).

The Backbone would deliver water to recharge facilities to boost groundwater supply. SGPWA would like to know where the best locations to recharge the water would be, considering increase in groundwater supplies, impact of basin sustainability, feasibility, cost, and efficacy. The performance of the modeled recharge scenarios at different locations will then inform details of the Backbone alignment to maximize its benefits and progress towards the San Gorgonio Pass Subbasin's sustainability goal.

INTERA has experience modeling the San Gorgonio Pass Subbasin (Subbasin) as it recently developed and calibrated the groundwater model for the Subbasin's Groundwater Sustainability Plan (GSP) (Provost & Pritchard 2022a). As a requirement for the GSP, INTERA used the model to project future conditions in the Subbasin, simulating project management actions (PMAs) as well as transient, climate-change impacted future hydrology (INTERA 2021).

INTERA was tasked to help SGPWA understand the best locations for recharge according to the groundwater model. INTERA used the groundwater model to simulate a range of scenarios of projected groundwater pumping and recharge to understand which locations are the most beneficial to the Subbasin. This Technical Memorandum details the scenarios simulated, the set-up of the groundwater model for all scenarios, and the results of the simulations. The Memorandum concludes with recommendations for recharge locations based on the results of the simulations.

1.1 Subbasin Geography

Detailed information describing the Subbasin's geography, geology, and hydrology are described in the GSP. A brief description of key features is summarized here.

The Subbasin is the portion of the Coachella Valley Groundwater Basin that lies completely within San Gorgonio Pass. Its boundaries are defined: in the North, by semi-permeable rocks and the San Bernardino Mountains; in the West, by the Upper Santa Ana Valley-San Timoteo Subbasin; in the South, by the San Jacinto Mountains; and in the East, by a bedrock constriction that forms a groundwater cascade into the Indio Subbasin.

The San Gorgonio Pass region has a transitional climate characterized by marine influences from the west and arid influences from the Mojave Desert to the east. The region is characterized by low annual precipitation (19.3 inches/year from 1910-2019 at Beaumont) with hot summers and cool winters. Much of the precipitation falls on higher elevation areas in the San Bernardino and San Jacinto Mountains that bound the north and south of the groundwater basin, respectively. This type of climate and geography leads to an area that experiences great spatial and temporal variability in runoff and natural recharge in response to precipitation. The variability of precipitation itself can be significant. Consequently, streamflow is generally ephemeral with episodic streamflows that discharge from the higher elevations and quickly infiltrate the gravel and sand-bedded canyons, recharging the lower elevation aquifers.

Another characteristic of the high temporal runoff variability is large changes in groundwater storage driven by long-term trends in wet and dry years. The Subbasin has a large variation in topography, with elevations dropping from more than 2,600 feet above sea level at the mouth of Banning Canyon to less than 1,400 feet above sea level at the boundary with the Indio Subbasin. Groundwater levels generally follow the topographic features, with a 500-foot decline in groundwater levels in the Cabazon storage unit from west to east, and significant outflows into the Indio Subbasin at the eastern boundary. The San Gorgonio Subbasin naturally drains into the Indo Subbasin due to natural change in topography and a drop in the underlying bedrock elevations. Storage change in the San Gorgonio Subbasin is driven by the relative amounts of long-term recharge and underflows to Indio Subbasin. In wet years, recharge to the Subbasin from the San Gorgonio River can exceed underflows to Indio Subbasin, leading to increases in groundwater levels. Over many years, the high groundwater levels gradually drain into the Indio Subbasin with the high water levels declining and stabilizing over many years. Conversely, successive dry years can lead to a long-term decline in water levels as outflows into the Indio Subbasin are not balanced by recharge from precipitation.

As an example, low water levels in the early 1970s increased to high levels in the late 1990s due to an extended wet period. After 1998, groundwater storage in the San Gorgonio Pass Subbasin dropped for more than twenty years as a result of extended dry conditions, with groundwater storage declining more than 200,000 acre-feet over the period. During this period, subsurface outflow to the Indio Subbasin, the largest component of use, varied from 28,084 acre-feet per year during years of higher water levels to 21,618 acre-feet per year during years of lower water levels. Extractions in the San Gorgonio Pass Subbasin during this period ranged from 8,357 acre-feet per year to 11,185 acre-feet per year, less than half the amount of subsurface drainage to the Indio Subbasin (Provost & Pritchard, 2022b). In summary, subsurface drainage from the Subbasin to the Indio Subbasin is the dominant water use, greatly exceeding in-basin groundwater pumping.

A critical feature of the hydrogeologic system of the Subbasin is the San Andreas Fault system. Active parts of the fault system related to the San Andreas Fault system are the Banning, Garnet Hill, and San Gorgonio Pass Thrust faults. Water-level and geochemical data indicate that these faults act as groundwater flow barriers. The flow barriers end up creating significant differences in groundwater levels and flow throughout the Subbasin. The San Gorgonio Pass hydrogeological system has been divided into storage units: Beaumont, Banning, Cabazon, Calimesa, San Timoteo, South Beaumont, Banning Bench, Singleton, and the canyon storage units (Banning, Hathaway, Potrero, and Millard Canyons).

Hydrogeological and geophysical data suggest that the primary deep aquifer system is separated from the shallow aquifer system by a vadose zone. While the deeper aquifer system is where the majority of groundwater pumping exists, the vadose zone constrains and attenuates deep percolation from the shallow aquifer to the deeper aquifers. There are no known extensive horizontal aquitards in the Subbasin, therefore the deeper system is considered unconfined or locally semi-confined. There is significant uncertainty in how deeper recharge from the shallow system to the deep is limited (INTERA 2021; Provost & Pritchard 2022a).

1.2 Model Description

The San Gorgonio Pass Groundwater Model framework consists of three interconnected models (Figure 1.1). For a detailed explanation of the set-up and calibration of the full groundwater modeling framework, the Technical Memorandum attached to the San Gorgonio Pass GSP has more information. Below is a brief description of the modeling framework and how the models work together.

- The upper-most model is developed using INFILv3 (USGS 2008) and calculates runoff and infiltration daily based on surface features of the Subbasin.
- Infiltration from the upper-most model is then applied to the upper groundwater model as recharge. The upper groundwater model is developed using MODFLOW-NWT (Niswonger et al., 2011). The upper groundwater model is representative of the shallow perched aquifer system. This model represents interactions with the land surface and the shallow hydrogeology, computing the flow that can percolate down to the deeper aquifer system.
- The lower-most groundwater model is representative of the primary aquifer system, from which pumping is extracted from. The lower groundwater model is developed using MODFLOW-NWT (Niswonger et al., 2011). Percolation from the upper groundwater model passes through a vadose zone before arriving at the deeper aquifer. This is the main groundwater unit and the model from which all results are extracted from.

2.0 SCENARIOS AND METHODOLOGY

2.1 Groundwater Modeling Scenarios

Nine scenarios for groundwater modeling were developed through discussion with SGPWA, Provost & Pritchard, and Webb Associates, which informed the simulations INTERA completed. Provost & Pritchard outlined details and assumptions about projected conditions used to formulate each scenario and how each scenario may be informative for the objective of ranking recharge locations.

All nine scenarios assume a set of fixed (baseline) assumptions that were not changed from scenario to scenario along with key assumptions that were varied from one scenario to another. The key assumptions related to the groundwater modeling are listed in Table 2.1 and are described as follows. INTERA identified two additional scenarios to support comparative analysis, resulting in a total of nine groundwater modeling scenarios for the Backbone.

2.1.1 Baseline Assumptions for All Scenarios

Table 2.1 summarizes average inflows and outflows for model boundary conditions for each scenario including the baseline assumptions. The modeling scenarios assume projected hydrology was based on historical hydrology from 1949-1998 scaled by DWR-formulated 2030 climate change factors (DWR 2018); this includes areal recharge from precipitation as well as recharge from streamflow. This assumption about projected hydrology also applies to projected water levels to the east in the Indio Subbasin which determines how much water flows to the Indio Subbasin.

Return flows that recharge the Subbasin from the Banning Wastewater Treatment Plant (WWTP) are assumed to be approximately 4,000 AFY based on the City of Banning’s 2020 Urban Water Management Plan (UWMP) projection for 2045. Distributed return flows repeat the last five years of what was simulated in the historical model (from 2015-2019) and repeat over the 50-year simulation period. This latter assumption is consistent with all projected simulations in the GSP (Provost & Pritchard 2022b).

Groundwater pumping from the City of Banning is assumed to be based on the projected pumping in 2045 found in their 2020 UWMP and is approximately 11,900 AFY. Similarly, groundwater pumping from the Beaumont-Cherry Valley Water District (BCVWD) is based on the 2045 projection found in the 2020 BCVWD UWMP and is assumed to be approximately 16,800 AFY. For all scenarios, these pumping amounts do not vary. Baseline pumping for the Morongo Band of Mission Indians (MBMI) is assumed to be 2,500 AFY based on the 2018 San Gorgonio Pass Integrated Regional Water Management Plan. Baseline pumping for the Cabazon Water District (CWD) is assumed to be 500 AFY (Provost & Pritchard 2022b). Baseline pumping in the primary area of concern – the Banning, Banning Canyon and Cabazon storage units – totaled roughly 8,000 acre-feet per year (Provost & Pritchard 2022c).

2.1.2 Variable Assumptions for All Scenarios

Groundwater pumping for CWD and MBMI may potentially increase in the future. The potential amount of increase in pumping is accounted for in different scenarios. For scenarios that CWD is assumed to increase groundwater pumping, it was assumed that it would pump an additional 4,300 AFY for a total of approximately 4,800 AFY. In scenarios that MBMI wells are projected to increase the amount of groundwater extracted from the Subbasin, it was assumed that MBMI would pump an additional 3,800 AFY for a total of 6,300 AFY. For both entities, in scenarios where there was a projected increase in pumping, it was also assumed that new wells would be a part of those future scenarios. Figure 2.1 shows the locations used to represent potential recharge facilities or extraction wells for MBMI and CWD.

Managed recharge at the existing Noble Creek Recharge Facility is assumed, but the amount varied slightly from the two alternate baseline scenarios, Scenarios 1a and 1b (18,550 AFY), to all other scenarios (16,050 AFY). Lateral groundwater flow from Beaumont to the Banning storage unit in the east are affected by the amount of recharge at the Noble Creek Facility so this varies accordingly. The scenarios that model less recharge at Noble Creek divert the difference of 2,500 AFY of recharge to the Atwell Project Detention Basin.

There are four potential recharge facilities simulated in addition to the existing Noble Creek Recharge Facility and the Atwell Project Detention Basin (Figure 2.1). The four potential recharge locations are assumed to apply up to 4,300-4,500 AFY of water. Recharge sites 1-4 and potential extraction wells for CWD and MBMI are located conceptually for modeling purposes and do not represent specific planned facilities.

Table 2.1 summarizes for each scenario the amounts of additional extraction of recharge and from which entity or recharge location the water is pumped from or applied to, respectively. Scenario 1a and 1b are two alternative baseline scenarios. Scenario 2 is a direct comparison with Scenario 1a. All other scenarios are coined based on which entity increased pumping and which potential recharge facility was employed for that scenario. If the CWD increased groundwater extractions, the scenario name starts with "C"; if MBMI increased extractions, the name begins with "M". If both increased extractions, the name starts with "CM". The number corresponding to the potential recharge site follows the letter which indicates who increased pumping. If potential recharge site 1 is used and CWD increased pumping, the name is Scenario C1. If both CWD and MBMI increased pumping while recharge is added as sites 2 and 4, the name is Scenario CM24. Table 2.1 in Appendix XX summarizes the scenarios under this terminology. A summary of each scenario is described below.

- <u>Scenario 1a</u> provided a base scenario with recharge at existing Noble Creek facilities of an average of 18,550 AFY. No additional groundwater pumping was applied. Figure 2.2 shows the layout of this configuration of projected recharge and pumping.
- <u>Scenario 1b</u> has the same recharge as Scenario 1, 18,550 AFY applied only at Noble Creek. However, it increased groundwater pumping from CWD wells by 4,300 AFY (4,800 total AFY) and MBMI wells by 3,800 AFY (6,300 total AFY). The purpose of this scenario is to demonstrate groundwater impacts if there were no recharge facilities, for use as an alternate baseline. Figure 2.3 shows the layout of this configuration of projected recharge and pumping.
- <u>Scenario 2</u> was a slight modification of Scenario 1a by diverting an average of 2,500 AFY of recharge from Noble Creek (so that now it averages 16,050 AFY) and applying it to the Atwell Project Detention Basin. No additional groundwater pumping was applied. The purpose of this scenario is to identify improvements in groundwater conditions in the Banning storage unit resulting from moving recharge to the Atwell Project, which is nearer the Banning storage unit

than the Noble Creek facilities. Figure 2.4 shows the layout of this configuration of projected recharge and pumping.

- Scenario C2 builds on Scenario 2 with 16,050 AFY of recharge at Noble Creek and 2,500 at the Atwell Project location. It increased CWD pumping by 4,300 AFY and offset it with recharge of 4,300 AFY at Site 2 (Banning WWTP). This scenario is designed to evaluate the effectiveness of recharge at Site 2 in meeting increased CWD pumping. Figure 2.5 shows the layout of this configuration of projected recharge and pumping.
- Scenario C3 builds on Scenario 2 by recharging 16,050 AFY at Noble Creek and 2,500 AFY of recharge at the Atwell site. It increased extraction from CWD wells such that their total pumping is 4,800 AFY with two new CWD wells coming online. Scenario C3 included 4,300 AFY of recharge at Site 3 (Robertson's Ready Mix Cabazon Pit) to offset the 4,300 AFY of increased pumping from CWD. This scenario is designed to evaluate the effectiveness of recharge at Site 3 in meeting increased CWD pumping. Comparison of the results of Scenarios C2 and C3 is useful for comparing the relative performance of Sites 2 and 3 in supporting increased CWD pumping. Figure 2.6 shows the layout of this configuration of projected recharge and pumping.
- Scenario M1 applied 16,050 AFY of recharge at Noble Creek and 2,500 at the Atwell Project location. It also increased MBMI pumping by 4,800 AFY to a total of 6,300 AFY and offsets it with applied recharge of 4,500 AFY at Site 1 (Robertsons Ready Mix Banning Pit). This scenario is designed to evaluate the effectiveness of recharge at Site 1 in meeting increased MBMI pumping. Figure 2.7 shows the layout of this configuration of projected recharge and pumping.
- Scenario M3 applied 16,050 AFY of recharge at Noble Creek and 2,500 at the Atwell Project location. It increased extraction at MBMI wells (6,300 total AFY) only similar to Scenario M1. It also applies 4,300 AFY of recharge at Location 3 (Robertson's Ready Mix Cabazon Pit). The purpose of this scenario is to provide a juxtaposition with Scenario M1 to evaluate the impact of recharge in different locations when only MBMI increases extraction. The amount of recharge is not the same as in Scenario M1—it is 200 AFY less—so that must be accounted for when comparing the two scenarios. This scenario is designed to evaluate the effectiveness of recharge at Site 3 in meeting increased MBMI pumping. Figure 2.8 shows the layout of this configuration of projected recharge and pumping.
- Scenario CM14 applied 16,050 AFY of recharge at Noble Creek and 2,500 at the Atwell Project location. It increased pumping from both CWD (total 4,800 AFY) and MBMI (total 6,300 AFY) while adding 4,500 AFY of recharge at Site 1 (Robertson's Ready Mix Banning Pit) and 4,300 AFY of recharge at Site 4 in the Cabazon Area. This scenario is designed to identify how the combination of additional pumping and additional recharge offset for different potential recharge basin sites. Figure 2.9 shows the layout of this configuration of projected recharge and pumping.
- Scenario CM124 applied 16,050 AFY of recharge at Noble Creek and 2,500 at the Atwell Project location. It increased pumping from both CWD (total 4,800 AFY) and MBMI (total 6,300 AFY) while adding recharge at three locations: 4,500 AFY of recharge at Site 1 (Robertson's Ready Mix Banning Pit), 2,000 AFY at Site 2 (Banning WWTP), and 2,300 AFY at Site 4 in the Cabazon Area. Similar to Scenario CM14, this scenario is designed to identify how the combination of additional

pumping and additional recharge offset for different potential recharge basin sites. Figure 2.10 shows the layout of this configuration of projected recharge and pumping.

2.2 Scenario Modeling Methodology

For all modeling scenarios, only the additional recharge and extraction needed to be modified. Provost & Pritchard provided a time-series for all projected rates of extraction and managed recharge. Recharge time-series were provided for the entire projected simulated period on a monthly basis. Additional extraction was provided on a monthly basis for one year, which was to be repeated in the simulated period.

The new wells were added by mapping them to the model grid and applying the corresponding extraction to the coinciding grid cell in layer two of the lower model—this assumed all pumping was to come from the deeper groundwater system. All wells for CWD and MBMI, including the new wells, had a mapping to the grid location with a layer, row, and column from which a specified production rate could be extracted. The time-series of pumping provided by Provost & Pritchard was then applied to the appropriate wells and repeated over the 50-year simulation period. The groundwater model may adjust the simulated pumping based on low water levels, so the model result of total pumping may be slightly different from the input.

To add additional recharge in any given scenario, the specified recharge rate was mapped to a user-specified cell, identified by its row, column, and layer position in the three-dimensional model grid. For a given recharge location, a set of model cells were selected that coincided with the potential recharge basin locations. The recharge rate was then converted to the model units (cubic feet per day) and distributed evenly amongst all cells that were selected in the top layer of the lower model, directly to the deeper groundwater system.

All recharge was applied to the top layer of the lower model for results discussed in Section 4. A second duplicate set of model runs was executed with the only difference being that all additional recharge was placed in the top layer of the upper model. This second set of runs with potential recharge placed in the upper model was to evaluate uncertainty with regards to how much of that recharge would percolate through the vadose zone separating the shallow aquifer from the deeper aquifer. The model is set up to have a connection between the two aquifer systems that is dependent on a vertical hydraulic conductivity factor which restricts vertical flow (e.g., recharge) that is highly uncertain. The findings of those simulations are reported in Appendix A. The one exception being that all recharge in all scenarios at Noble Creek was placed in the top layer of the lower model based on previous modeling which has been calibrated to recharge from Noble Creek being applied to the lower model.

3.0 RESULTS AND INTERPRETATION

The groundwater model simulations were conducted to show how effective increased recharge at various locations was in offsetting pumping increases without adversely affecting baseline water levels, while also not resulting in large increases in groundwater outflow from the SGP Subbasin.

Specifically, results of all model simulations are evaluated on three primary considerations:

1. The average annual change in storage representing how much water was gained or lost over the simulation period in the GSA area.
2. The average annual flow to the Indio Subbasin representing how much of the recharge water is lost by flowing out of the GSA area.
3. The number of exceedances of Minimum Thresholds (MTs) as defined in the San Gorgonio Pass GSP (Provost & Pritchard 2022a). MTs are considered exceeded if the water levels drop below the MT for a consecutive period of 5 years at any point in the projected simulation period. Fewer exceedances of MTs would indicate more sustainable groundwater conditions and fewer undesirable results in the basin.

Each scenario is evaluated relative to Scenario 1a as Scenario 1a is defined as the baseline. Scenario 1b is provided as an indication of increased groundwater pumping that is not supported by increased recharge. It does not evaluate the impact of recharge locations given that there are no additional recharge locations in Scenario 1b.

Using the above criteria, the ideal scenario can be described as one that would maximize the storage in the basin without losing too much of the recharge water to the Indio Subbasin. This ideal scenario would also lead to the same or fewer exceedances of MTs than Scenario 1a, i.e., the increased groundwater pumping is generally offset by increased recharge resulting in groundwater levels similar to the baseline scenario. Figure 3.1 shows the locations of key wells in the Subbasin used to analyze MT exceedances and water level trends.

Table 3.1 summarizes the results for each scenario with the average annual change in storage and average annual flow to the Indio Subbasin terms. Table 3.2 summarizes the MT exceedances for each scenario. Section 3.1 contains summaries of each scenario. It should again be noted that the results shown and used as criteria use the lower groundwater model's results as they are representative of the primary deeper aquifer system.

3.1 Assessment of Baseline Scenarios

Two individual scenarios were evaluated as baselines without additional recharge facilities. These two scenarios were used to assess the impact from additional recharge basins in other scenarios.

3.1.1 Scenario 1a

Scenario 1a serves as a baseline for the impact of potential projected pumping and additional recharge. There is an average loss of groundwater storage in the basin of approximately 600 AFY (Table 3.1). On average, approximately 19,000 AFY of water flowed from the GSA to the Indio Subbasin (Table 3.1). Figure 3.2 shows the water levels in the basin at the end of the simulation. The water levels flow from west to east out to the Indio Subbasin, with peak water levels of over 2,600 ft above mean sea level (amsl) and lows in the east of approximately 890 ft amsl resulting in an average gradient of 0.02 ft/ft across the Subbasin. Figures 3.3a-3.3f show the hydrographs at key wells. Three of the six wells indicated MT exceedances (18A1, 11F4, 7P4). Figure 3.3g shows the simulated water levels at Noble Creek plotted with the land surface. The peak water levels of Noble Creek are approximately 100 ft lower than the land surface, indicating that the 18,550 AFY of simulated recharge at Noble Creek does not lead to flooding or overtopping of water levels at the recharge basin.

3.1.2 Scenario 1b

Scenario 1b serves to provide a basis for the potential impact of a worst case scenario with no additional recharge basins as there is additional extraction from CWD and MBMI. Scenario 1b lost on average 5,000 AFY of storage, 4,400 AFY more lost than in Scenario 1a. Approximately 15,200 AFY flowed out to the Indio Subbasin—3,800 AFY (about 20%) less than in Scenario 1a. Figure 3.4 shows the difference in head between Scenario 1b and Scenario 1a at the end of the simulation. As expected, there are no areas where the head is higher in Scenario 1b than Scenario 1a. The biggest drawdowns are near the CWD and MBMI wells up to 110 ft lower than heads in Scenario 1a. In the western area, (the Beaumont Basin), there is not much head difference since pumping remains unchanged in this area across both scenarios. Figures 3.5a-3.5f show the hydrographs at key wells. Increased extraction with no supplemental recharge results in all key wells exceeding the MTs with more exceedances for Scenario 1b compared to 1a. Figure 3.5g also shows the simulated water levels at Noble Creek and they match up with Scenario 1a, indicating there is no risk of high water levels at the recharge basin location. Overall, the impact of no recharge with additional pumping significantly risks causing undesirable results by significantly reducing groundwater storage.

3.2 Assessment of Scenarios with Additional Recharge Facilities

Scenarios were paired to further analyze the impact of recharge locations under different increased pumping conditions. Increased pumping scenarios were grouped based on the following:

- Increased CWD Pumping
- Increased MBMI Pumping
- Increased CWD & MBMI Pumping

Each pair of simulations places identical or similar amounts of recharge at different sites. This allows the scenarios to be directly compared to one another to evaluate the effectiveness of the location of the recharge with other factors held fixed.

3.2.1 Scenario 2

Scenario 2 assessed the impact from recharging less water at Noble Creek and, instead, moving some of that recharge to the Atwell Project location. Other assumptions remained the same as Scenario 1a. Scenario 2 lost approximately, 550 AFY, only 50 AFY more than Scenario 1a. 19,000 AFY flowed out from the GSA to the Indio Subbasin, with only a 2 AFY difference compared to Scenario 1a. Compared with Scenario 1b, Scenario 2 gained 4,500 AFY more of storage each year and lost 3,800 AFY more flow to the Indio Subbasin on average.

Figure 3.6 shows the difference head between Scenario 2 and Scenario 1a at the end of the simulation. This shows that in most of the basin, there is no difference in head and it is only near the Noble Creek Facility (where recharge is lower) that water levels are lower and near the Atwell Project (where recharge is added) that heads are higher. Figures 3.7a-3.7f show the hydrographs at key wells for Scenarios 1a and 2. The same wells exceed MTs , generally by similar amounts as in the baseline. Water levels at well 3S/1E-18A1 (Figure 3.7a) located in the South Banning storage unit (considered a part of the Banning storage unit) show a slight increase in groundwater levels that does not appear to be significant. The simulated water levels at Noble Creek and the Atwell Site are shown in Figures 3.7g-h, respectively. At both recharge sites, water levels do not come within 100 ft of land surface, suggesting they are not at risk of high water levels. In summary, placing recharge at the Atwell Project location had a negligible difference on simulated groundwater conditions (except at the Noble Creek and Atwell Project locations). Since the Atwell Project is a planned project, it was included in all later scenarios with 2,500 AFY of recharge assumed at the facility.

3.2.2 Scenarios C2 and C3: Increased CWD Pumping

In Scenarios C2 and C3, CWD increased pumping by 4,300 AFY compared to the baseline and applied 4,300 AFY of recharge at two different locations. Scenario C2 placed recharge to the west at Site 2 (the Banning WWTP location). Scenario C3 placed the additional recharge at Site 3 (Robertson's Ready Mix Cabazon Pit).

Findings

Compared to Scenario 1a, Scenario C2 and C3 gained 1,000 and 600 AFY more of storage on average, respectively. Compared to Scenario 1b, Scenario C2 and C3 gained 5,400 and 5,000 AFY of storage on average, respectively. Scenario C2 performs better for groundwater storage as it gains more water and leads to higher water levels, on average, in the basin.

Compared to Scenario 1a, Scenarios C2 and C3 lost 700 and 300 AFY less flow to the Indio Subbasin, respectively. The reduction in flow to the Indio Subbasin is less than 2% for Scenario C3 and less than 4% for Scenario C2, which are both considered to be negligible impacts. Compared to Scenario 1b, Scenarios C2 and C2 lost 3,100 and 3,500 AFY more flow to the Indio Subbasin, respectively. Scenario C2 also performs better for losing less flow out to the Indio Subbasin than Scenario C3, however this relative difference is negligible compared to the total outflow to the Indio Subbasin.

Figure 3.8 shows the difference in head between Scenario C2 and Scenario 1a at the end of the simulation. Figure 3.9 shows the difference in head between Scenario C3 and Scenario 1a at the end of the simulation. There is a positive difference in head near Atwell and negative difference in head near Noble Creek matching that of Scenario 2 due to the diversion of 2,500 AFY of recharge from Noble Creek to Atwell. Figure 3.8 shows that there is a positive impact of higher water levels near Site 2 with increased water levels up to 178 ft greater than in Scenario 1a. Figure 3.8 also shows that near the areas of increased pumping, there are drawdowns up to 14 ft, with drawdowns greater than five feet extending laterally to the east. Comparatively, Figure 3.9 shows a smaller area with increased water levels with the peak increased water level being 73 ft higher than Scenario 1a at the end of the simulation period. Figure 3.9 also shows a lesser drawdown with a smaller area experiencing drawdown greater than five feet and a peak drawdown of 9 ft near the CWD wells. Overall, the maximum drawdowns are greater in Scenario C2 than Scenario C3, but the peak high water levels are higher in

Scenario C2 than Scenario C3. The reduced drawdown near increased pumping areas and also reduced maximum water levels demonstrate how the recharge from Site 3 more effectively mitigates the pumping drawdown than recharge at Site 2.

Figures 3.10a-3.10f show the hydrographs for Scenarios 1a, 1b, C3, and C2 overlain on top of each other. Four wells, 11F4, 23B1, 7M1, and 8M1, do not exceed MTs in Scenario C2 whereas five wells, 11F4, 7P4, 23B1, 7M1, and 8M1, stay above the MTs in Scenario C3. In Scenario 1b, in which pumping is increased for MBMI and CWD with no additional recharge, all MTs are exceeded so Scenarios C2 and C3 both clearly perform better than Scenario 1b. In both scenarios, a fewer number of wells exceed MTs than in Scenario 1a indicating the benefit of recharge, despite increased pumping. In the evaluation of MTs, Scenario C3 performs better than Scenario C2.

Figures 3.10g-3.10j show the simulated water levels at all employed recharge facilities, Noble Creek, Atwell, Site 2, and Site 3, respectively. Water levels at Noble Creek and Atwell match the water levels in Scenario 2 for both Scenarios C2 and C3. Simulated water levels at Site 2 are higher in Scenario C2; similarly, water levels are higher at Site 3 in Scenario C3. Neither high water level comes within 200 ft of land surface, suggesting there is not a risk of high water levels in either scenario at either potential recharge site.

In summary, Scenario C3 places the recharge closer to the increased extraction which mitigates the drawdown from the increased pumping and causes fewer MT exceedances, yet allows for more flow to leave the Subbasin to the Indio Subbasin. Scenario C2 places recharge further to the west away from the CWD pumping wells which reduces the amount of flow lost to the Indio Subbasin but doesn't mitigate drawdown or MT exceedance as effectively. While Scenario C2 increases storage relative to Scenario C3 and the baseline, much of the increase in storage isn't beneficial as it is away from the pumping centers. As Scenario C3 performs best in the way of mitigating drawdown from increased pumping and minimizing MT exceedances at key wells, recharge at Site 3 (simulated in Scenario C3) is preferred to recharge at Site 2 (simulated in Scenario C2) to offset the impact from additional CWD pumping.

3.2.3 Scenarios M1 and M3: Increased MBMI Pumping

In Scenarios M1 and M3, MBMI increased pumping by 3,800 AFY compared to the baseline. Scenario M1 applies 4,500 AFY of recharge at Site 1 (the Robertsons Ready Mix Banning Pit). Scenario M3 applies 4,300 AFY of recharge (200 AFY less than Scenario M1) at Site 3 (the Robertsons Ready Mix Cabazon Pit). Scenario M3 applies less recharge than Scenario M1 because it uses the same recharge inputs as Scenario C3. This difference of 200 AFY will be factored into the evaluation.

Findings

Compared to Scenario 1a, Scenarios M1 and M3 gained 1,200 and 600 AFY of storage on average, respectively. Compared to Scenario 1b, Scenarios M1 and M3 gained 5,600 and 5,100 AFY of storage on average, respectively. Scenario M1 performs better for groundwater storage as it gains more water and leads to higher water levels, on average, in the basin.

Compared to Scenario 1a, Scenario M1 lost 200 AFY less flow and Scenario M3 lost 200 AFY more flow to the Indio Subbasin, respectively. The differences in losses through outflows to the Indio Subbasin for both Scenarios M1 and M3 are roughly 1% of the total outflow and are considered to be negligible. Compared to Scenario 1b, Scenarios M1 and M3 lost 3,600 and 4,000 AFY more flow to the Indio

Subbasin, respectively. Scenario M1 performs better for losing less flow out to the Indio Subbasin than Scenario M3, however this relative difference is negligible compared to the total outflow to the Indio Subbasin.

Figure 3.11 shows the difference in head between Scenario M1 and Scenario 1a at the end of the simulation. Figure 3.12 shows the difference in head between Scenario M3 and Scenario 1a at the end of the simulation. There is a positive difference in head near Atwell and negative difference in head near Noble Creek matching that of Scenario 2 due to the diversion of 2,500 AFY of recharge from Noble Creek to Atwell. Figure 3.11 shows that there is a positive impact of higher water levels near Site 1 with increased water levels up to 120 ft near Site 1. Even east of the fault, where the effect of the recharge is lessened, there is no negative water level impact at the end of the simulation period in Scenario M1. It also is shown that the increased water levels are somewhat constrained by the flow barriers (faults) as it propagates east along the northern boundary; conversely, this can be seen as drawdowns from increased MBMI pumping not propagating as much past the fault to the north that runs east-west, above well MB-7. Comparatively, Figure 3.12 shows a lesser positive effect of a smaller amount of recharge with a maximum increase in water levels relative to Scenario 1a of 74 ft at the end of the simulation period. There are also no negative head differences comparing Scenario M3 to Scenario 1a indicating how placing recharge nearer the pumping is better able to mitigate drawdown. Placing the recharge closer to the extraction and to the fault allows the increase in head to propagate past the fault more than in Scenario M1. Consequently, even in the area where there is increased pumping, the water levels are higher due to the greater volume of recharge in this period.

Figures 3.13a-3.13f show the hydrographs for Scenarios 1a, 1b, M1, and M3 overlain on top of each other. Four wells, 11F4, 23B1, 7M1, and 8M1, do not exceed MTs in Scenario M1 whereas five wells, 11F4, 7P4, 23B1, 7M1, and 8M1, stay above MTs in Scenario M3. In Scenario 1b, in which pumping is increased for MBMI and CWD with no additional recharge, all MTs are exceeded so Scenarios M1 and M3 both clearly perform better than Scenario 1b. Scenario M3 performs the best among all scenarios in keeping water levels above MTs, even including the baseline. Placing recharge closer to the increased MBMI extraction helped bring 7P4 from exceedance in Scenarios 1a and M1, to above the threshold in Scenario M3 despite the increase in pumping. In the evaluation of MTs, Scenario M3 performs better than Scenario M1.

Figures 3.13g-3.13j show the simulated water levels at all employed recharge facilities, Noble Creek, Atwell, Site 1, and Site 3, respectively. Water levels at Noble Creek and Atwell match the water levels in Scenario 2 for both Scenarios C2 and C3. Simulated water levels at Site 1 are higher in Scenario M1; similarly, water levels are higher at Site 3 in Scenario M3. Neither high water level comes within 500 ft of land surface, suggesting there is not a risk of high water levels in either scenario at either potential recharge site.

In summary, Scenario M3 placed recharge closer to the increased extraction, which mitigated drawdowns from increased pumping and reduced MT exceedances very effectively. Scenario M1 placed recharge further to the west which increased water levels notably but did not as effectively mitigate drawdown from pumping. This increase in water levels resulted in an overall greater positive change in storage in the Subbasin, but the peak water levels are not in areas of significant production so these high water levels are less of a benefit to the Subbasin. Considering that Scenario M3 applied 200 AFY less recharge, recharge at Site 3 (Scenario M3) is preferred to recharge at Site 1 (Scenario M1) due to its impact on mitigating additional MBMI pumping effects more effectively and reducing the MT exceedances by a greater amount.

3.2.4 Scenarios CM14 and CM124: Increased CWD & MBMI Pumping

In Scenarios CM14 and CM124, both CWD and MBMI increased pumping by 4,300 AFY and 3,800 AFY, respectively, compared to the baseline. Scenario CM14 applies 4,500 AFY of recharge at Site 1 (Robertsons Ready Banning Pit), as well as 4,300 AFY of recharge at Site 4 (the New Cabazon Area). Scenario CM124 also applies 4,500 AFY of recharge at Site 1 (Robertsons Ready Banning Pit), Site 2 (Banning WWTP site), and 2,300 AFY and 2,000 AFY of recharge at Site 4 (new Cabazon Area, respectively).

Findings

Compared to Scenario 1a, Scenarios CM14 and CM124 gained 1,200 and 1,600 AFY more of storage on average, respectively. Compared to Scenario 1b, Scenarios CM14 and CM124 gained 5,600 and 6,000 AFY more of storage on average, respectively. Scenario CM124 performs better for groundwater storage as it gains more water and leads to higher water levels, on average, in the basin.

Compared to Scenario 1a, Scenario CM14 increased the amount of flow lost to Indio by 100 AFY (less than 1% of the baseline Indio flow losses) and Scenario CM124 decreased the amount of flow lost to Indio by 400 AFY (about 2% of the baseline Indio flow losses). Compared to Scenario 1b, Scenarios CM14 and CM124 decreased the amount of flow lost to Indio by 3,900 and 3,500 AFY, respectively. Scenario CM124 performs better for losing less flow out to the Indio Subbasin than Scenario CM14, however this relative difference is negligible compared to the total outflow to the Indio Subbasin.

Figure 3.14 shows the difference in head between Scenario CM14 and Scenario 1a at the end of the simulation. Figure 3.15 shows the difference in head between Scenario CM124 and Scenario 1a at the end of the simulation. There is a positive difference in head near Atwell and negative difference in head near Noble Creek matching that of Scenario 2 due to the diversion of 2,500 AFY of recharge from Noble Creek to Atwell. Figure 3.14 shows that there is a positive impact of higher water levels near Site 1 with increased water levels up to 114 ft near Site 1. East of the fault, where the pumping is concentrated, there is no negative head difference when compared with Scenario 1a. The recharge from Site 4 is able to mitigate drawdowns from CWD and MBMI wells. Comparatively, Figure 3.15 shows that Scenario CM124 increases water levels on average more with a maximum increase in water levels relative to Scenario 1a of 137 ft and a maximum drawdown of 3 ft at the end of the simulation period. Scenario CM124 observes greater drawdown and greater increases near the increased pumping locations and potential recharge sites, respectively, compared to Scenario CM14. This demonstrates how recharging at Site 4 better mitigates drawdowns near the increased pumping locations.

Figures 3.16a-3.16f show the hydrographs for Scenarios 1a, 1b, CM14, and CM124 overlain on top of each other. Only two wells, 18A1 and 7P4, dropped below the MT in both scenarios, where 18A1 dropped below the MT in all scenarios. However, key wells 23B1 and 7M1 fell below the MT briefly only in Scenario CM124. In Scenario 1b, in which pumping is increased for MBMI and CWD with no additional recharge, all MTs are exceeded demonstrating that the recharge from Scenarios CM14 and CM124 provide a clear benefit. Due to the exceedances at 23B1 and 7M1, Scenario CM14 performs better than Scenario CM124.

Figures 3.17g-k show the simulated water levels at all employed recharge facilities, Noble Creek, Atwell, Site 1, Site 2, and Site 4, respectively. Water levels at Noble Creek and Atwell match the water levels in Scenario 2 for both Scenarios CM14 and CM124. None of the high water levels at Site 1, 2, or 4 come within 500 ft of land surface, suggesting there is not a risk of high water levels in either scenario at either potential recharge site.

In summary, Scenario CM14 placed more recharge closer to the increased extraction, which mitigated the drawdown effects of increased pumping and minimized MT exceedances better than Scenario CM124, with only an insignificant increase in outflows from the Subbasin to the Indio Subbasin. Scenario CM124 increased water levels to the west more than Scenario CM14 while causing more, yet a small amount of, drawdown compared to Scenario CM14. Despite the difference in water lost to the Indio Subbasin favoring Scenario CM124 to Scenario CM14, the increase in storage in Scenario CM124 was not in key beneficial areas. Therefore, spreading recharge between Sites 1 and 4 (Scenario CM14) is preferred to spreading it across Sites 1, 2, and 4 (Scenario CM124) due to its ability to better mitigate drawdown in the east from increased pumping by both MBMI and CWD and reduce MT exceedances.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The nine scenarios simulated demonstrate the different impacts that increased pumping and additional managed recharge may have on the basin. Collectively, they can be used to assess the beneficial impact from each potential recharge location. The key impacts that each potential recharge site is evaluated for are:

- How they impact water levels in key parts of the Subbasin; mitigating drawdown and minimizing MT exceedances
- How much water is comparatively lost to the Indio Subbasin relative to the recharge placement. However, the differences in the amount of flow to the Indio Subbasin across different scenarios were not considered very significant; the difference in flow for each scenario never exceeded 5% of the total baseline flow to the Indio Subbasin.

These criteria are designed to capture maximization of the beneficial use that each recharge basin can provide while minimizing the loss of water as outflow. Table 4.1 provides the ranking of each recharge location based on the above criteria and lists a cumulative ranking based on the combined criteria. The potential recharge sites are ranked as follows:

1. Site 3 is ranked as the best performing potential recharge location due to its ability to mitigate drawdown and minimize MT exceedances. Scenarios C3 and M3 are the only scenarios to not observe MT exceedances at key well 7P4 and they are also the only scenarios placing recharge at Site 3. Site 3 had insignificant increases in outflows to the Indio Subbasin relative to recharge at Sites 1 and 2, which is greatly outweighed by the positive impact Site 3 has on water levels in key areas of the basin where major groundwater production centers are located.
2. Site 2 is ranked second and is located farthest to the west. Site 2 does not perform as well in terms of mitigating drawdowns near the increased pumping centers relative to Sites 3 and 4. Site 2 increases the overall Subbasin storage the most, but these increases are away from the major pumping centers reducing the actual benefit to the Subbasin. While it performs well in terms of minimizing losses to the Indio subbasin, the benefits of these reductions are negligibly small. Despite not reducing MT exceedances as much as Site 3, this location does still reduce the number of exceedances relative to either baseline alternative, Scenarios 1a and 1b, and as effectively as Site 4 while having the added benefits of greater overall basin storage and slightly less flow lost to the Indio Subbasin.
3. Site 4 is ranked third for its ability to mitigate drawdowns in the eastern Cabazon from increased CWD or MBMI pumping, yet it performs only as well as Site 2 does in terms of minimizing MT exceedances. Site 4 is in a great location to keep water levels near the increased production areas from dropping too low. Site 4 does perform the worst in terms of losing the most flow to the Indio Subbasin, however the differences in Indio subsurface flow are not significant.
4. Site 1 is ranked fourth due to its location being farthest from any of the main pumping centers. Site 1 does well to keep water levels above MTs compared to the baseline, but it is not able to effectively mitigate drawdown as well as the other potential recharge sites. Site 1 does perform well in terms of how little flow it loses out to Indio Subbasin due to its westernmost location, but the difference is not significant.

Placing recharge in the east (Sites 3 and 4), near increased production, effectively mitigates drawdown from the wells with increased pumping. Placing recharge in the west (Sites 1 and 2) provides a negligibly small benefit by reducing the amount of flow lost to the Indio Subbasin but it does not mitigate drawdown from the increased pumping areas as effectively. Recharge in the west increases water levels also in areas that are not major production areas as simulated in the model. Therefore, these water level increases are not as beneficial.

In Scenario 1b, the alternative with no additional recharge is explored. In this scenario, it is found that water levels in all wells would drop below their MTs. Scenario 1b performs well in reducing subsurface outflow to the Indio Subbasin, but with a great impact to water levels. An average of nearly 4,500 acre-feet more of storage is lost each year compared to Scenario 1a. It should be stated that the groundwater modeling simulations demonstrated that in all other scenarios, the impact of recharge was clearly positive despite commensurate increases in extraction.

Scenario 2 demonstrates that there is negligible impact, positive or negative, on moving some recharge from Noble Creek to the Atwell Project location. While there is negligible impact from the Atwell Project location, the Backbone pipeline would be located very close to the Atwell project meaning that incremental costs would be minimal.

While there is uncertainty in how the effect of the recharge will propagate through the model from the surface down to the deeper aquifer system, the same general conclusions hold when recharge is placed at the surface rather than directly to the lower aquifer system. There are lower water levels as more water is constrained in the unsaturated zone and the shallow aquifer which lead to more MT exceedances and less flow lost to the Indio Subbasin. However, the relative performance of the scenarios still indicates that the same consequences of placing recharge in eastern versus western locations exist.

4.2 Recommendations

Based on the above analyses, general recommendations are provided below to support identification of the most beneficial location of potential recharge basins. These recommendations can also be interpreted for the cases of if CWD or MBMI pumping increases are greater priorities, respectively.

- Site 3 is the preferred site for its ability to most effectively mitigate drawdown and protect key wells from exceeding MTs with an insignificant difference in the amount of flows lost to Indio relative to other potential recharge sites.
    - Site 2 is the runner-up for striking a balance of reducing flows lost out to Indio while reducing MT exceedances relative to the baseline.
    - Site 4 ranks third for its ability to minimize MT exceedances when both CWD and MBMI increase pumping.
    - Site 1 ranks fourth for its ability to raise water levels in the basin without losing flow to the Indio Subbasin.
- Appendix A details the uncertainty of how recharge may propagate from the shallow aquifer system to the deeper aquifer system. Due to the uncertainty in vertical permeability characteristics in the unsaturated zone between the shallow and deep aquifers throughout the Subbasin, it is recommended that additional field investigations be performed to assess the

subsurface geologic properties at the proposed recharge locations to ensure maximal efficiency and benefit from the recharge basins.

5.0 REFERENCES

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FIGURES

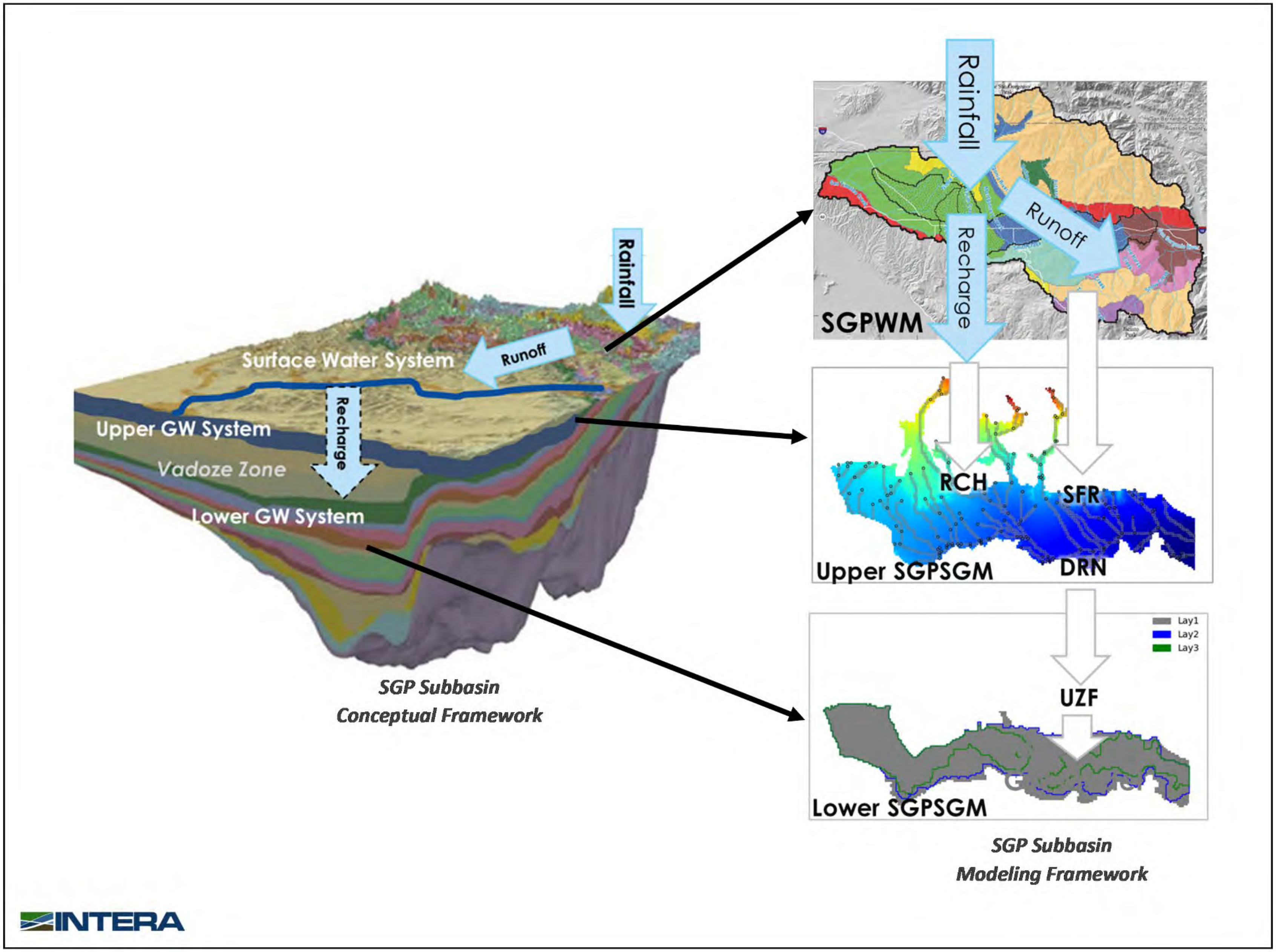

Figure 1.1 Model Framework.

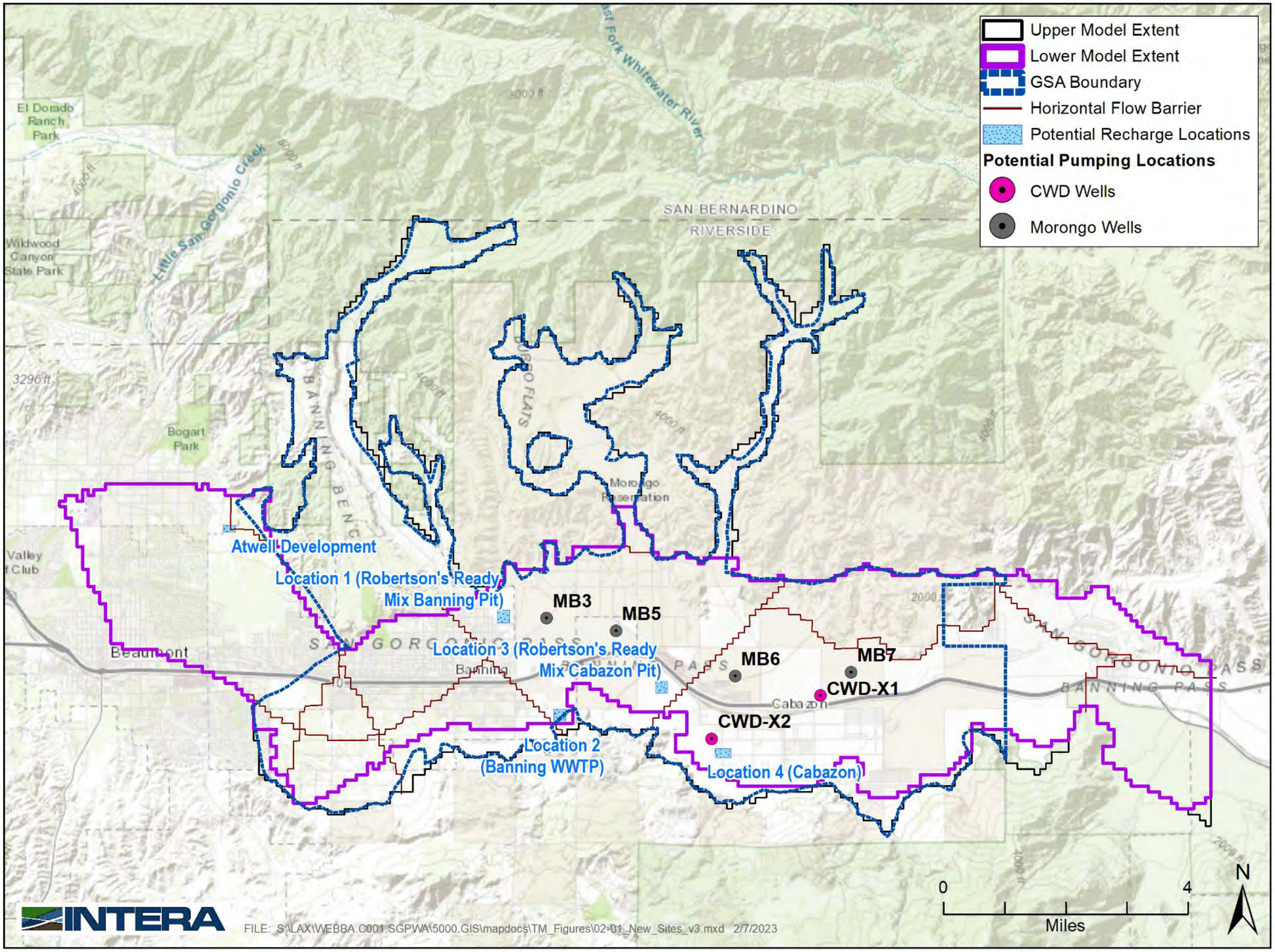

Figure 2.1 Potential Recharge and Pumping Locations.

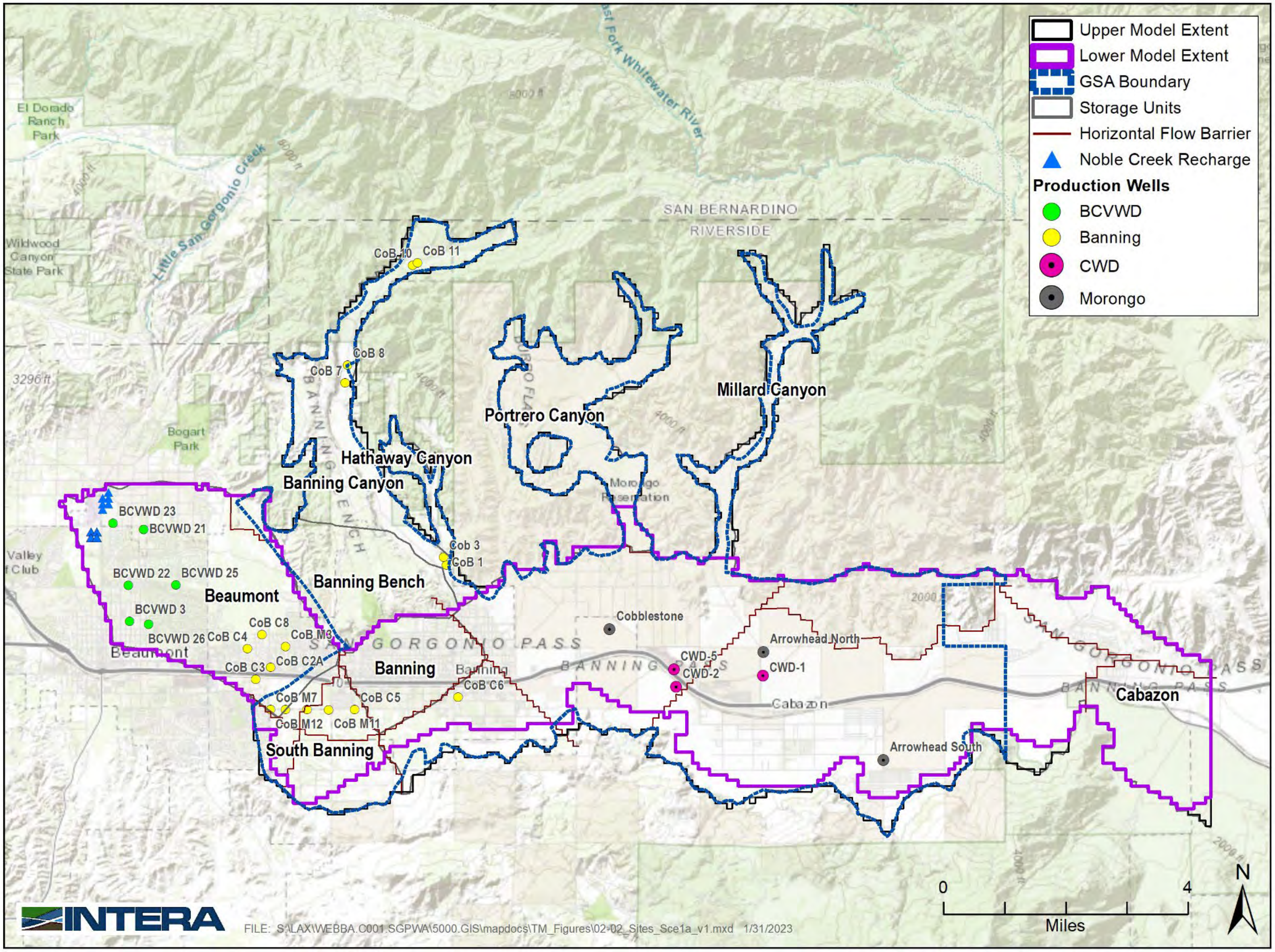

Figure 2.2 Projected Recharge and Pumping Locations - Scenario 1a.

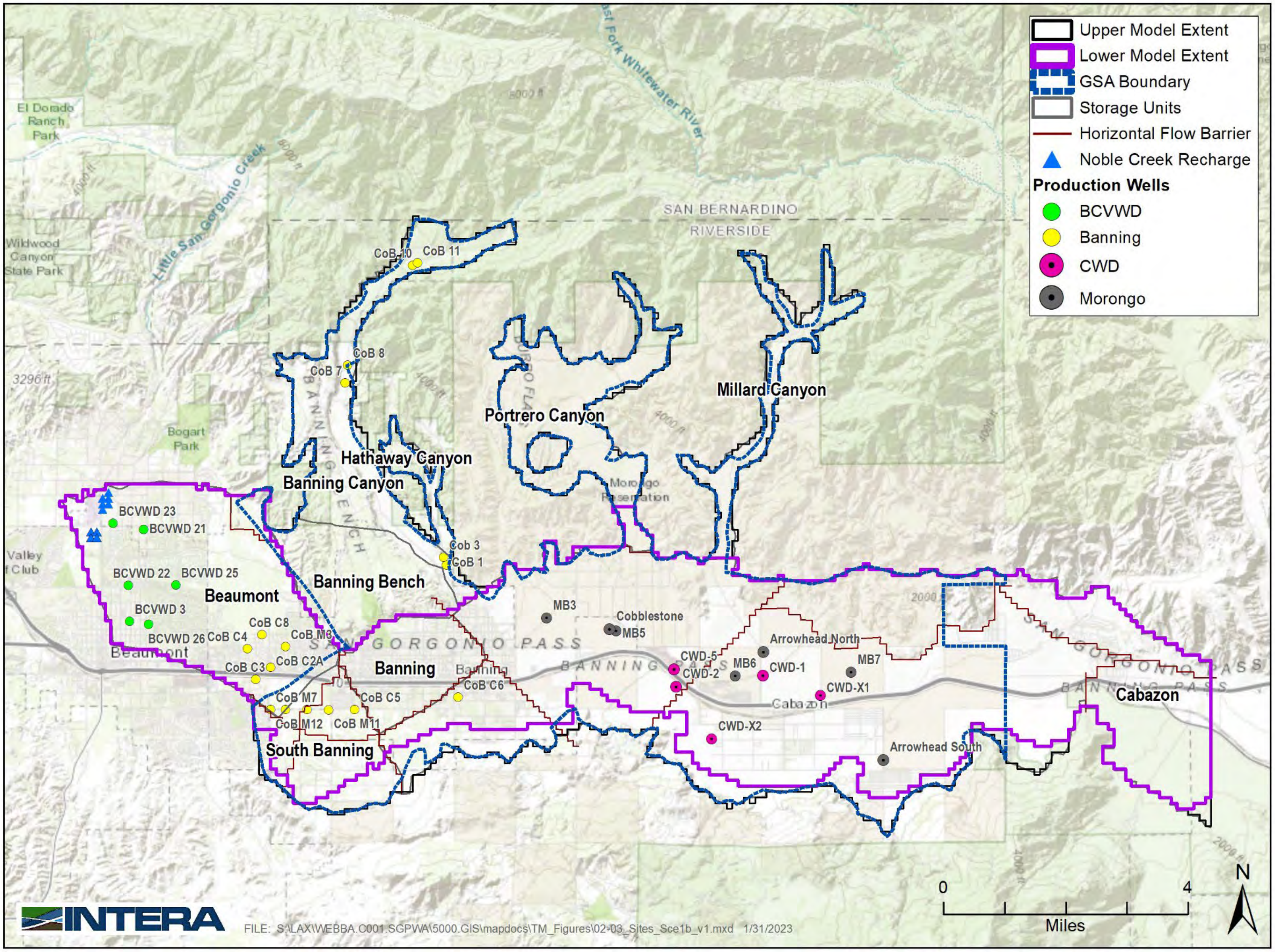

Figure 2.3 Projected Recharge and Pumping Locations - Scenario 1b.

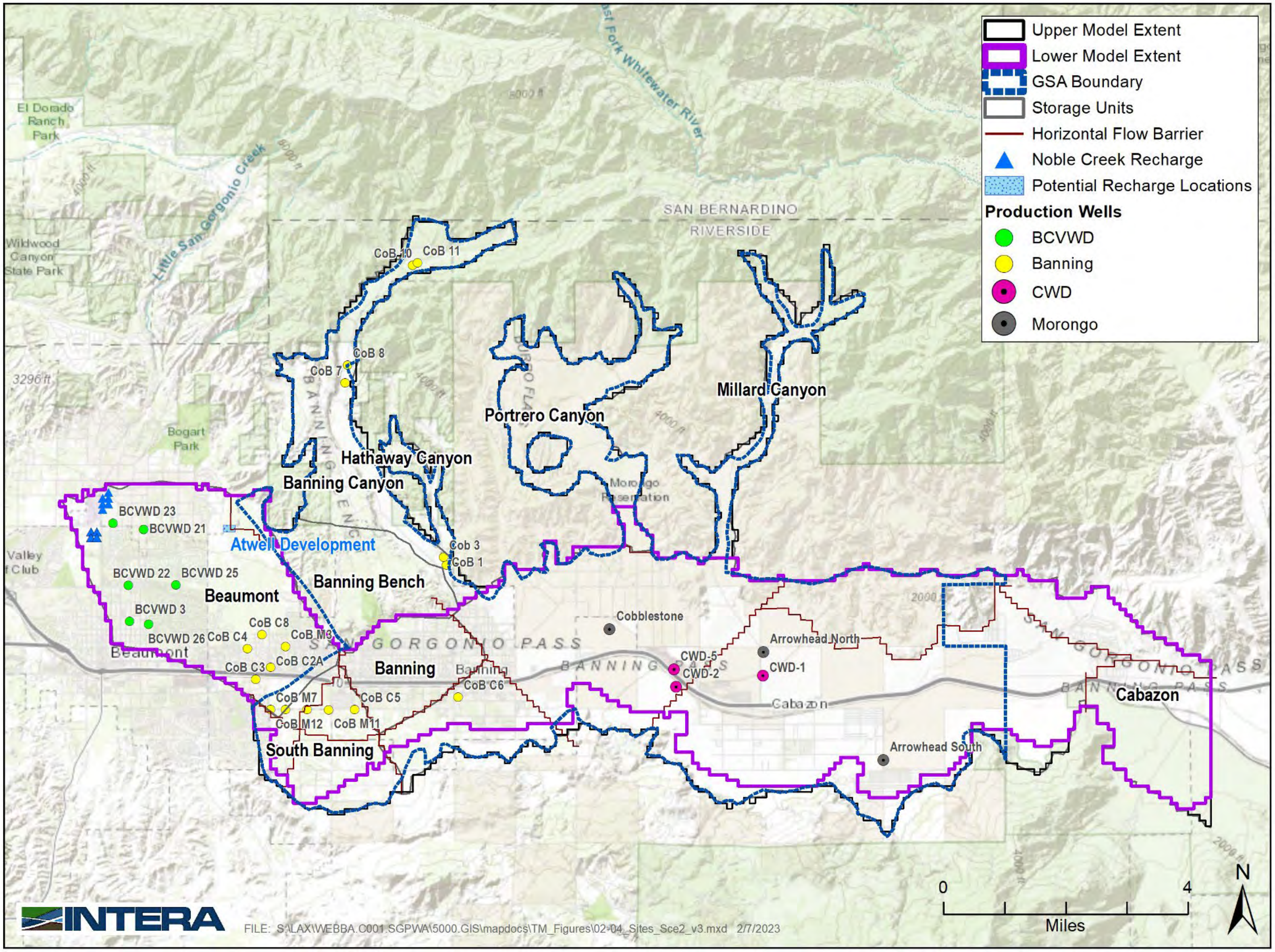

Figure 2.4 Projected Recharge and Pumping Locations - Scenario 2.

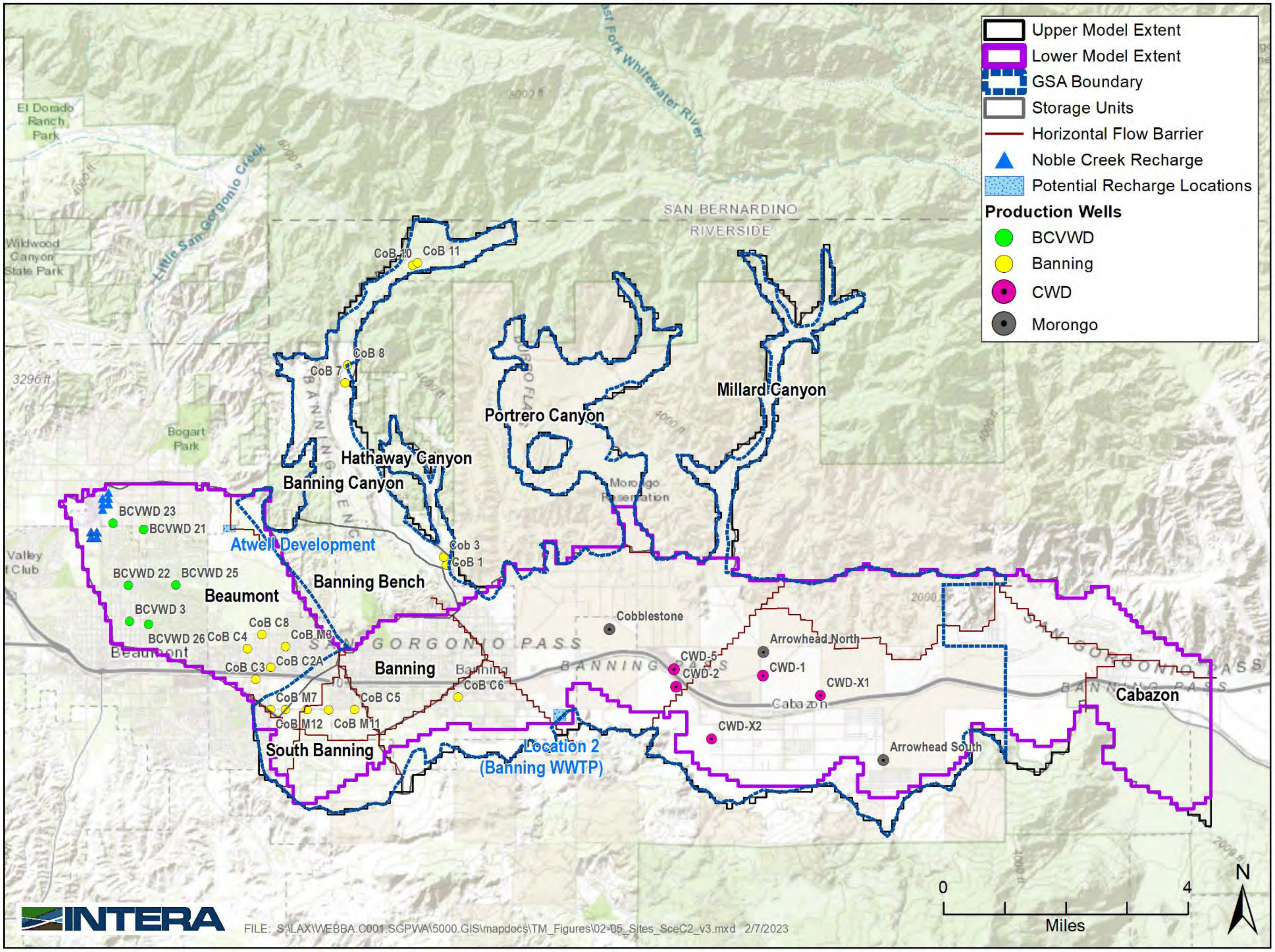

Figure 2.5 Projected Recharge and Pumping Locations - Scenario C2.

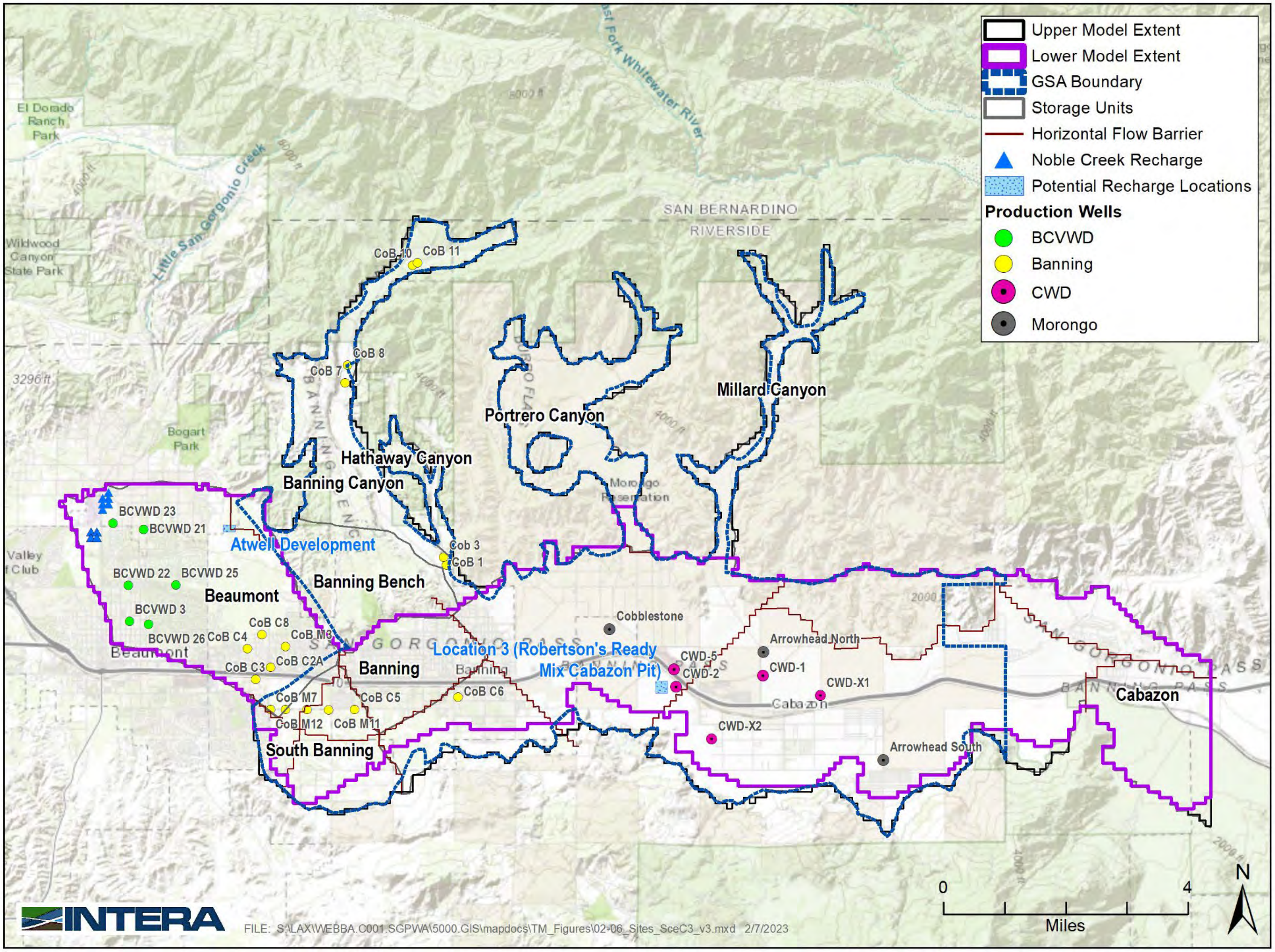

Figure 2.6 Projected Recharge and Pumping Locations - Scenario C3.

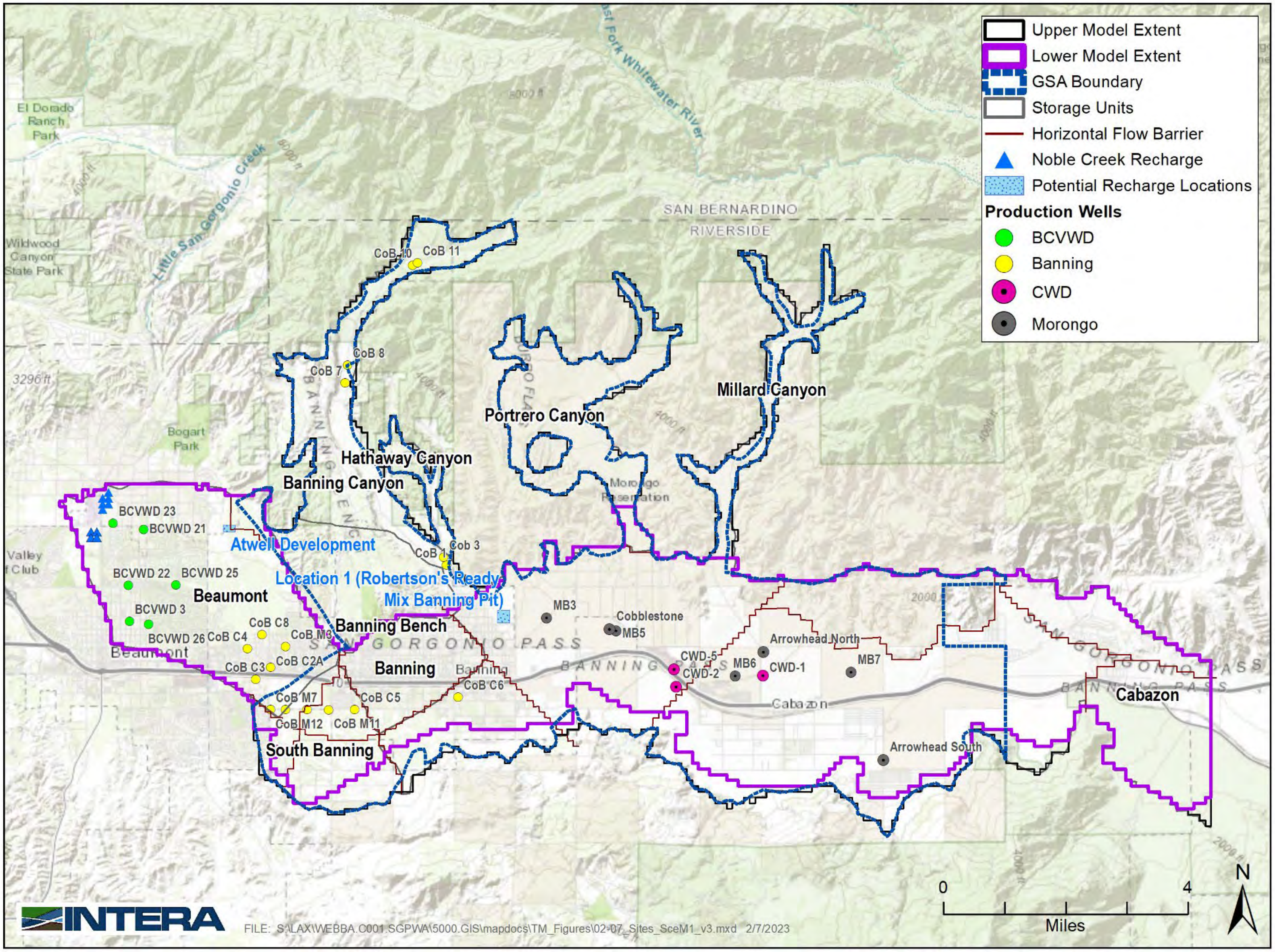

Figure 2.7 Projected Recharge and Pumping Locations - Scenario M1.

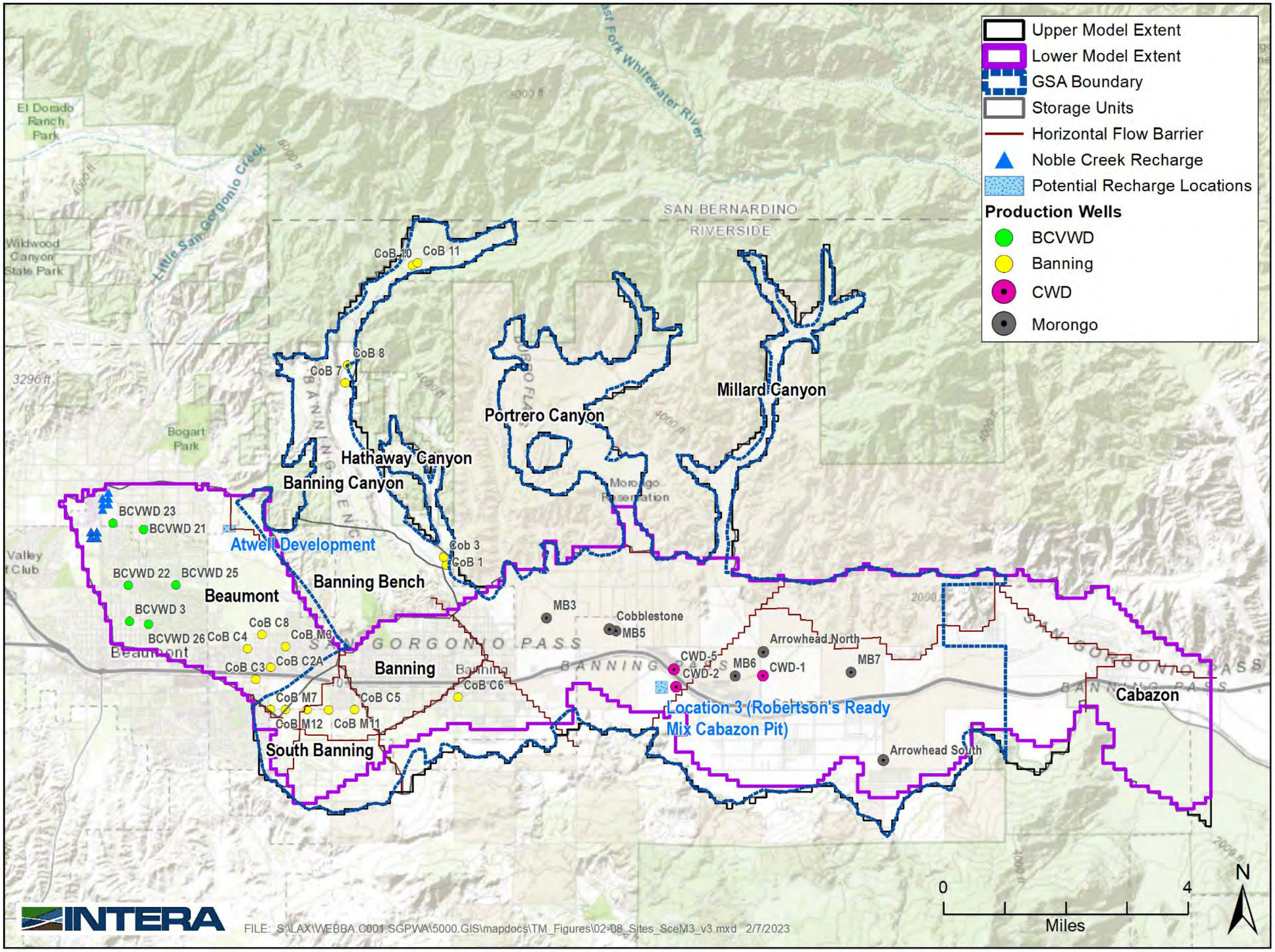

Figure 2.8 Projected Recharge and Pumping Locations - Scenario M3.

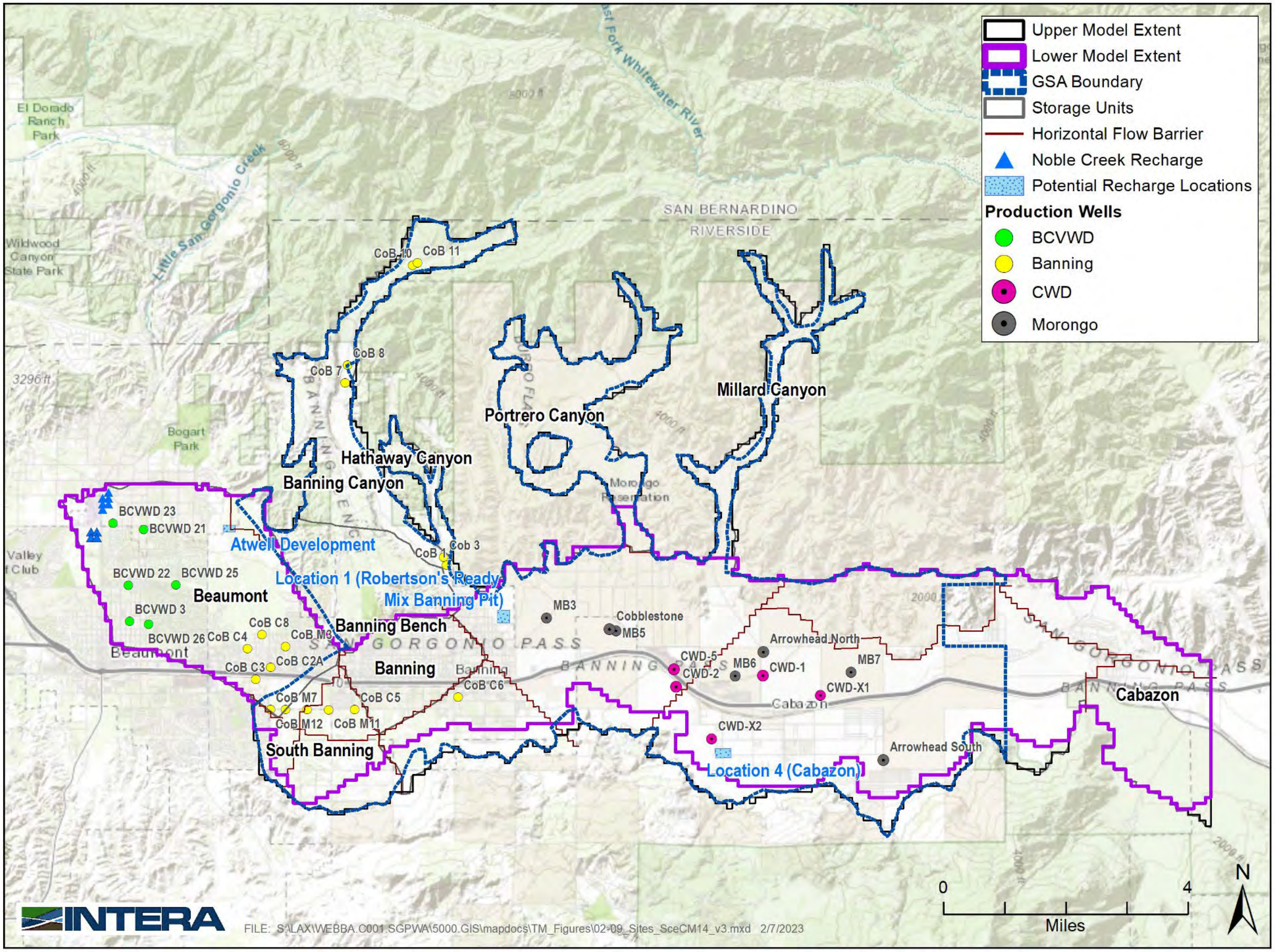

Figure 2.9 Projected Recharge and Pumping Locations - Scenario CM14.

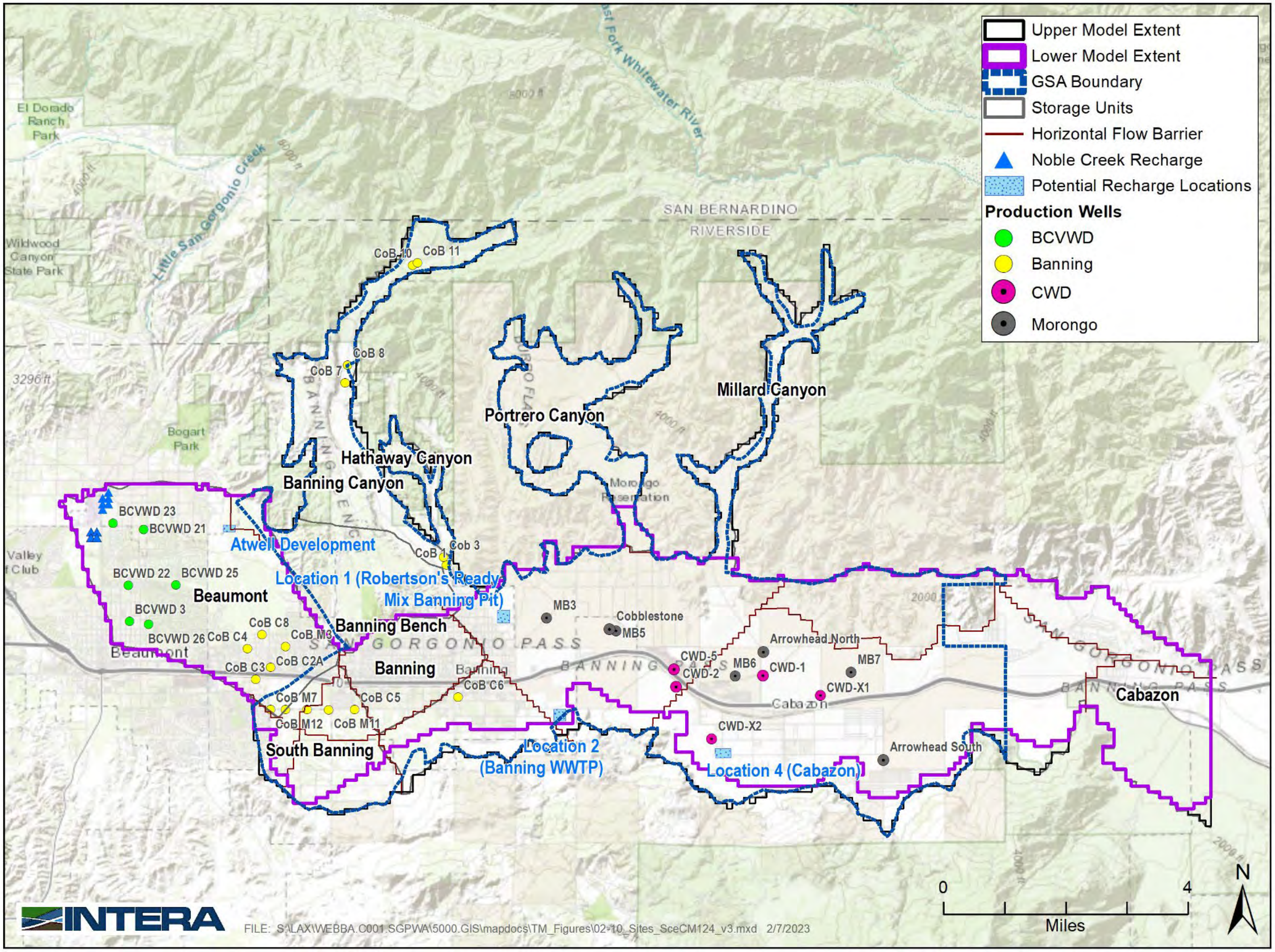

Figure 2.10 Projected Recharge and Pumping Locations - Scenario CM124.

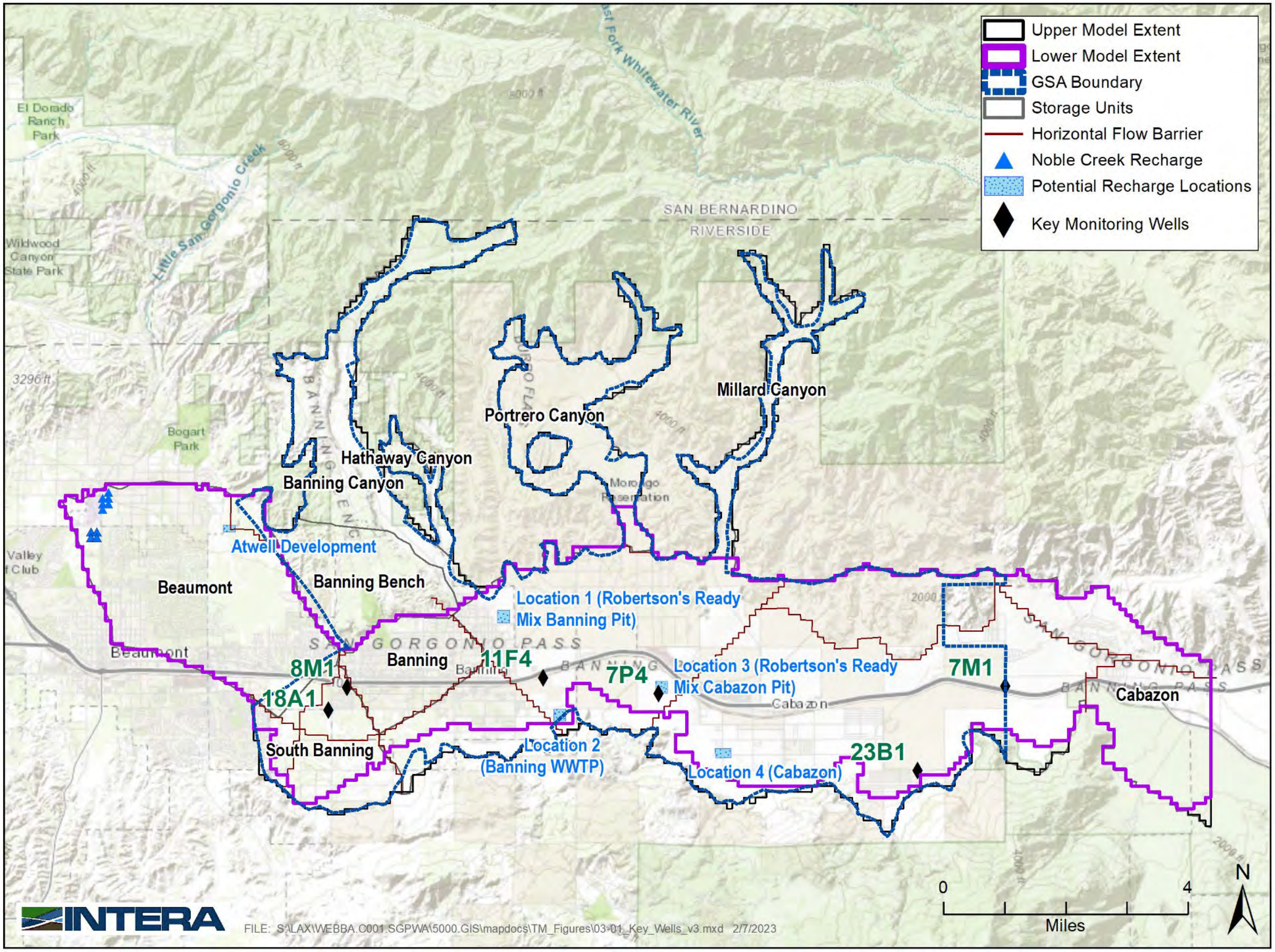

Figure 3.1 Locations of Key Monitoring Wells.

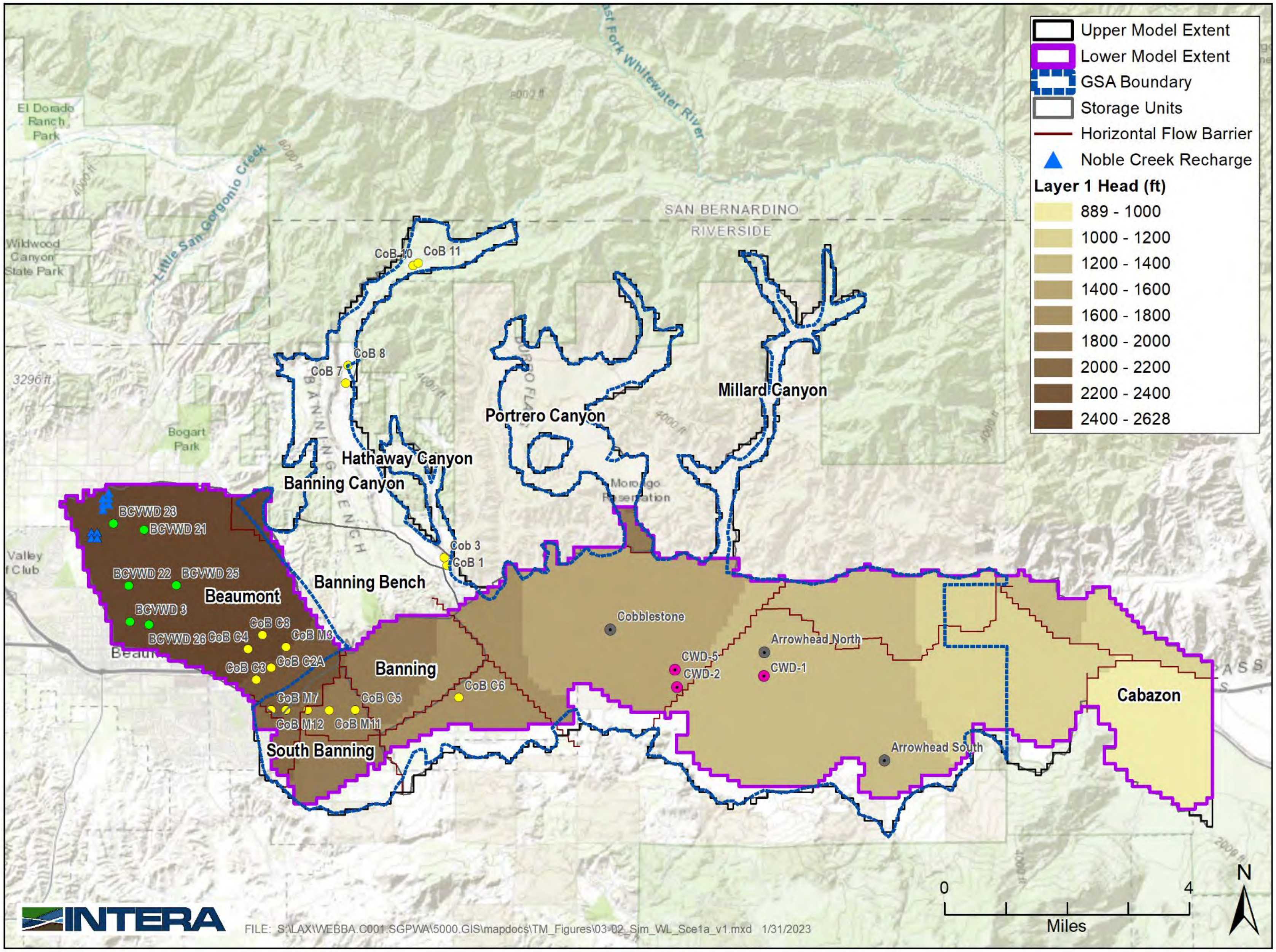

Figure 3.2 Simulated Water Levels - Scenario 1a.

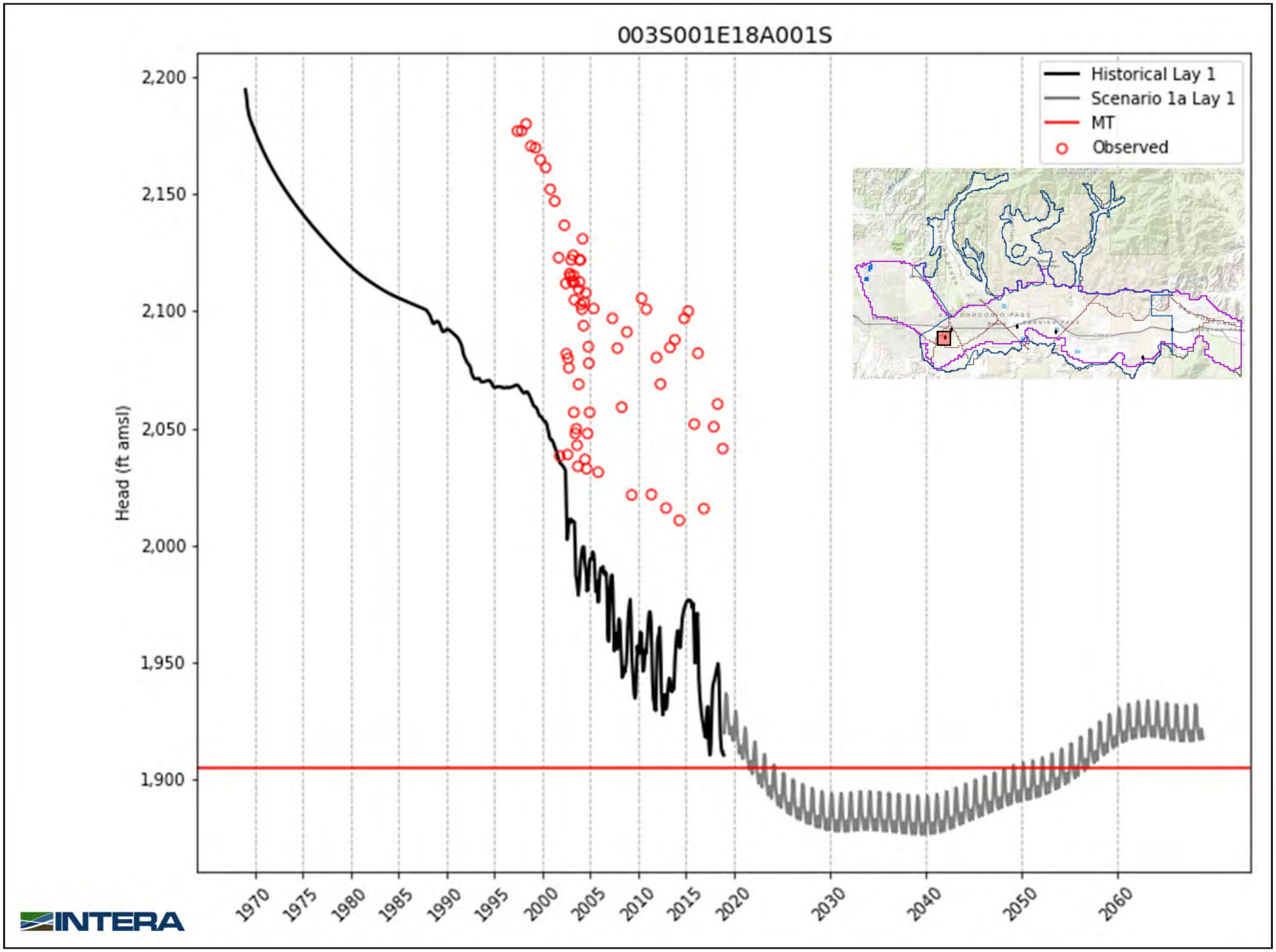

Figure 3.3a Hydrographs for 18A1 - Scenario 1a.

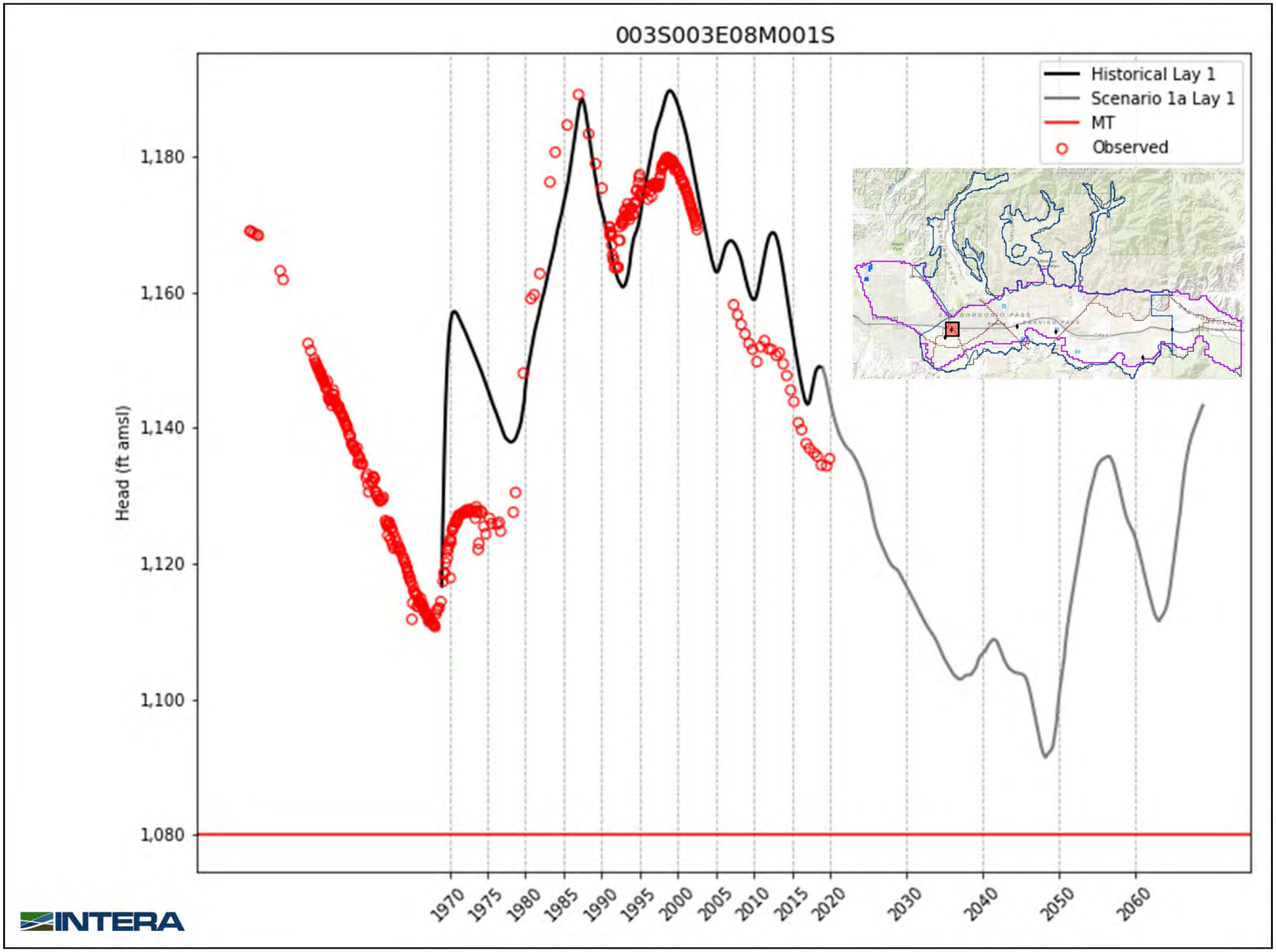

Figure 3.3b Hydrographs for 8M1 - Scenario 1a.

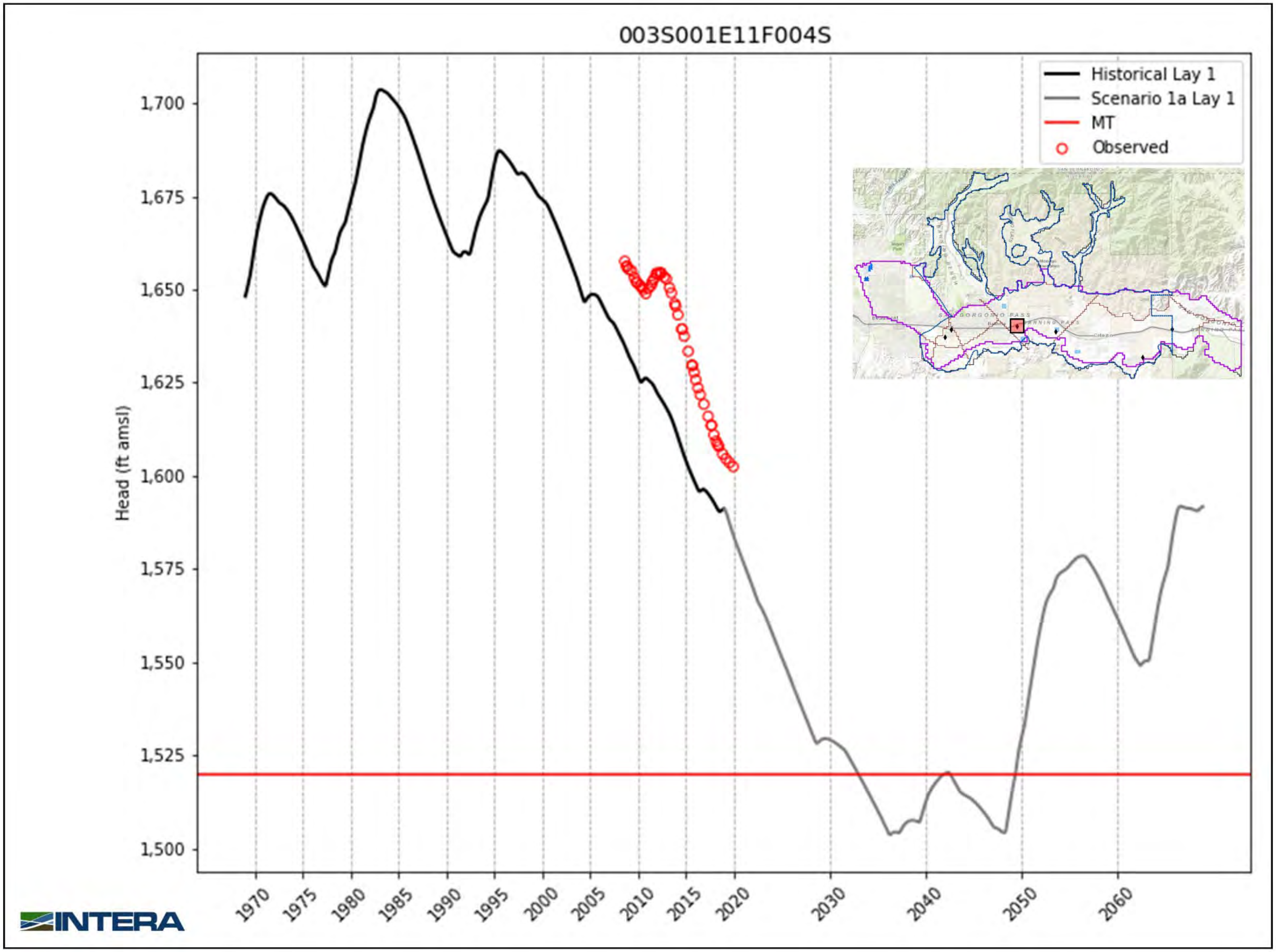

Figure 3.3c Hydrographs for 11F4 - Scenario 1a.

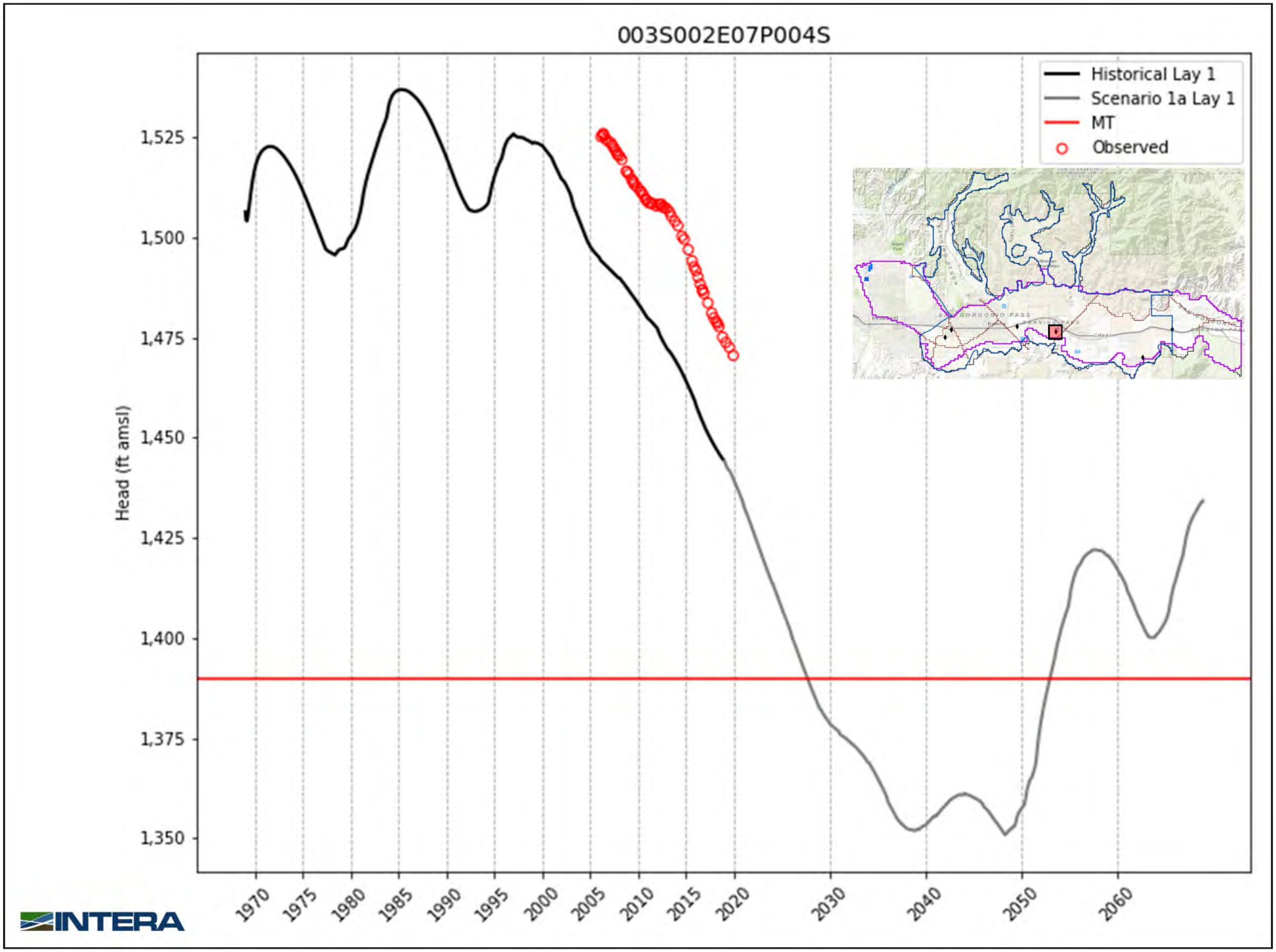

Figure 3.3d Hydrographs for 7P4 - Scenario 1a.

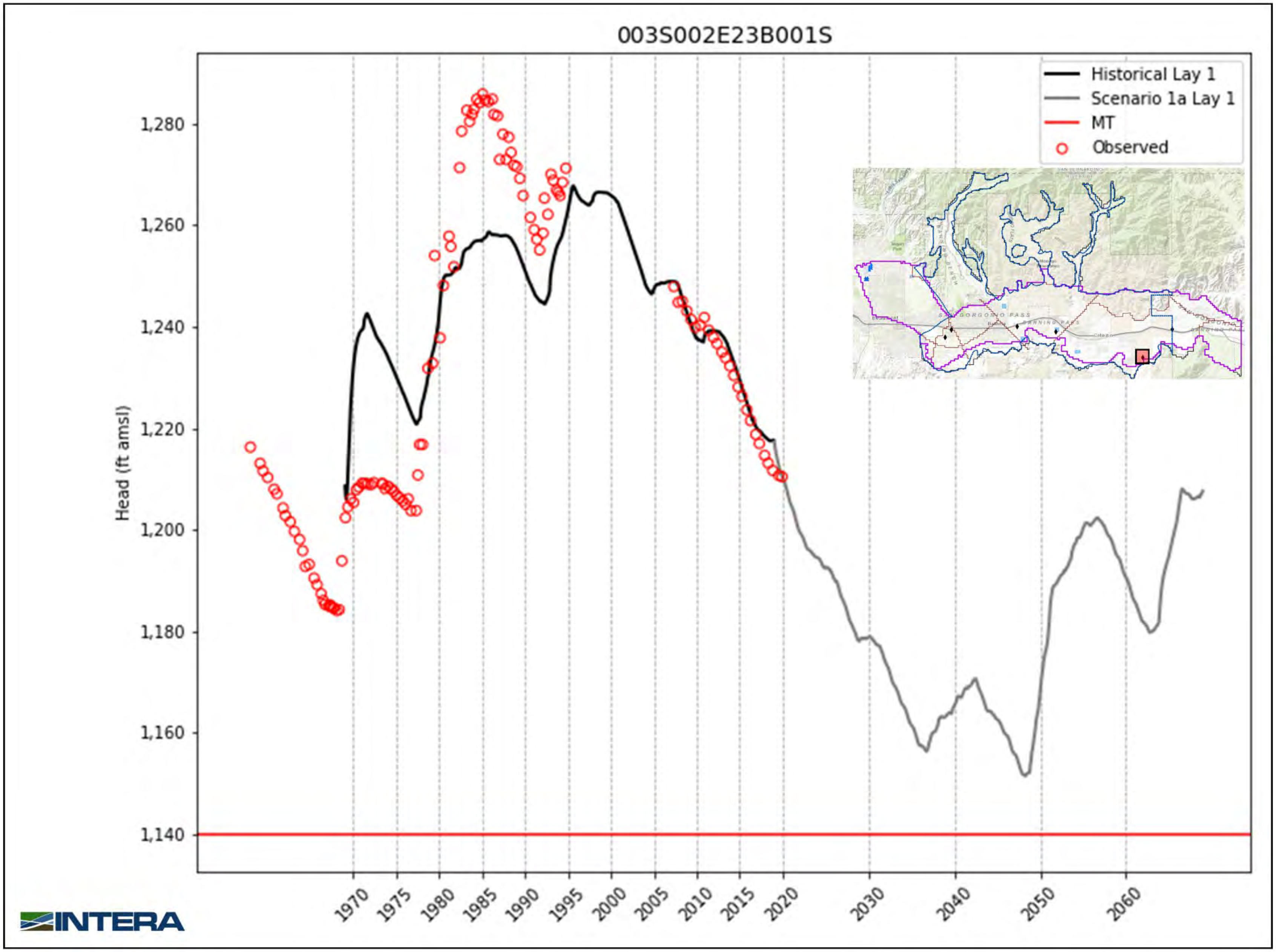

Figure 3.3e Hydrographs for 23B1 - Scenario 1a.

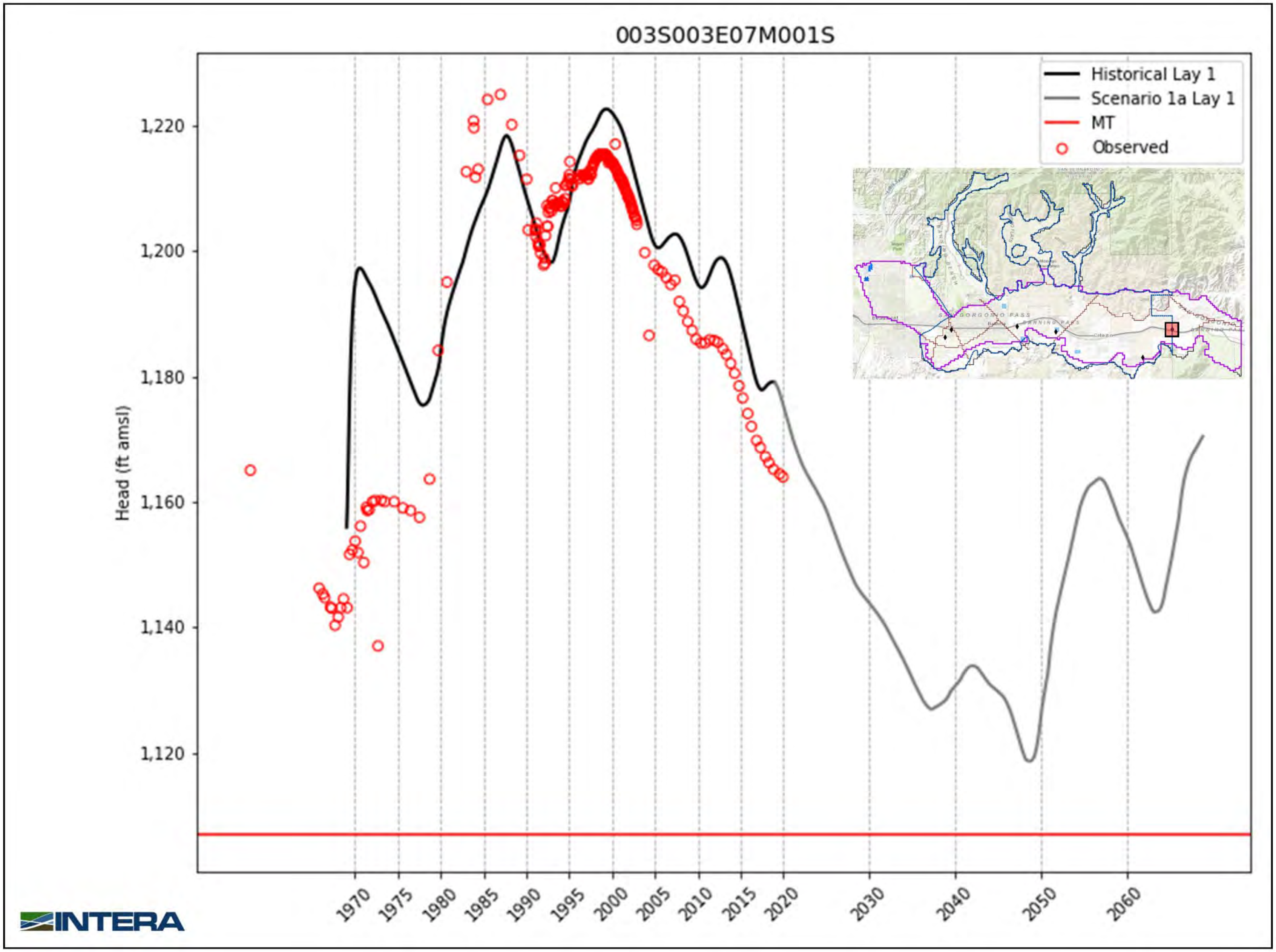

Figure 3.3f Hydrographs for 7M1 - Scenario 1a.

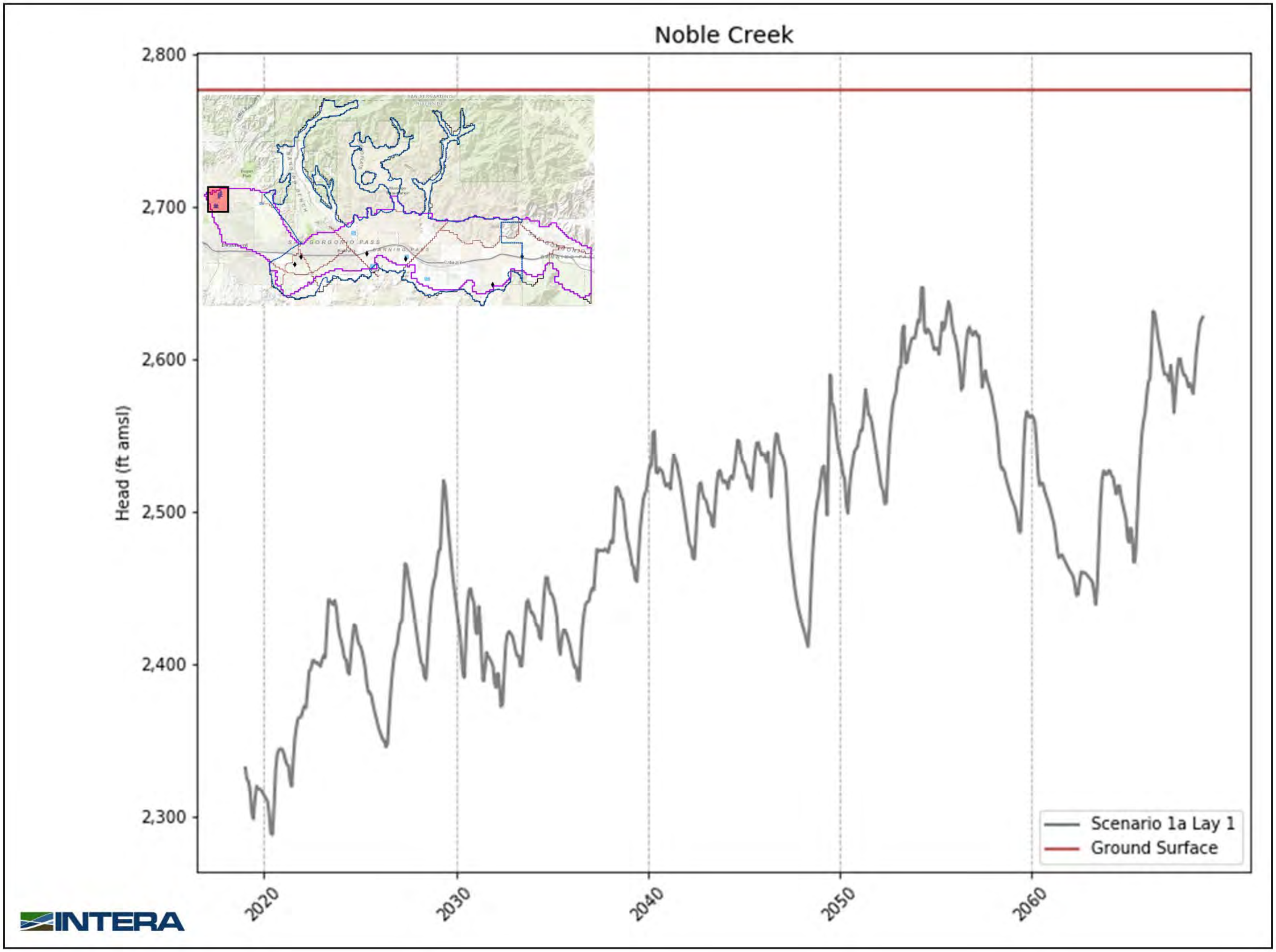

Figure 3.3g Hydrographs for Noble Creek - Scenario 1a.

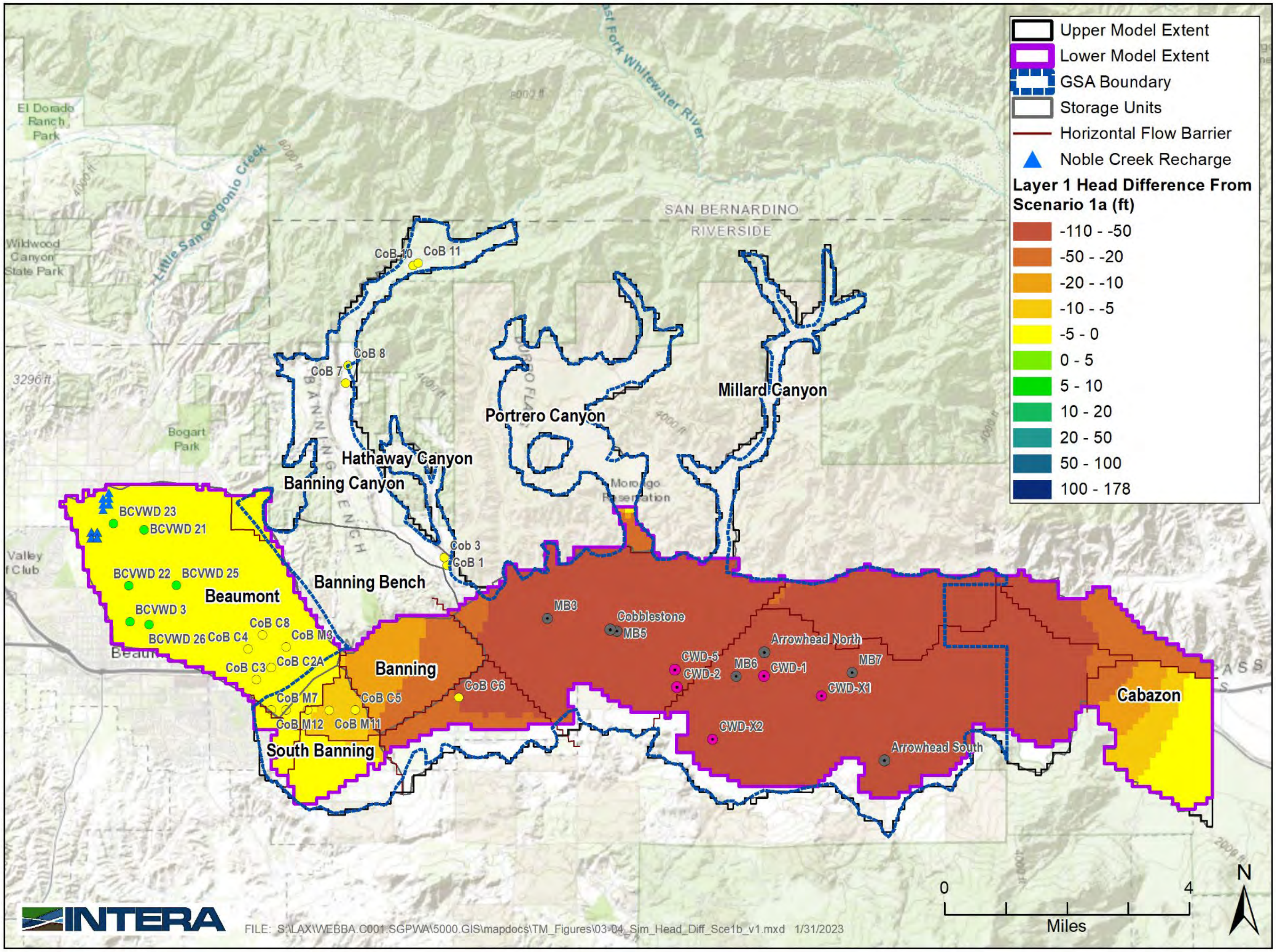

Figure 3.4 Simulated Head Difference - Scenarios 1a and 1b.

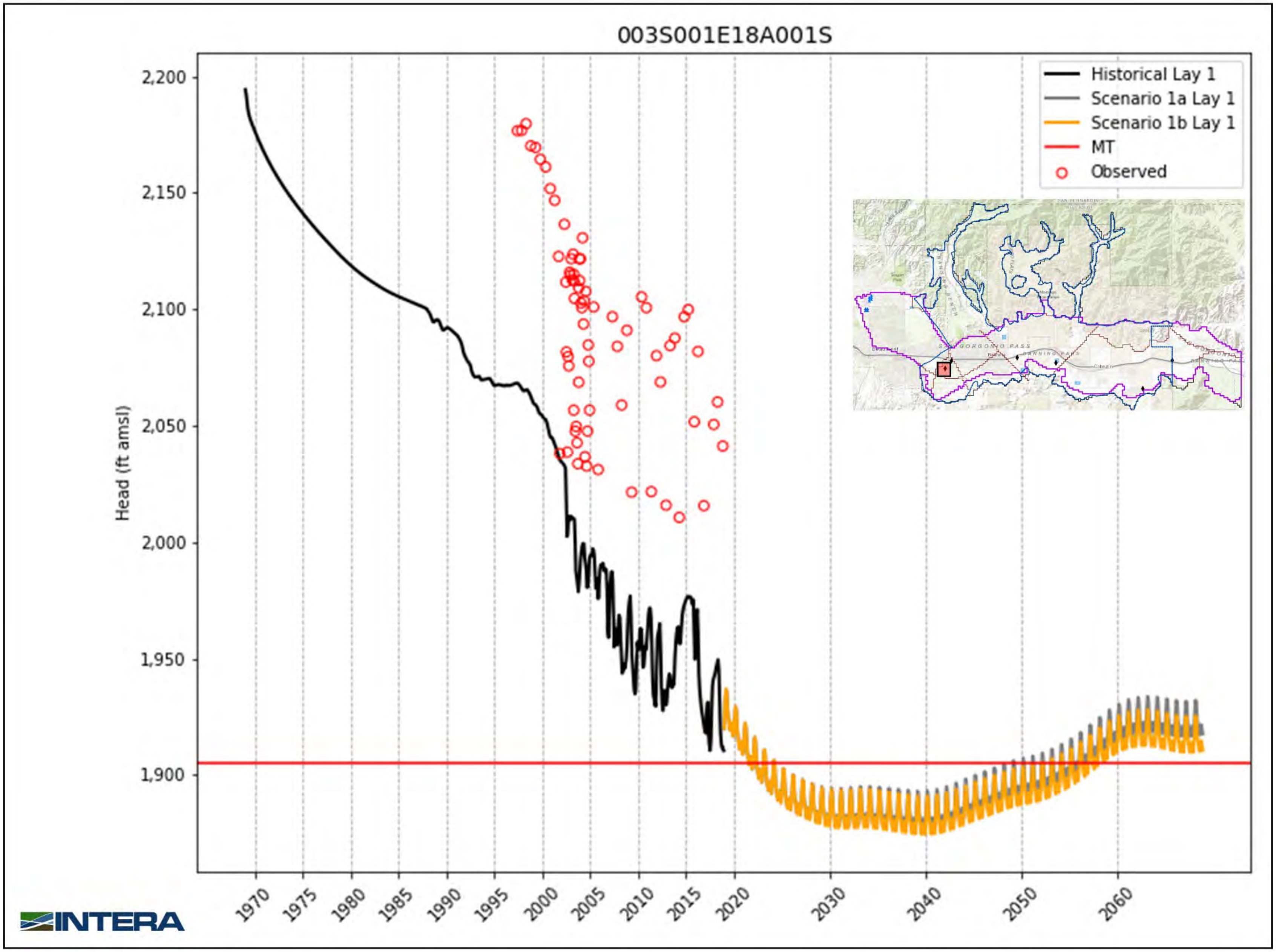

Figure 3.5a Hydrographs for 18A1 - Scenarios 1a and 1b.

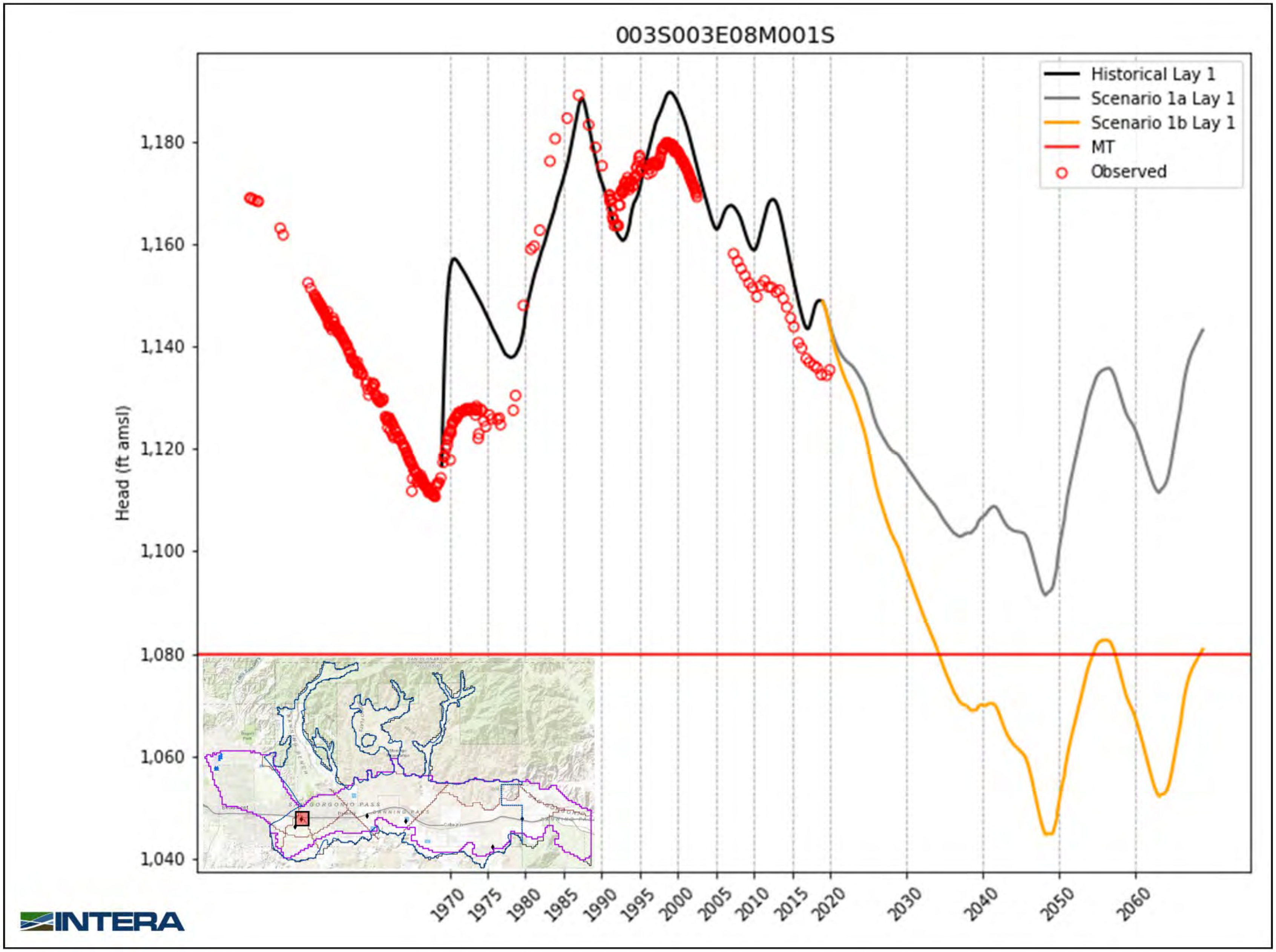

Figure 3.5b Hydrographs for 8M1 - Scenarios 1a and 1b.

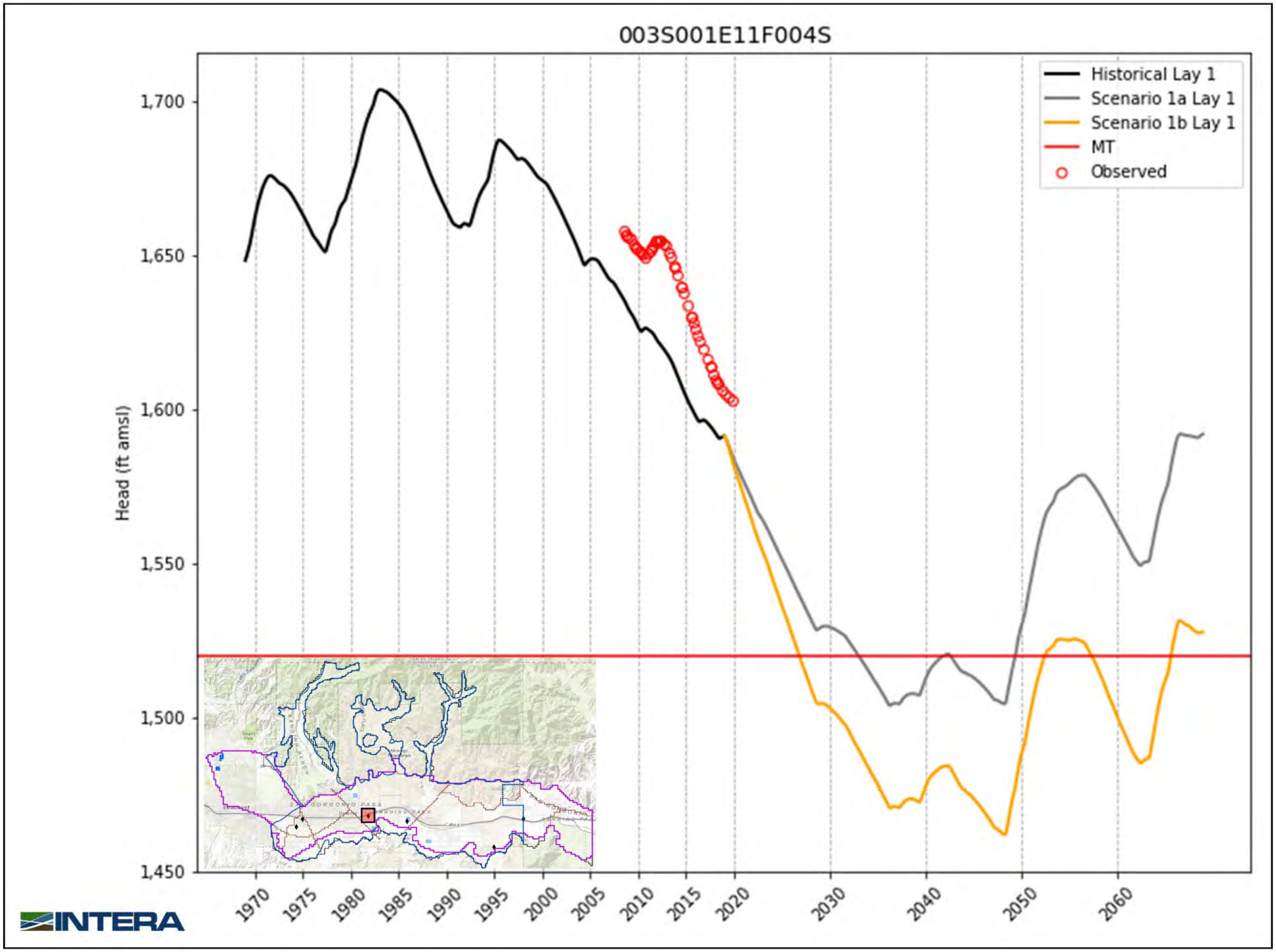

Figure 3.5c Hydrographs for 11F4 - Scenarios 1a and 1b.

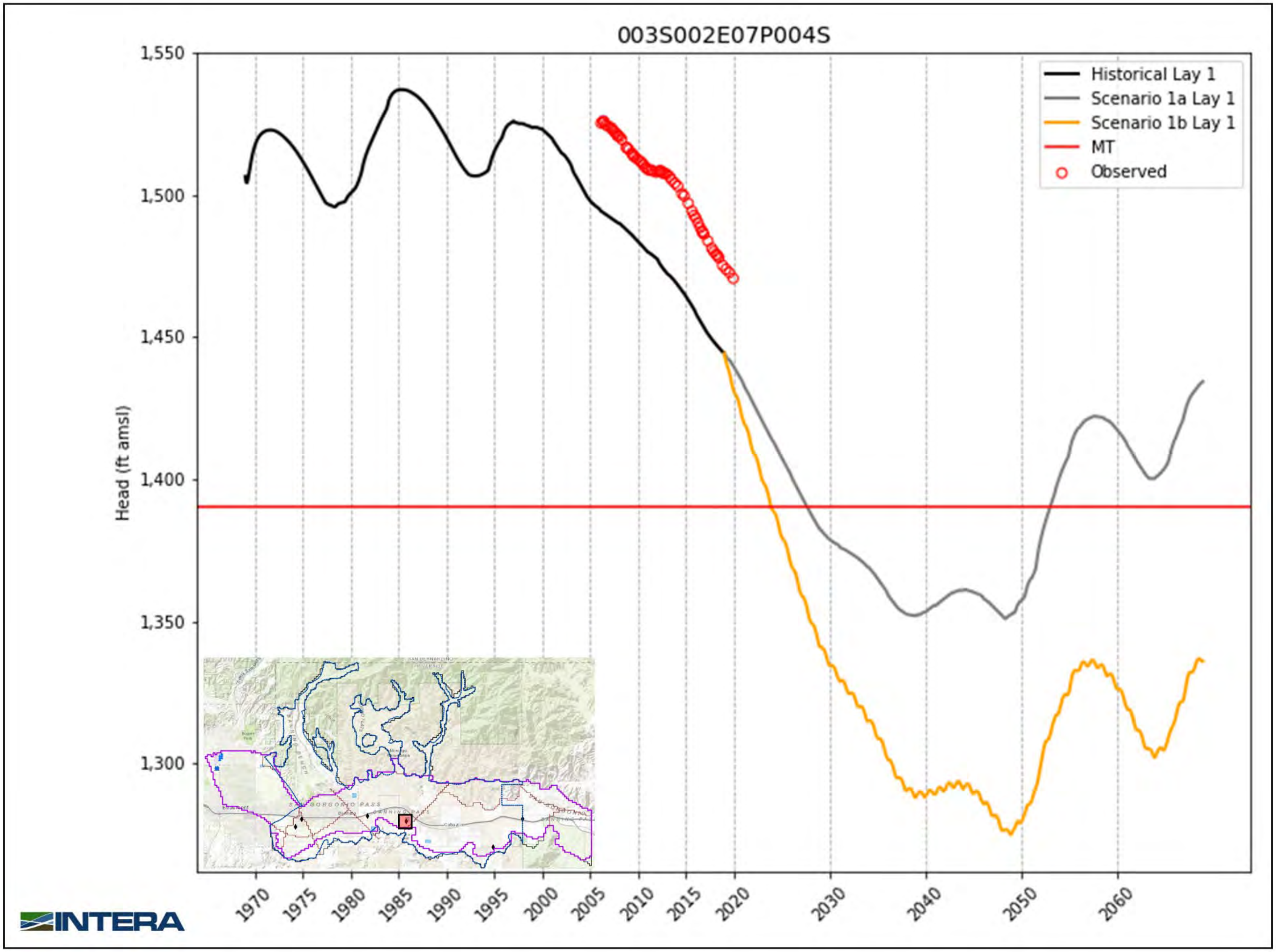

Figure 3.5d Hydrographs for 7P4 - Scenarios 1a and 1b.

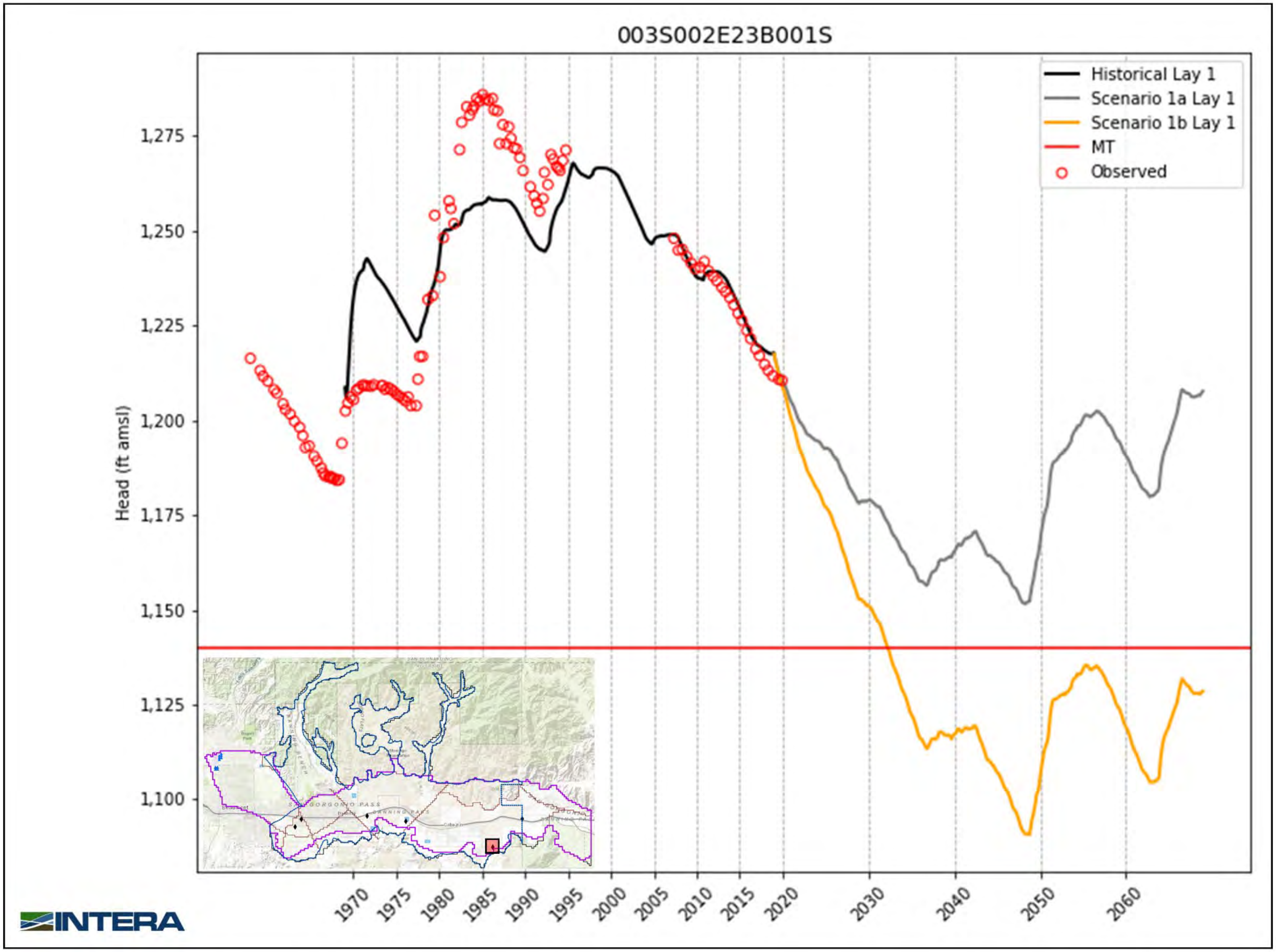

Figure 3.5e Hydrographs for 23B1 - Scenarios 1a and 1b.

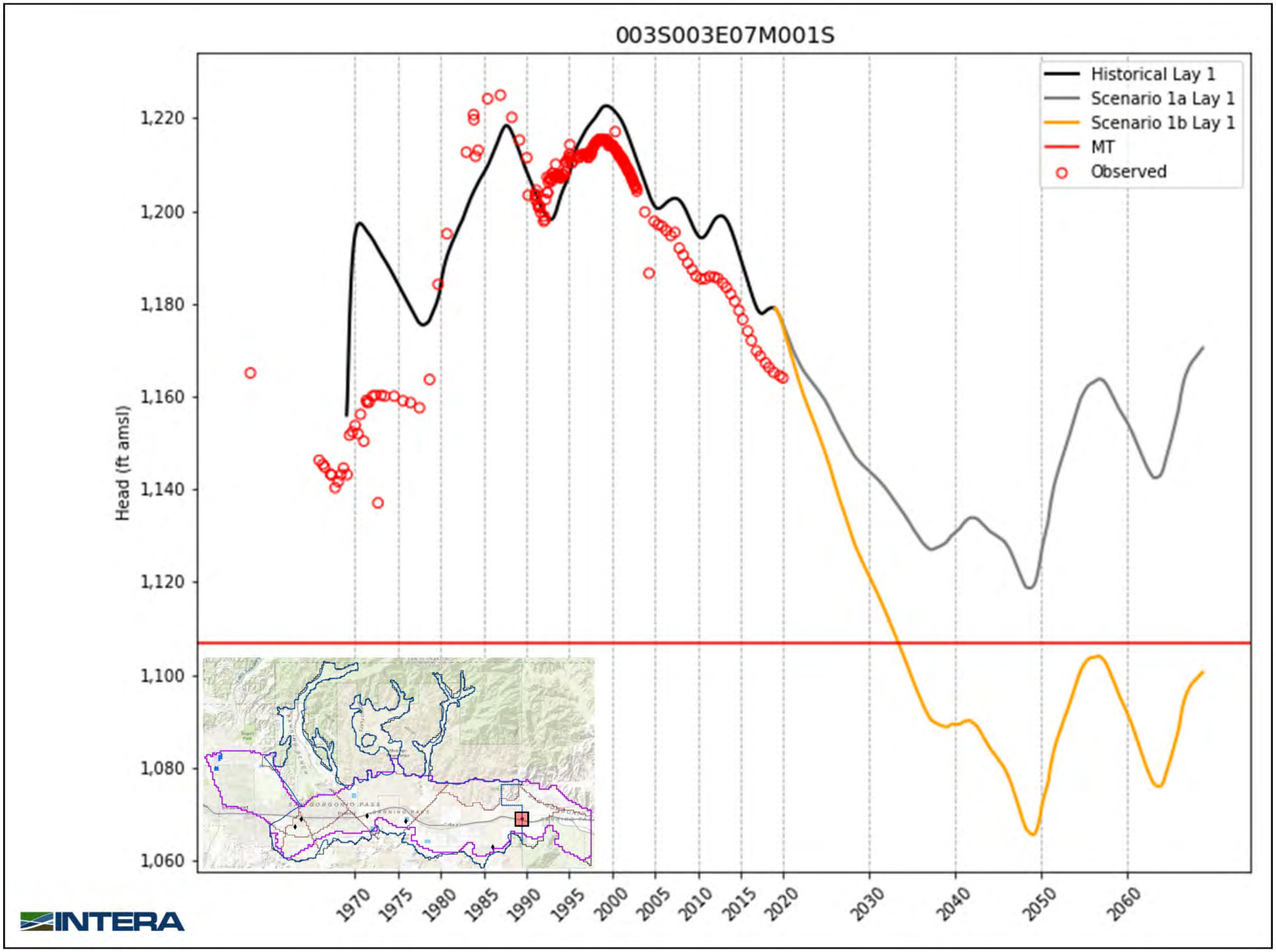

Figure 3.5f Hydrographs for 7M1 - Scenarios 1a and 1b.

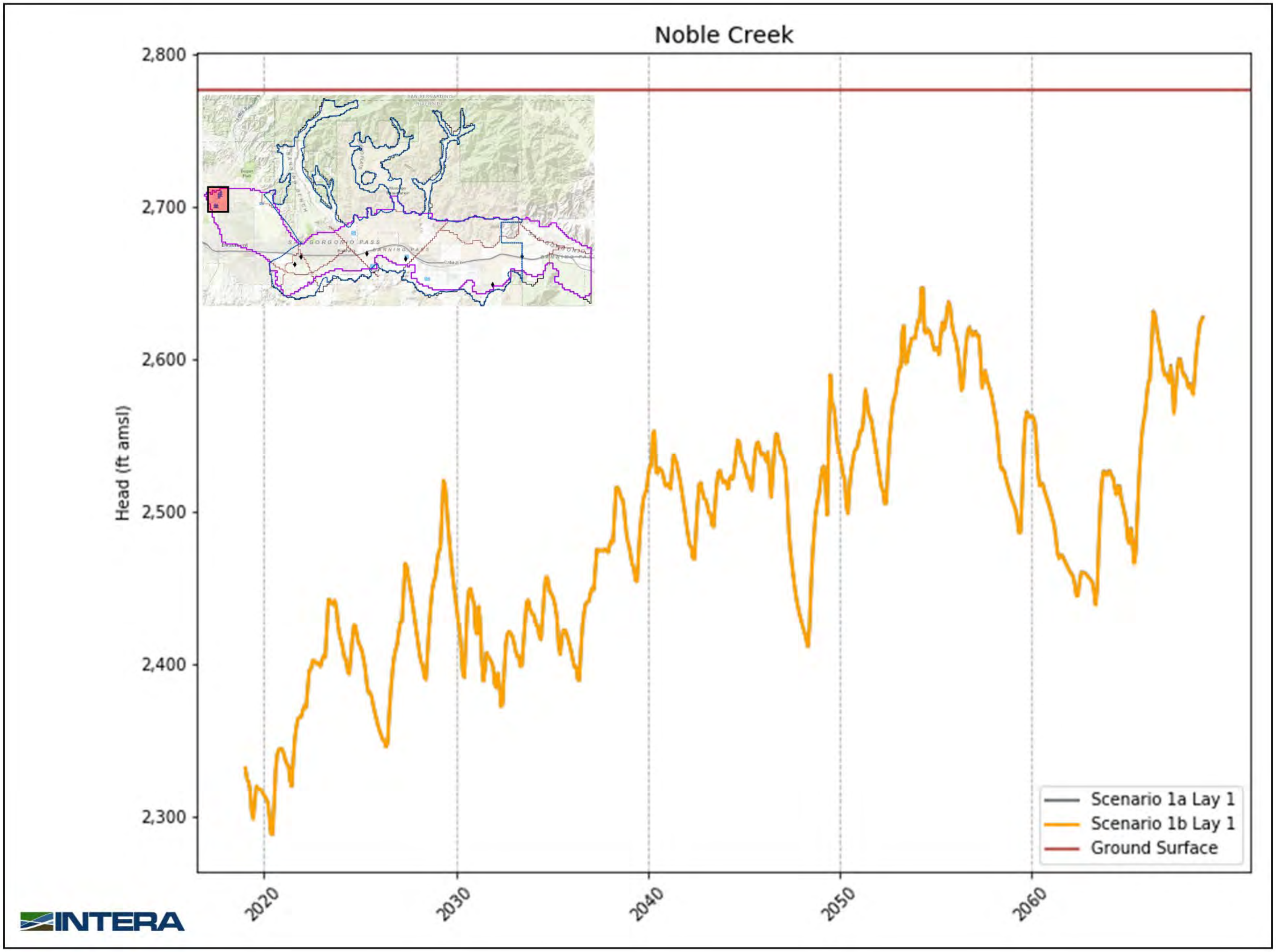

Figure 3.5g Hydrographs for Noble Creek - Scenarios 1a and 1b.

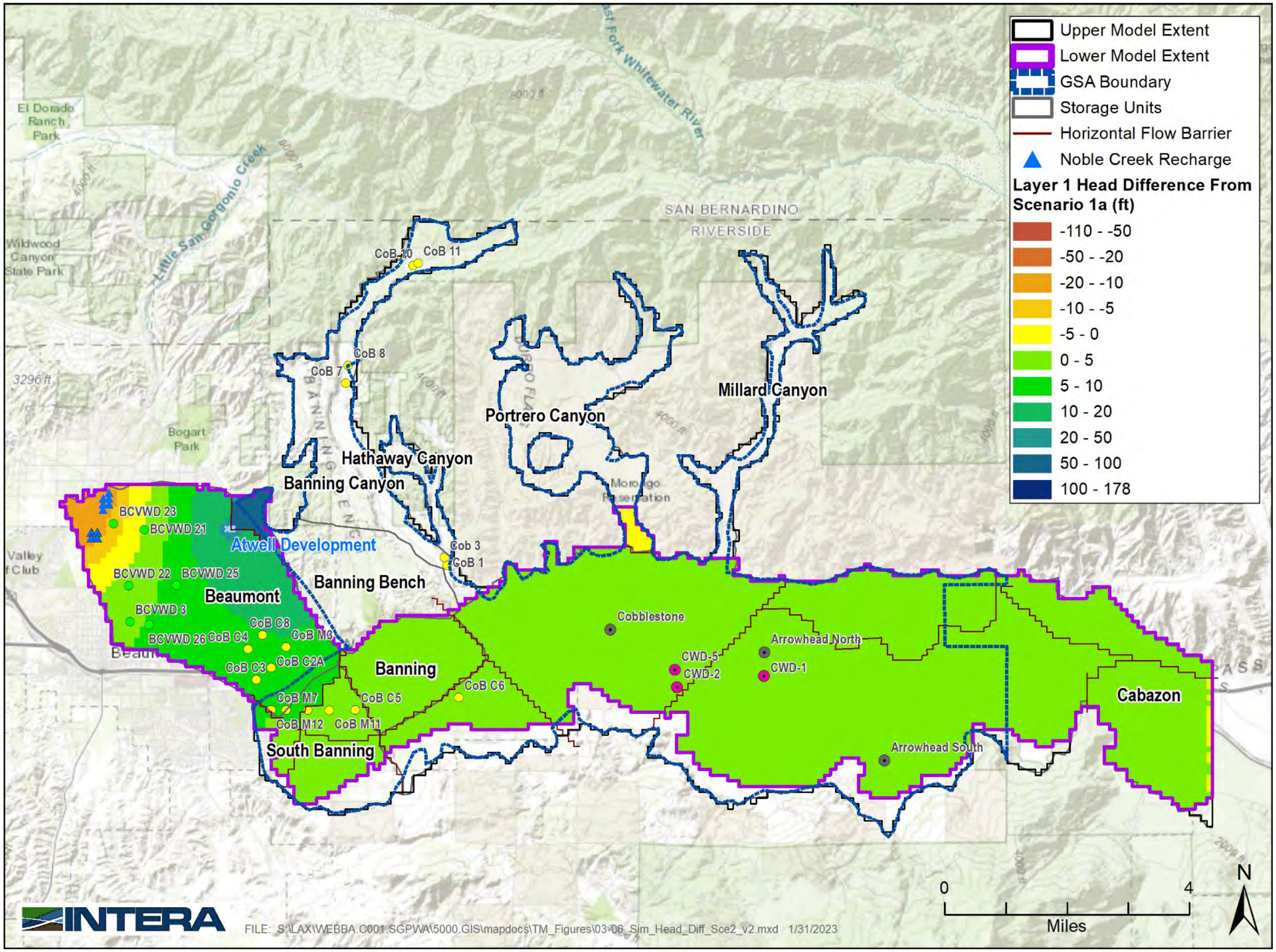

Figure 3.6 Simulated Head Difference - Scenarios 1a and 2.

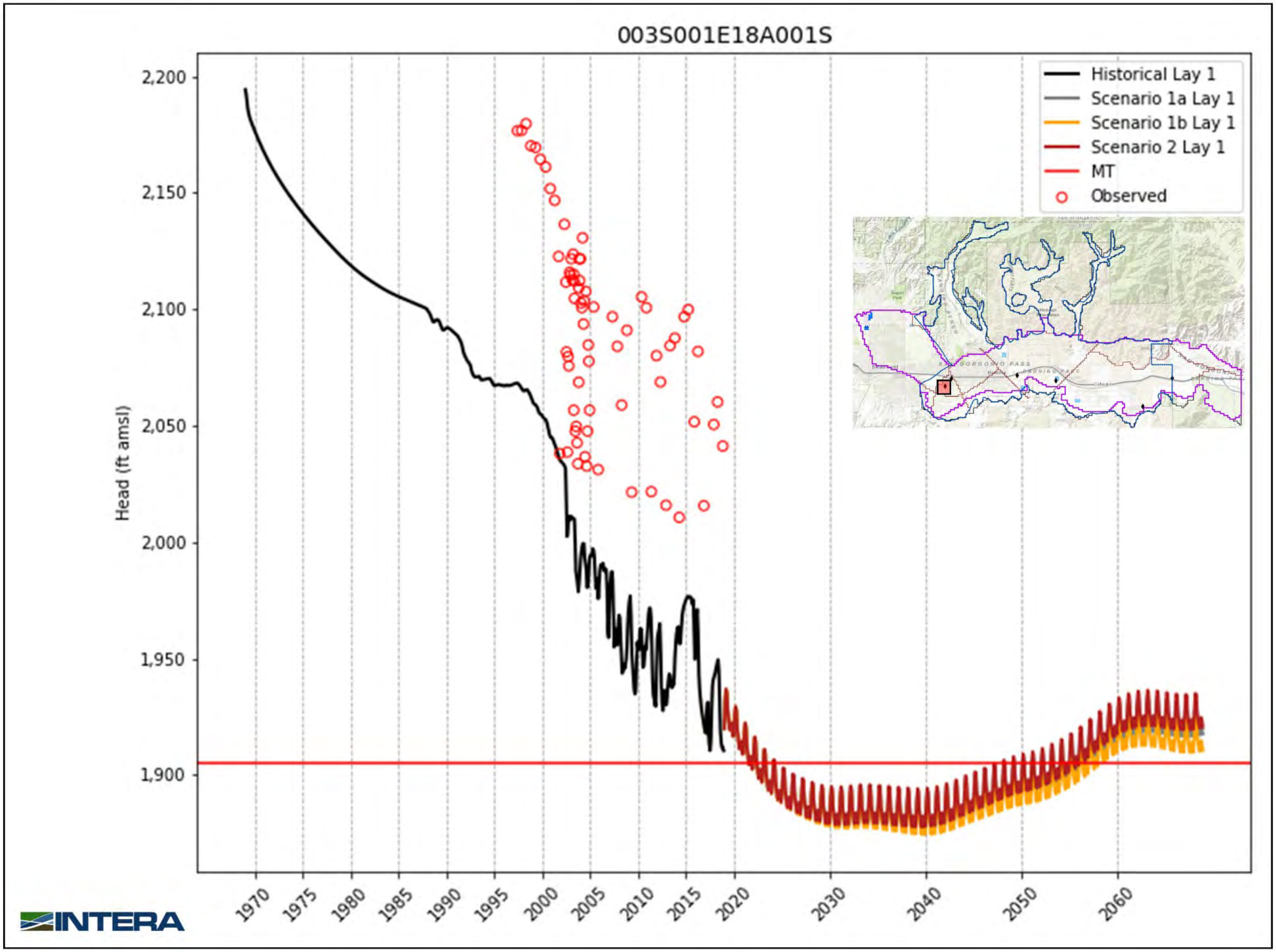

Figure 3.7a Hydrographs for 18A1 - Scenarios 1a, 1b, and 2.

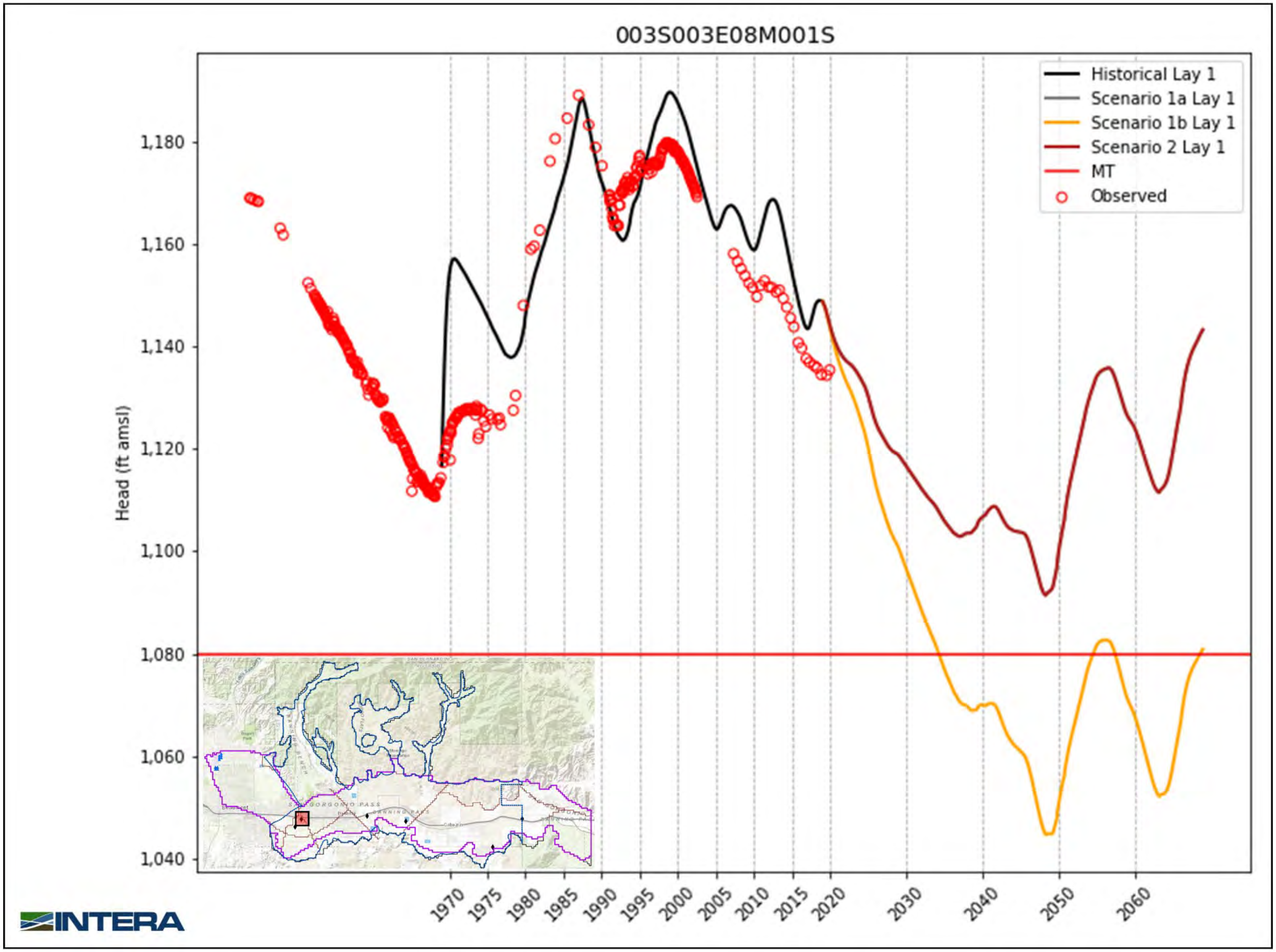

Figure 3.7b Hydrographs for 8M1 - Scenarios 1a, 1b, and 2.

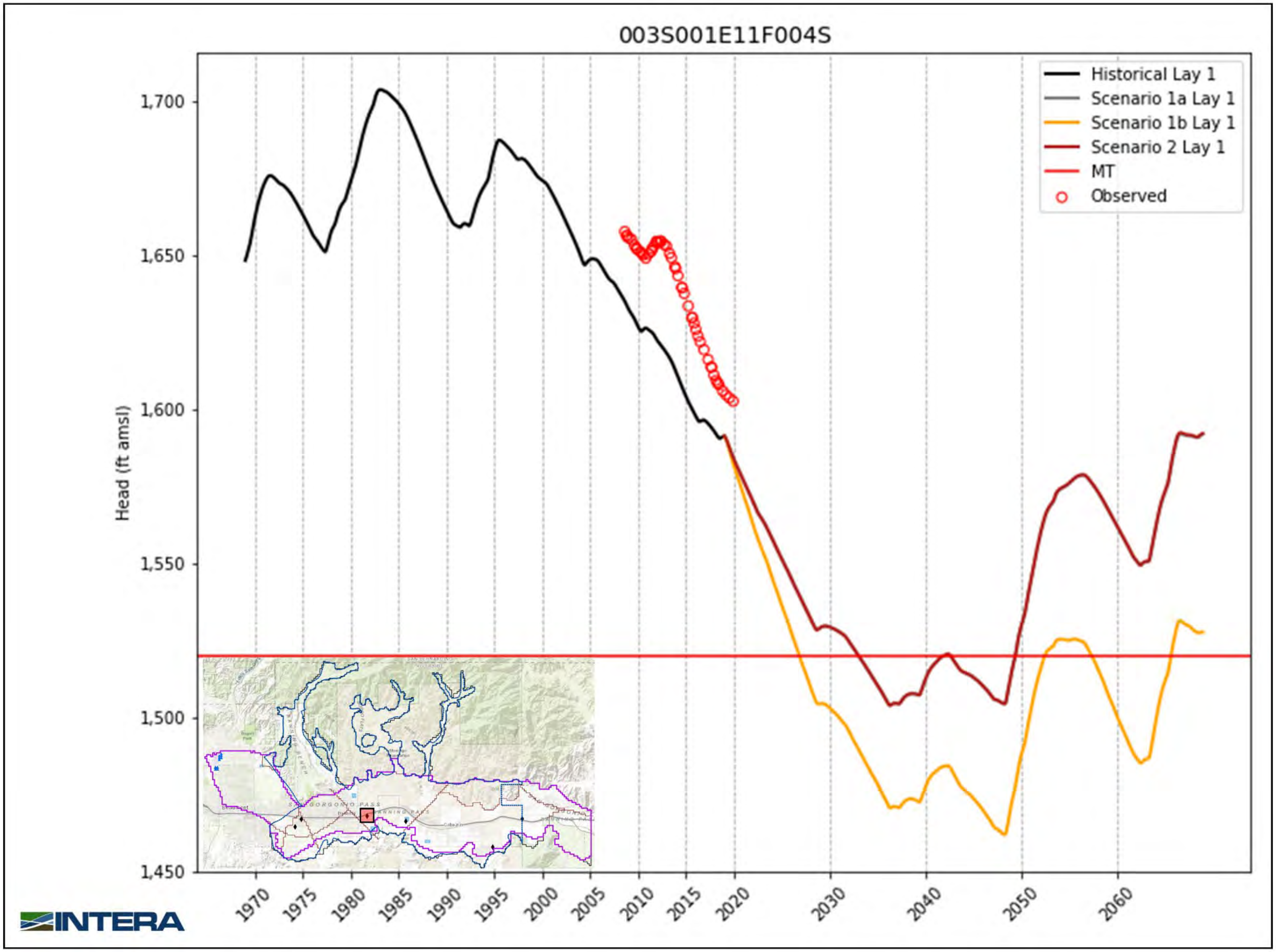

Figure 3.7c Hydrographs for 11F4 - Scenarios 1a, 1b, and 2.

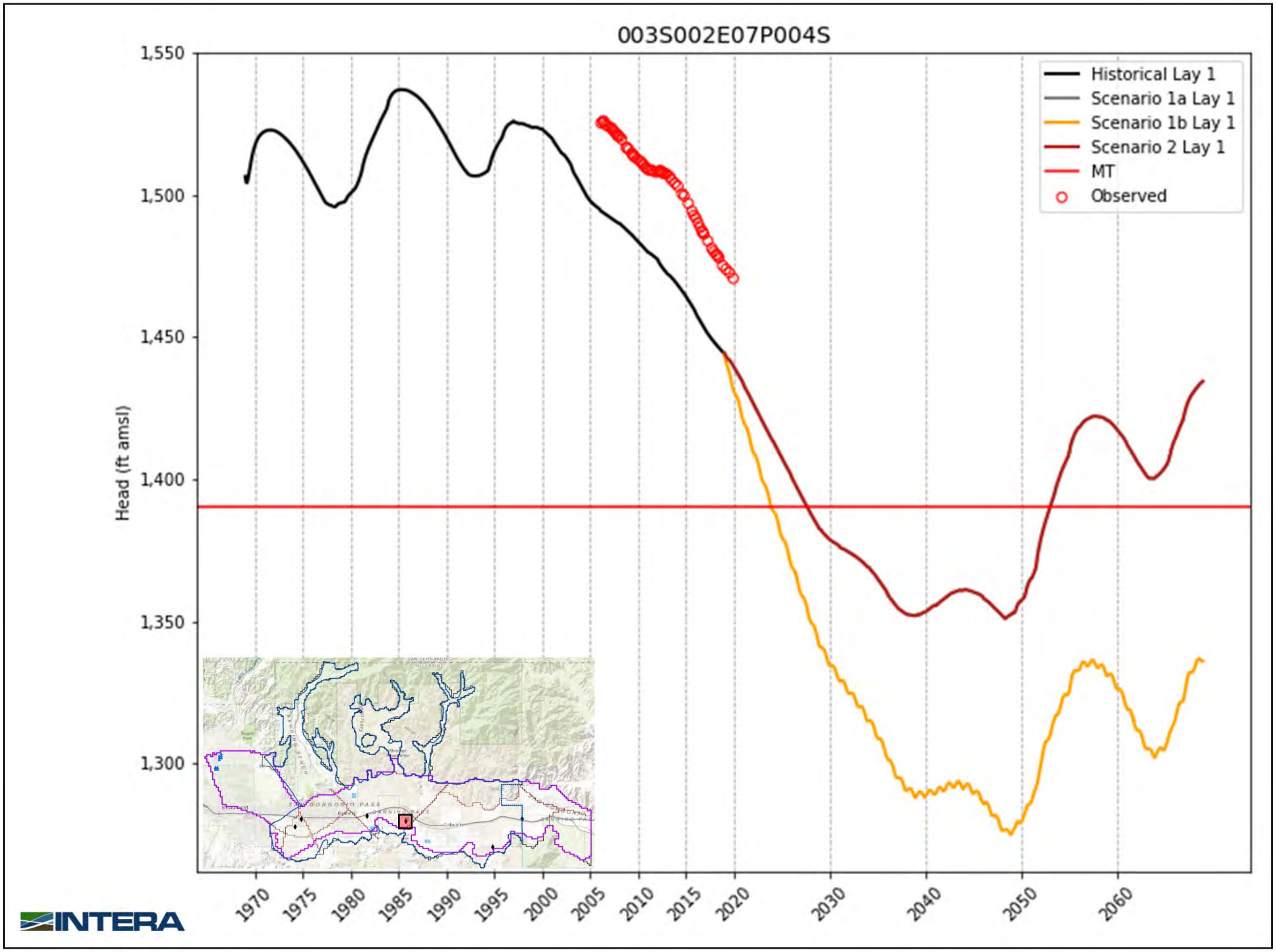

Figure 3.7d Hydrographs for 7P4 - Scenarios 1a, 1b, and 2.

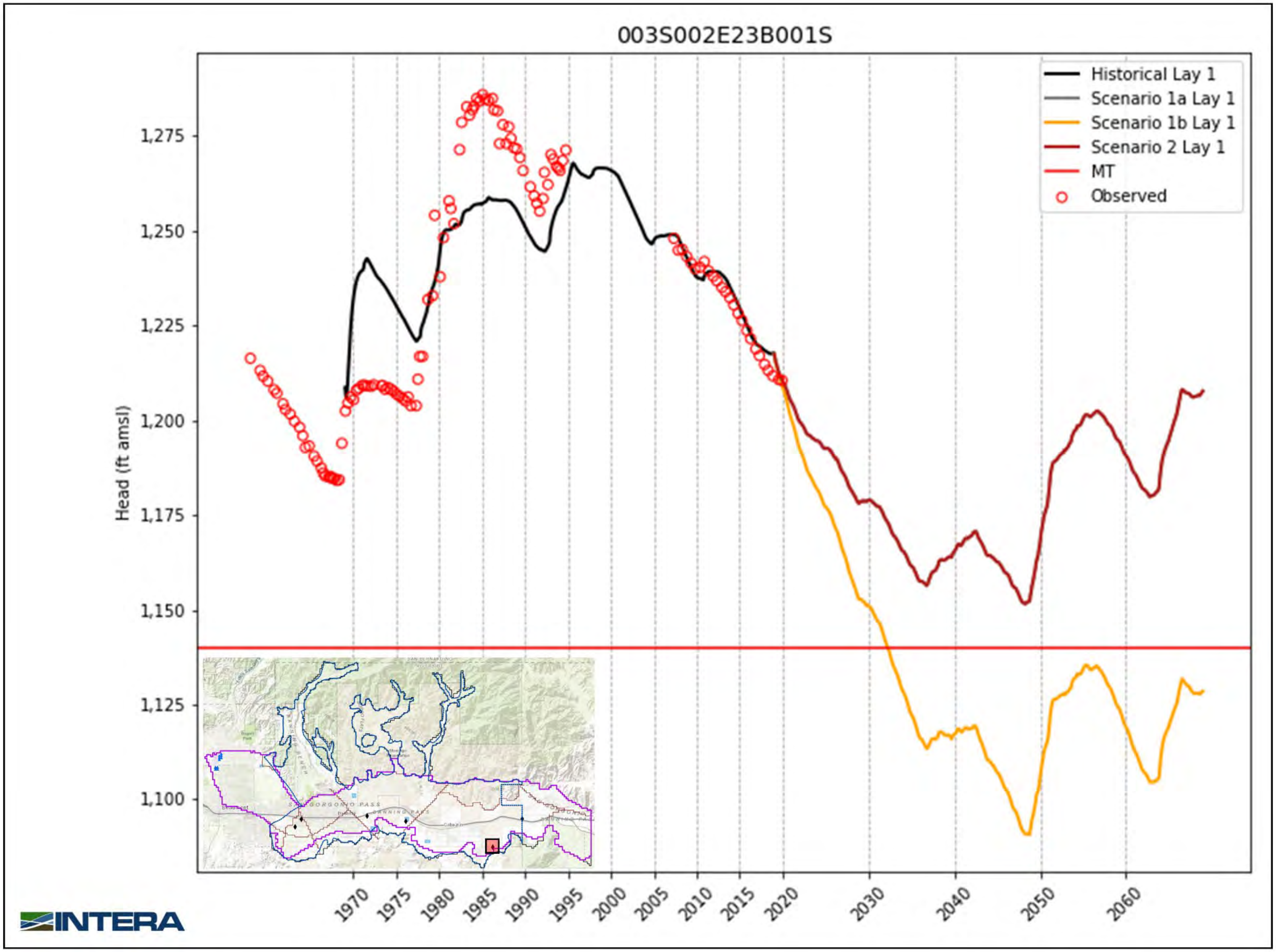

Figure 3.7e Hydrographs for 23B1 - Scenarios 1a, 1b, and 2.

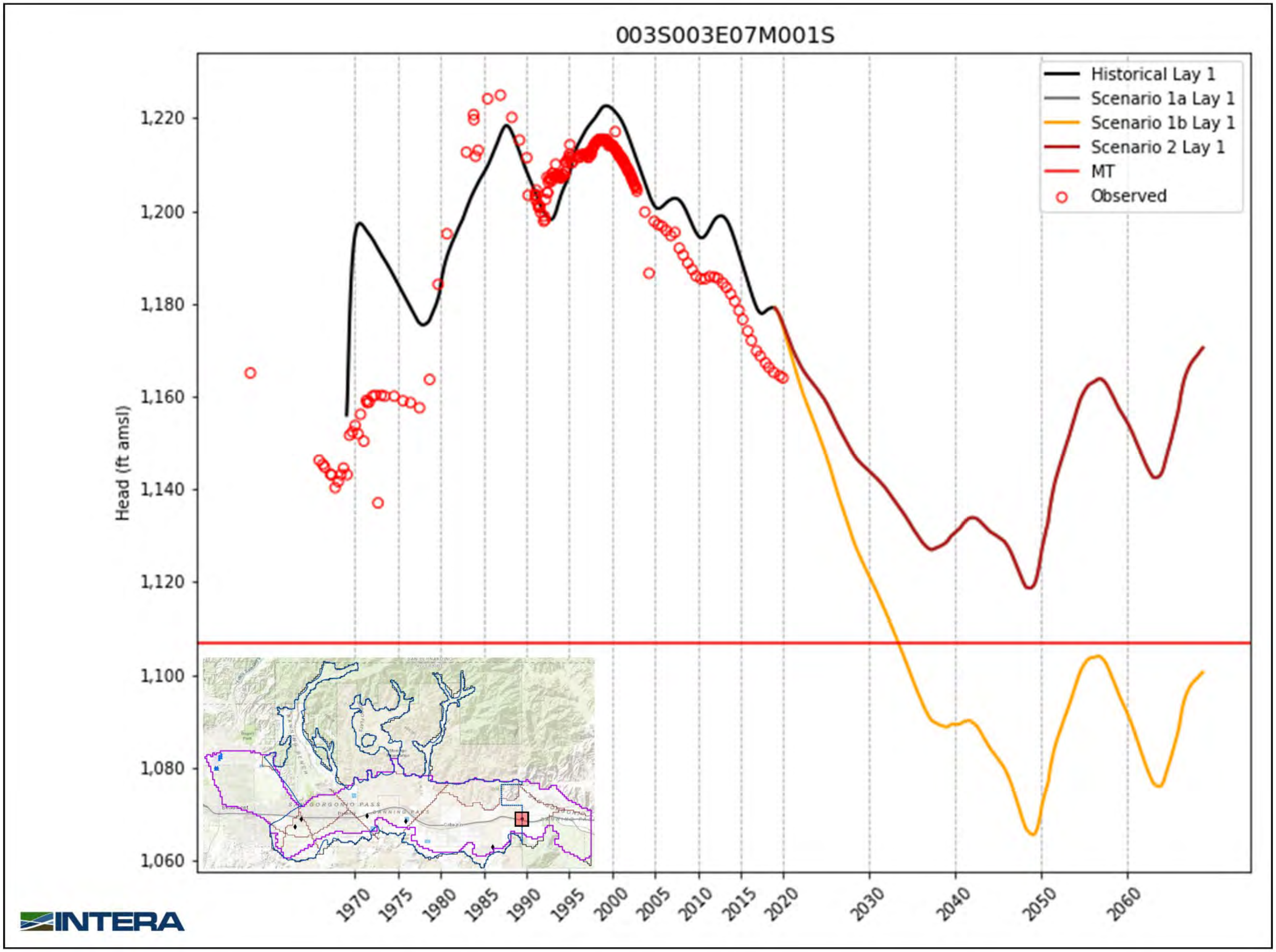

Figure 3.7f Hydrographs for 7M1 - Scenarios 1a, 1b, and 2.

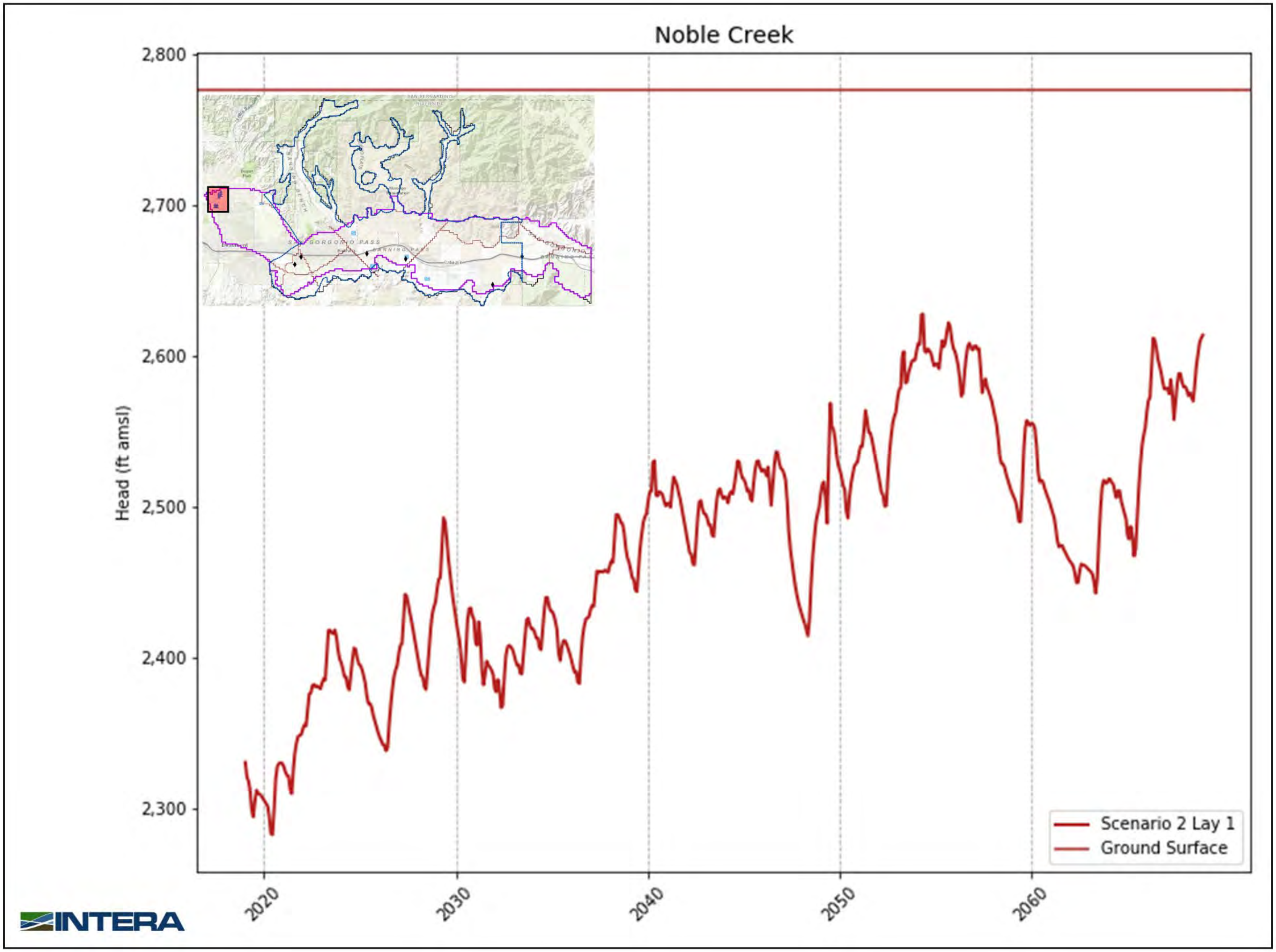

Figure 3.7g Hydrographs for Noble Creek - Scenario 2.

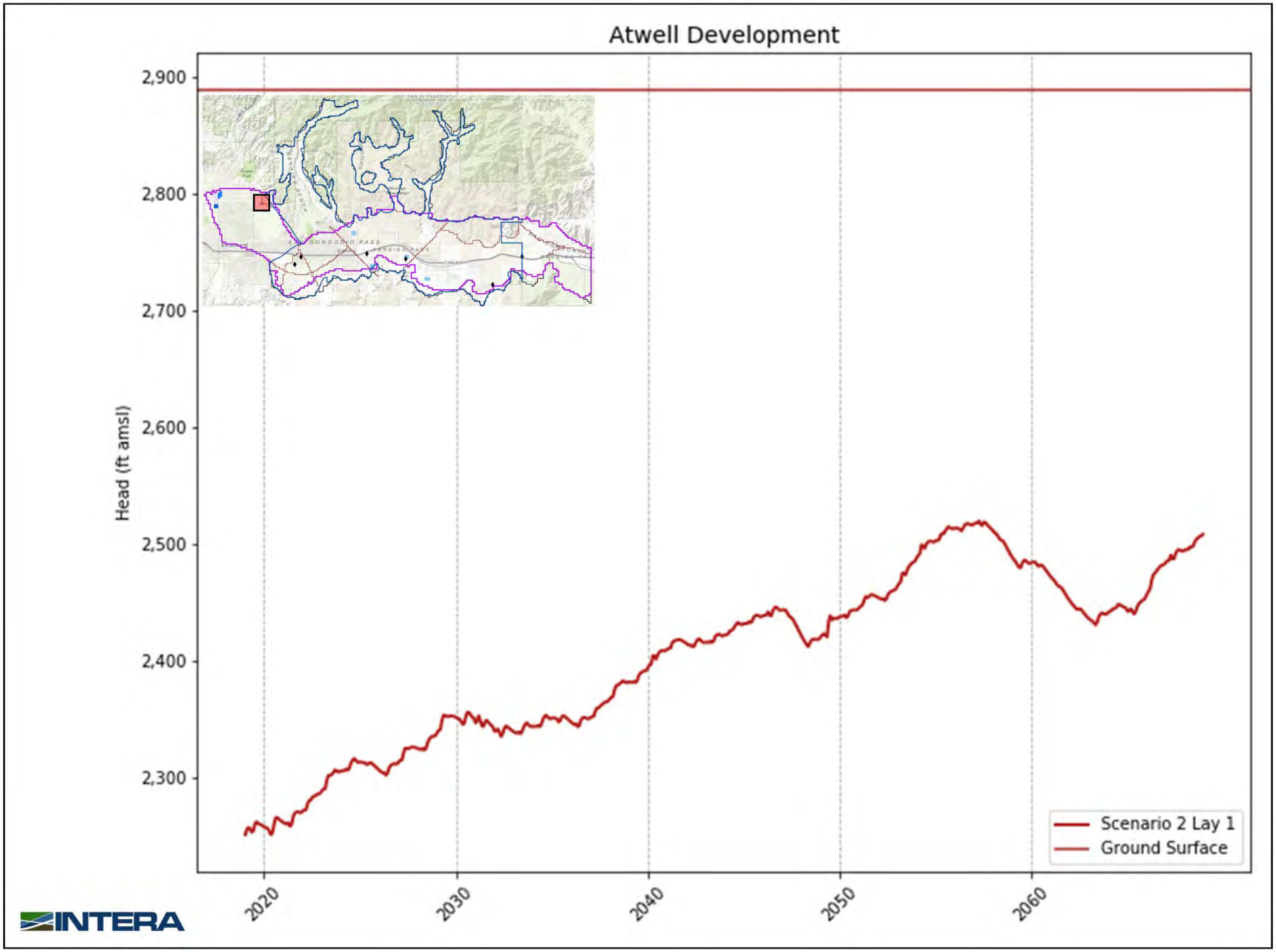

Figure 3.7h Hydrographs for Atwell Development - Scenario 2.

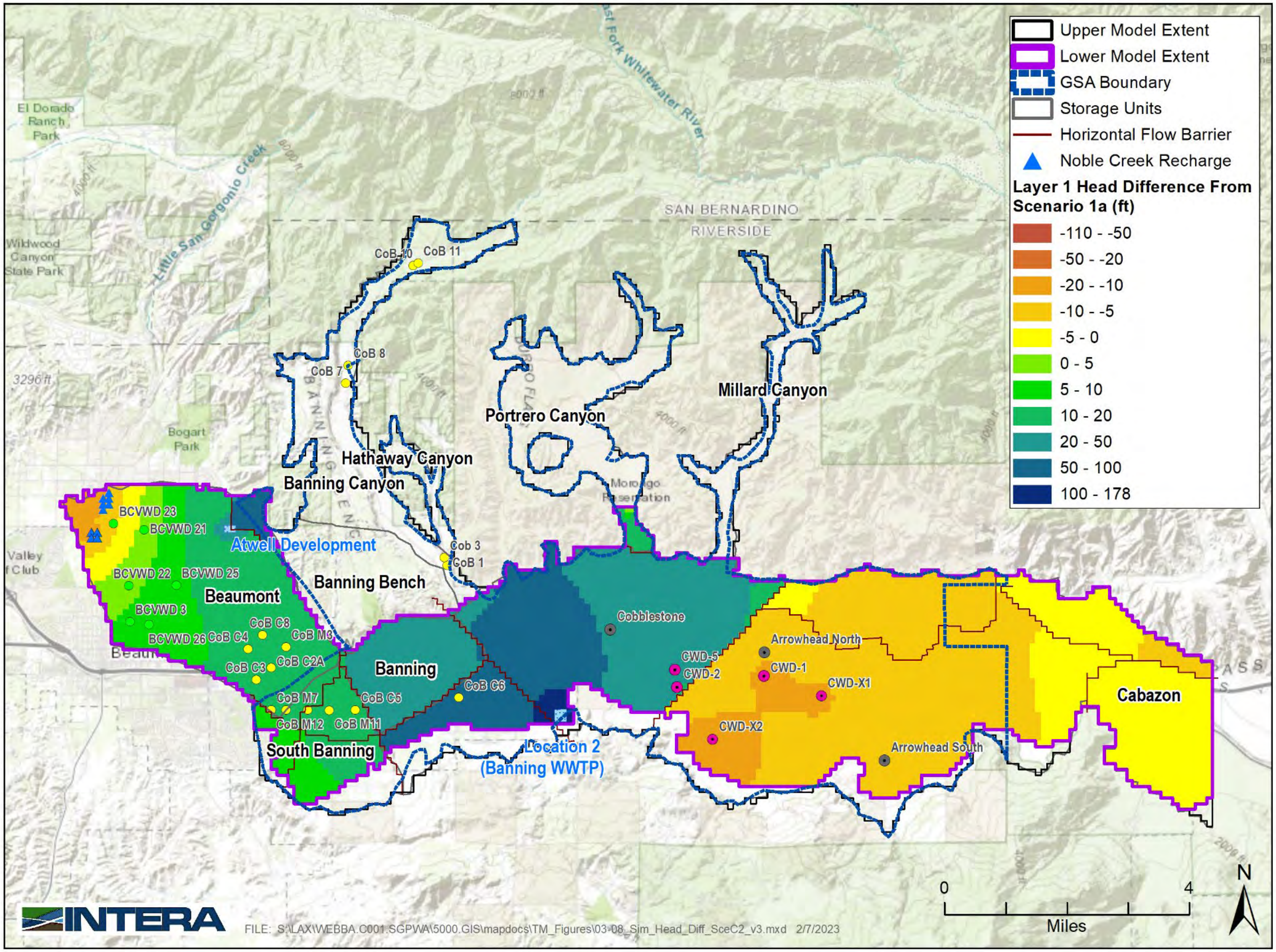

Figure 3.8 Simulated Head Difference - Scenarios 1a and C2.

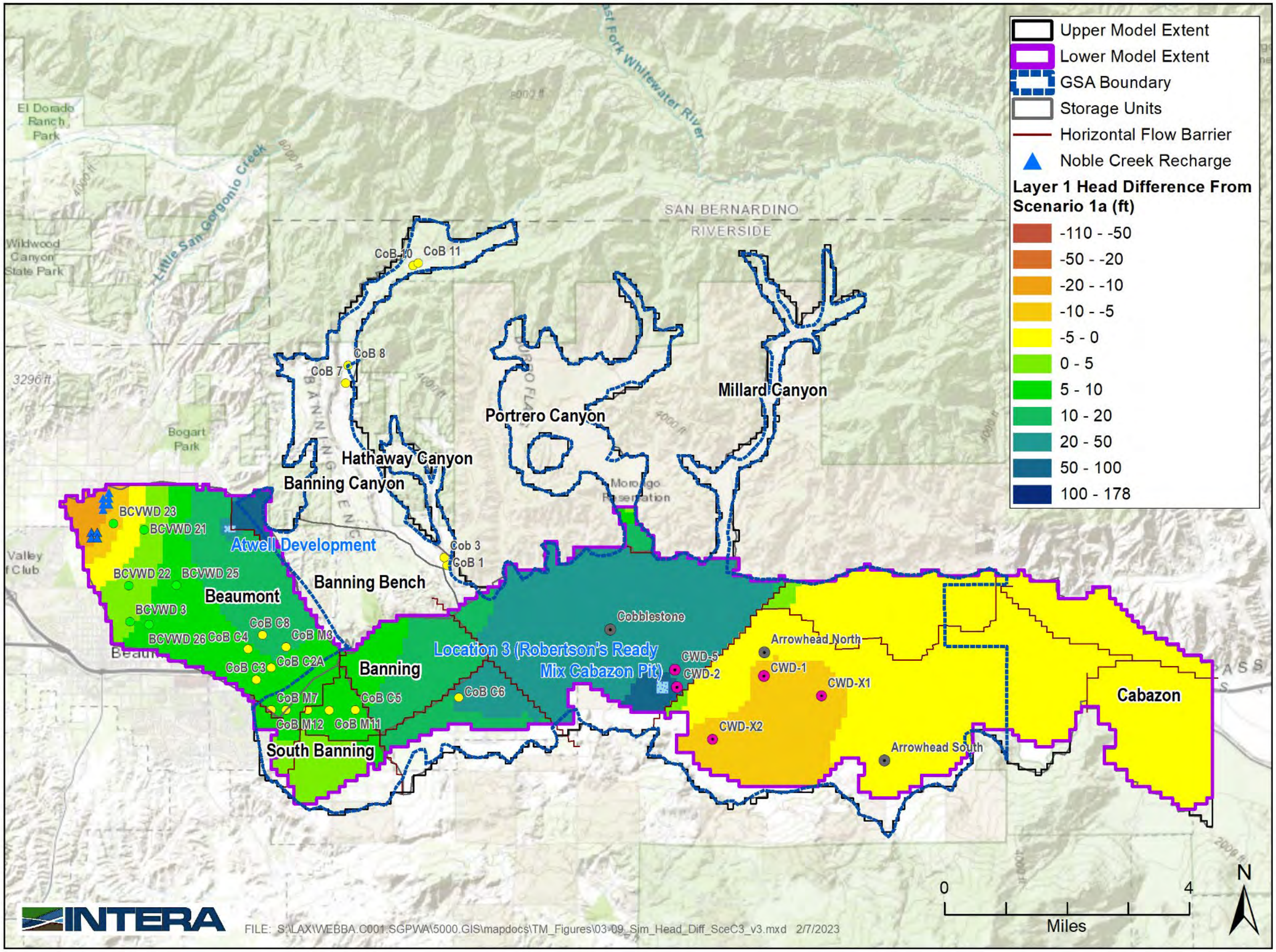

Figure 3.9 Simulated Head Difference - Scenarios 1a and C3.

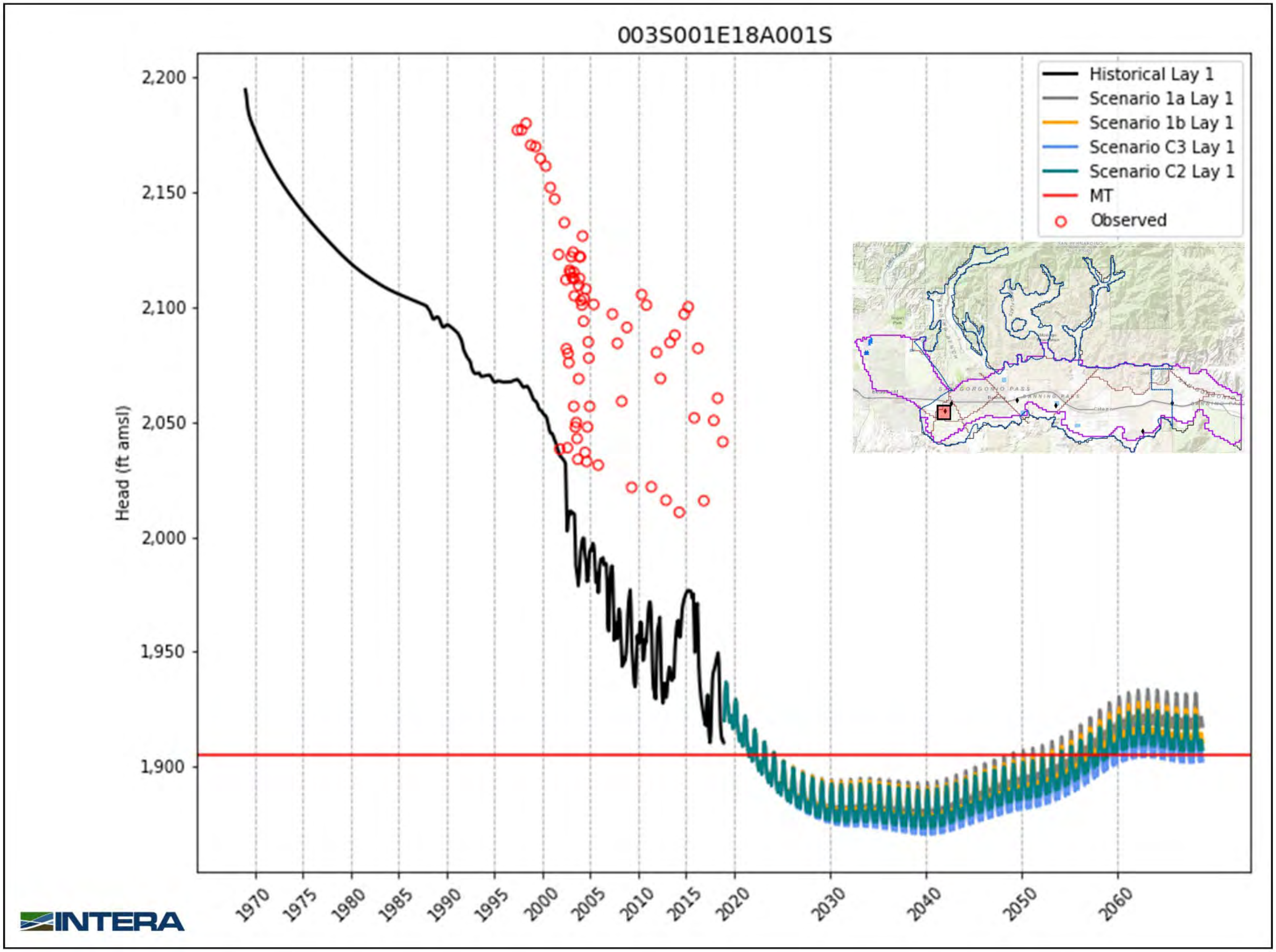

Figure 3.10a Hydrographs for 18A1 - Scenarios 1a, 1b, C2, and C3.

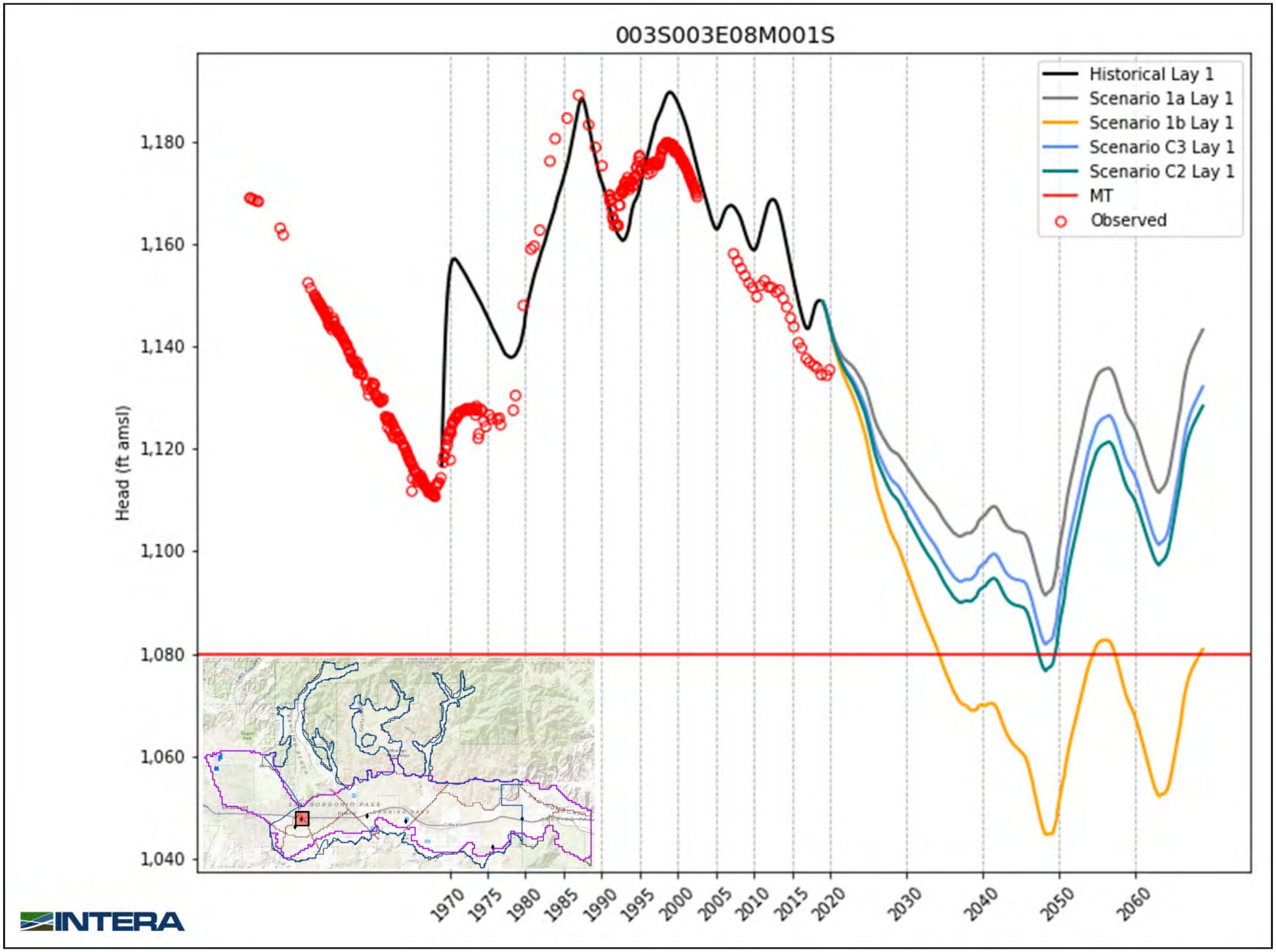

Figure 3.10b Hydrographs for 8M1 - Scenarios 1a, 1b, C2, and C3.

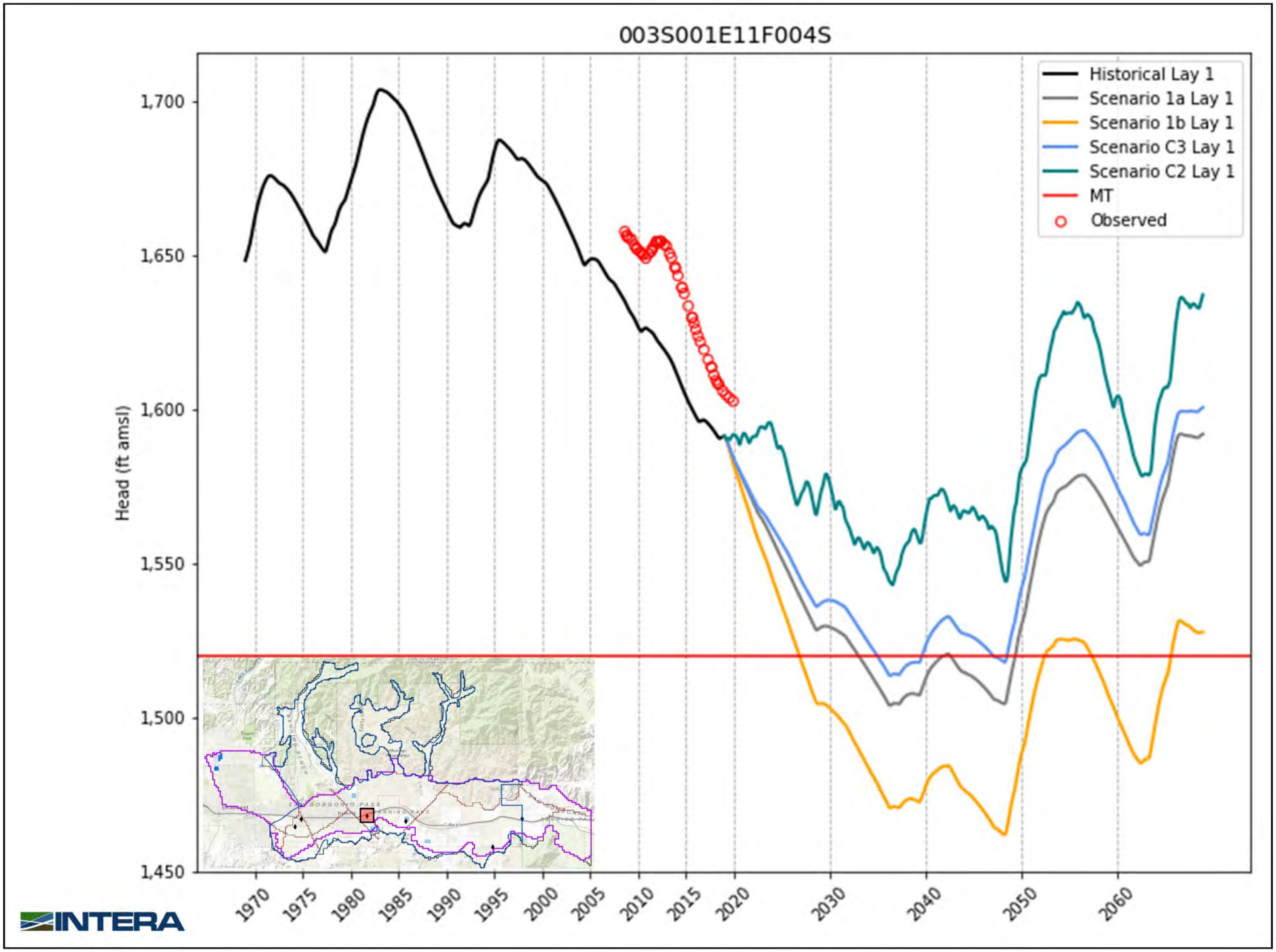

Figure 3.10c Hydrographs for 11F4 - Scenarios 1a, 1b, C2, and C3.

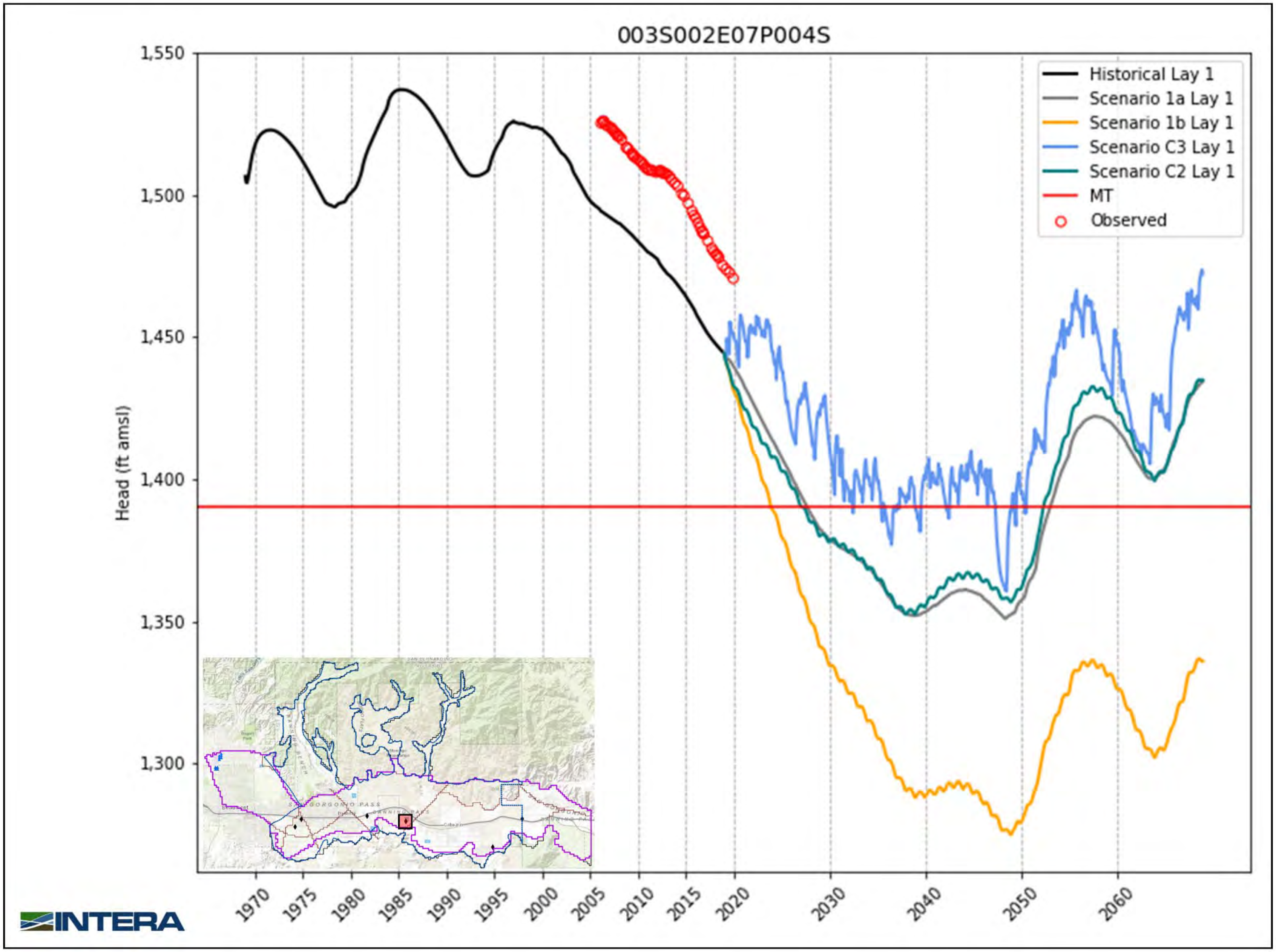

Figure 3.10d Hydrographs for 7P4 - Scenarios 1a, 1b, C2, and C3.

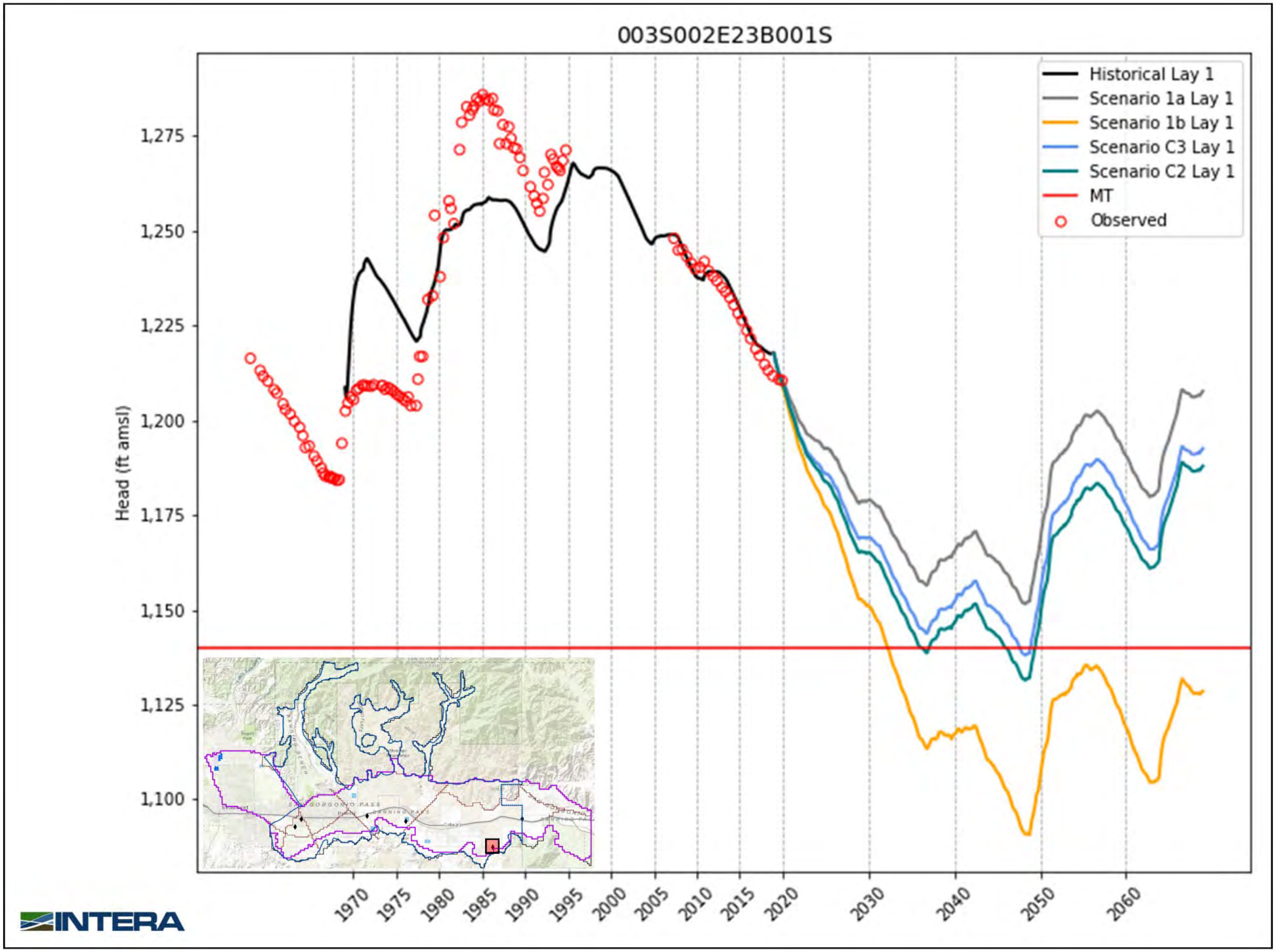

Figure 3.10e Hydrographs for 23B1 - Scenarios 1a, 1b, C2, and C3.

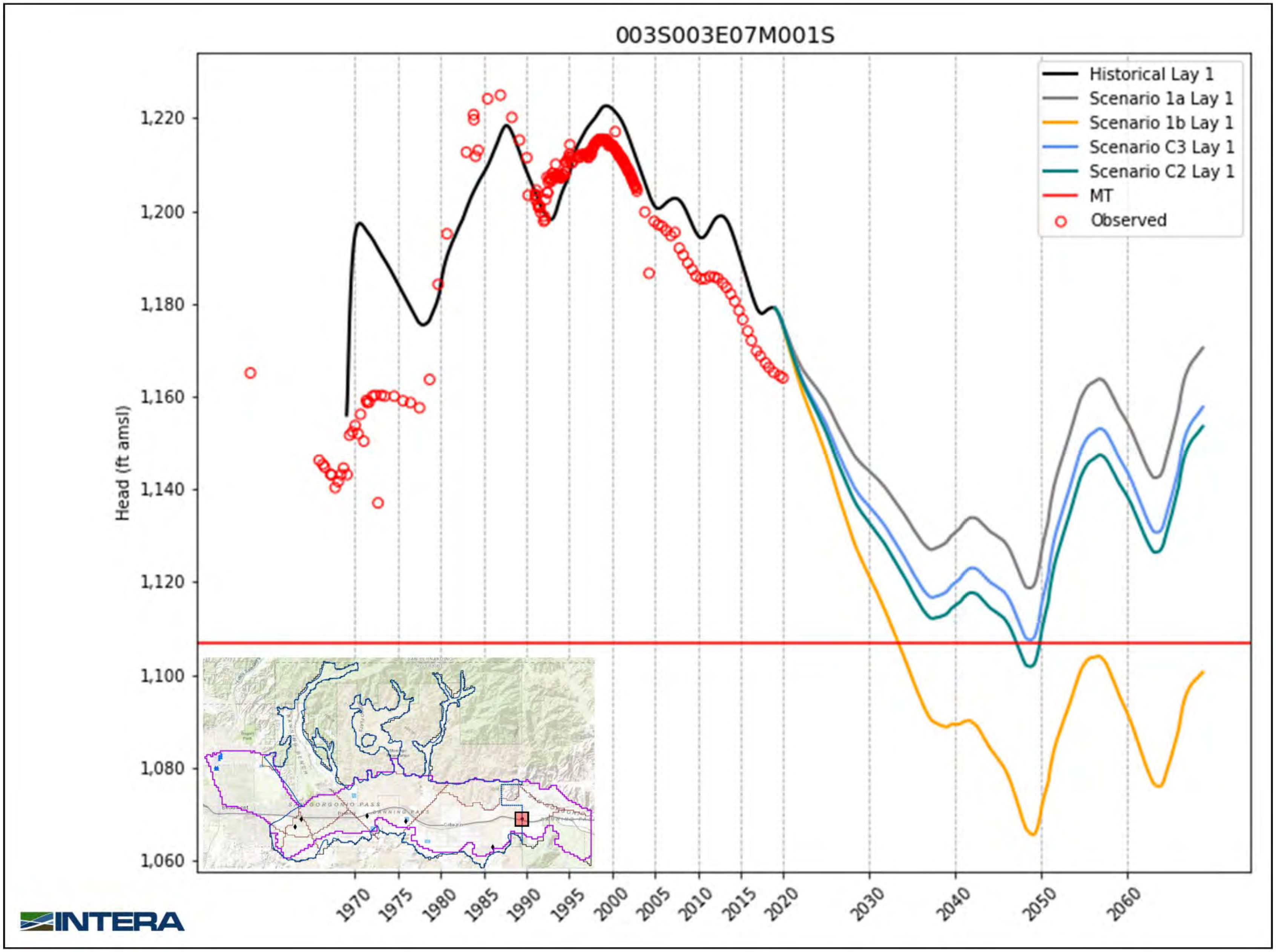

Figure 3.10f Hydrographs for 7M1 - Scenarios 1a, 1b, C2, and C3.

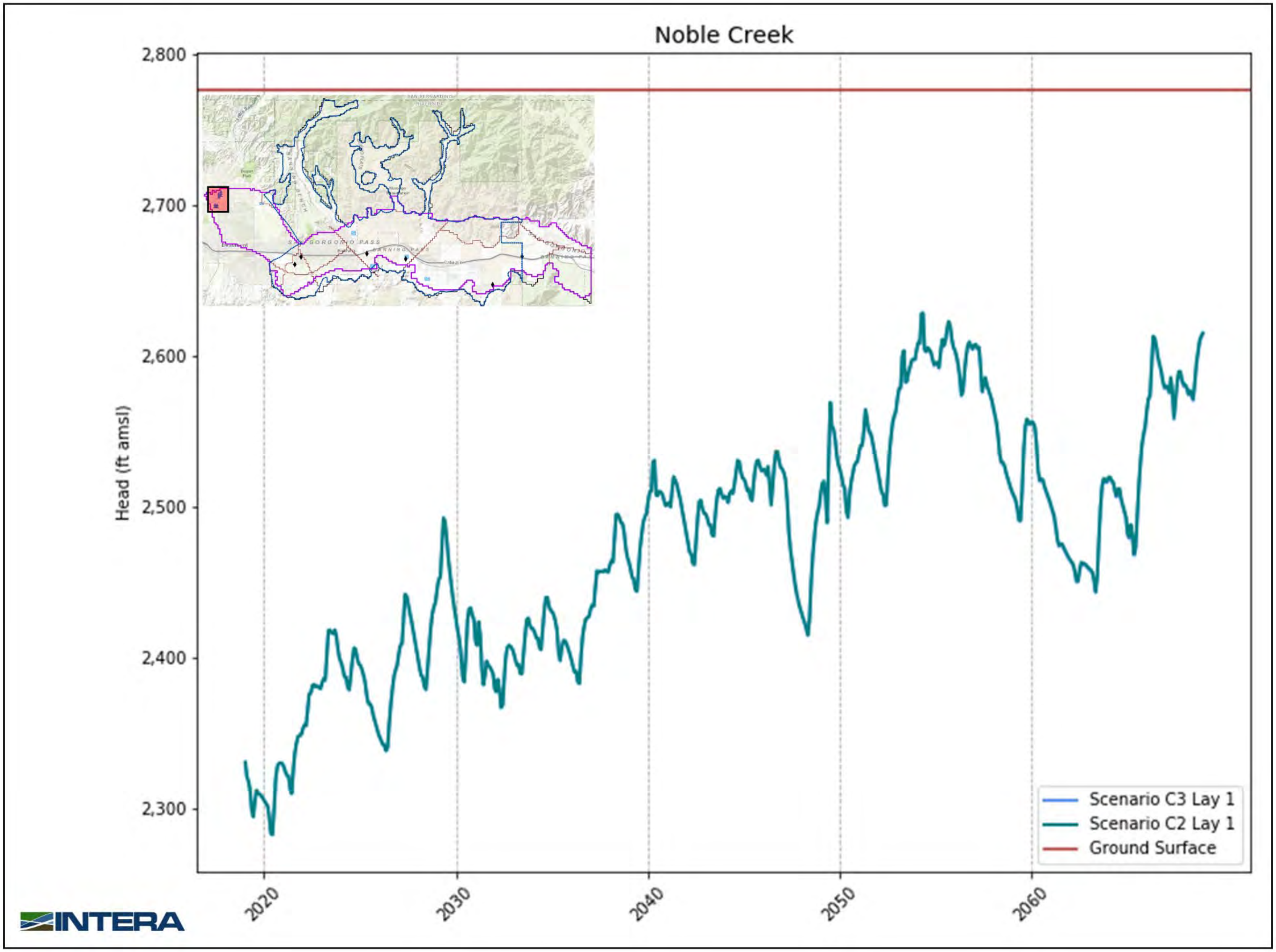

Figure 3.10g Hydrographs for Noble Creek - Scenarios C2 and C3.

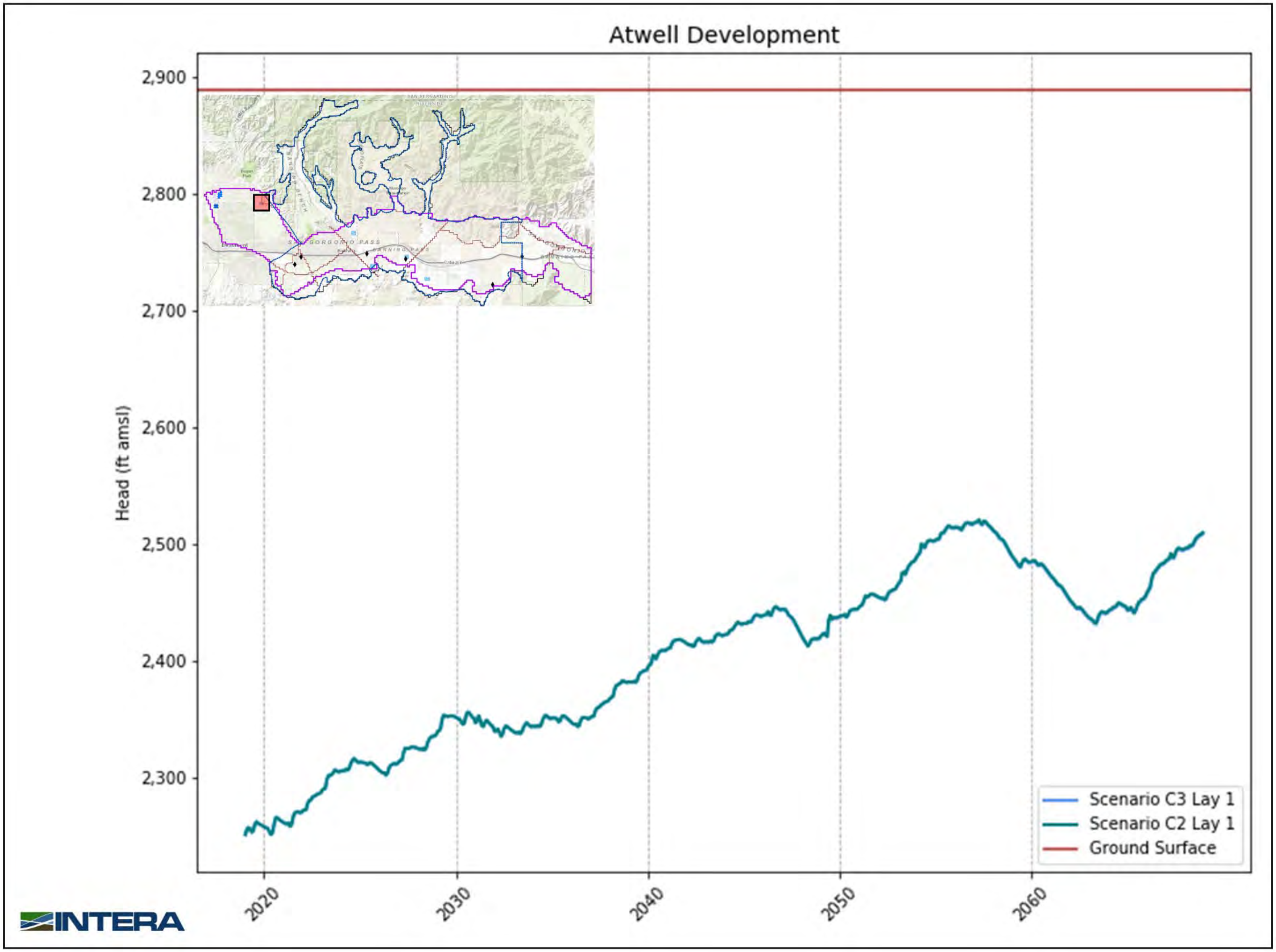

Figure 3.10h Hydrographs for Atwell Development - Scenarios C2 and C3.

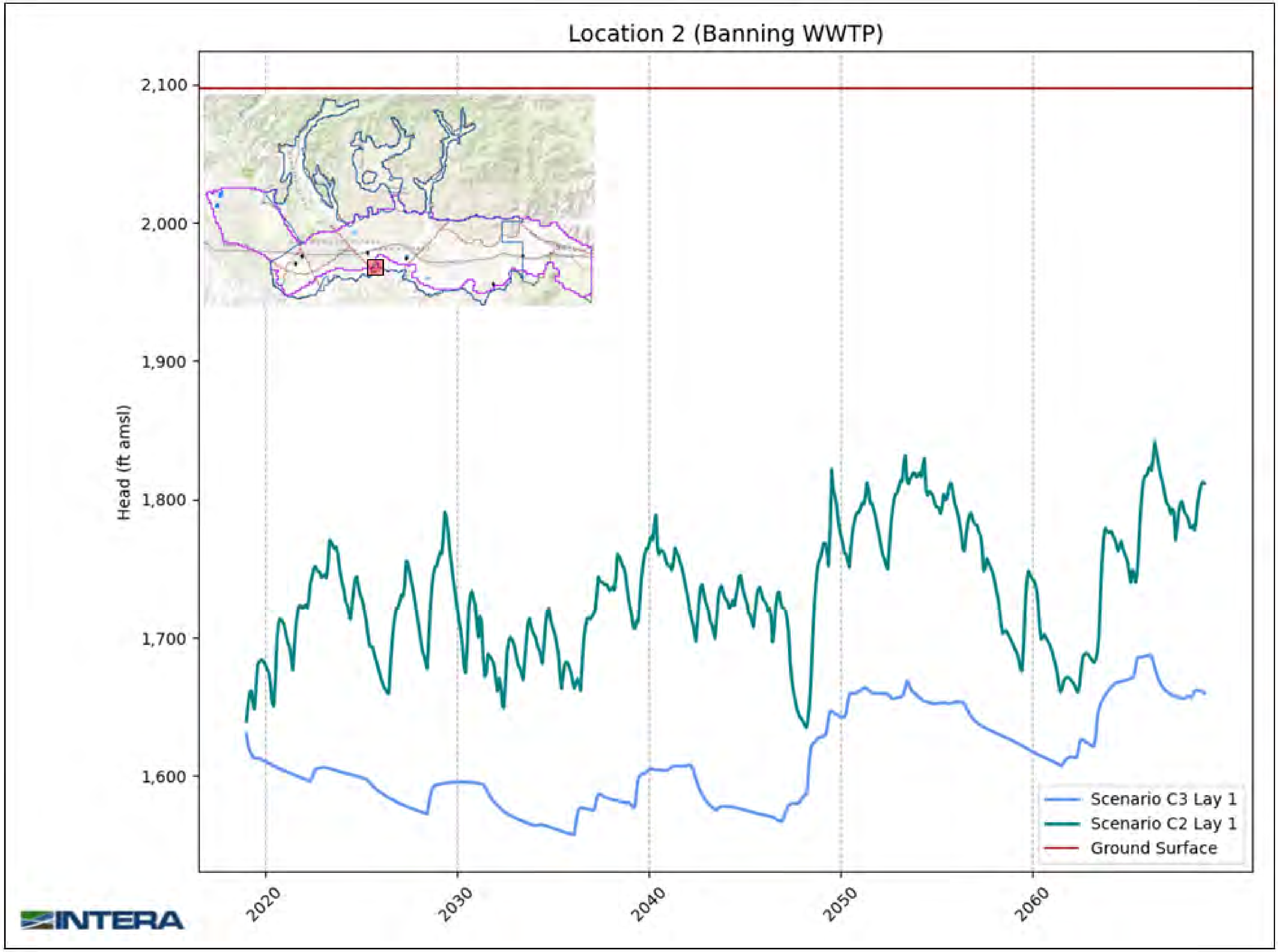

Figure 3.10i Hydrographs for Location 2 (Banning WWTP) - Scenarios C2 and C3.

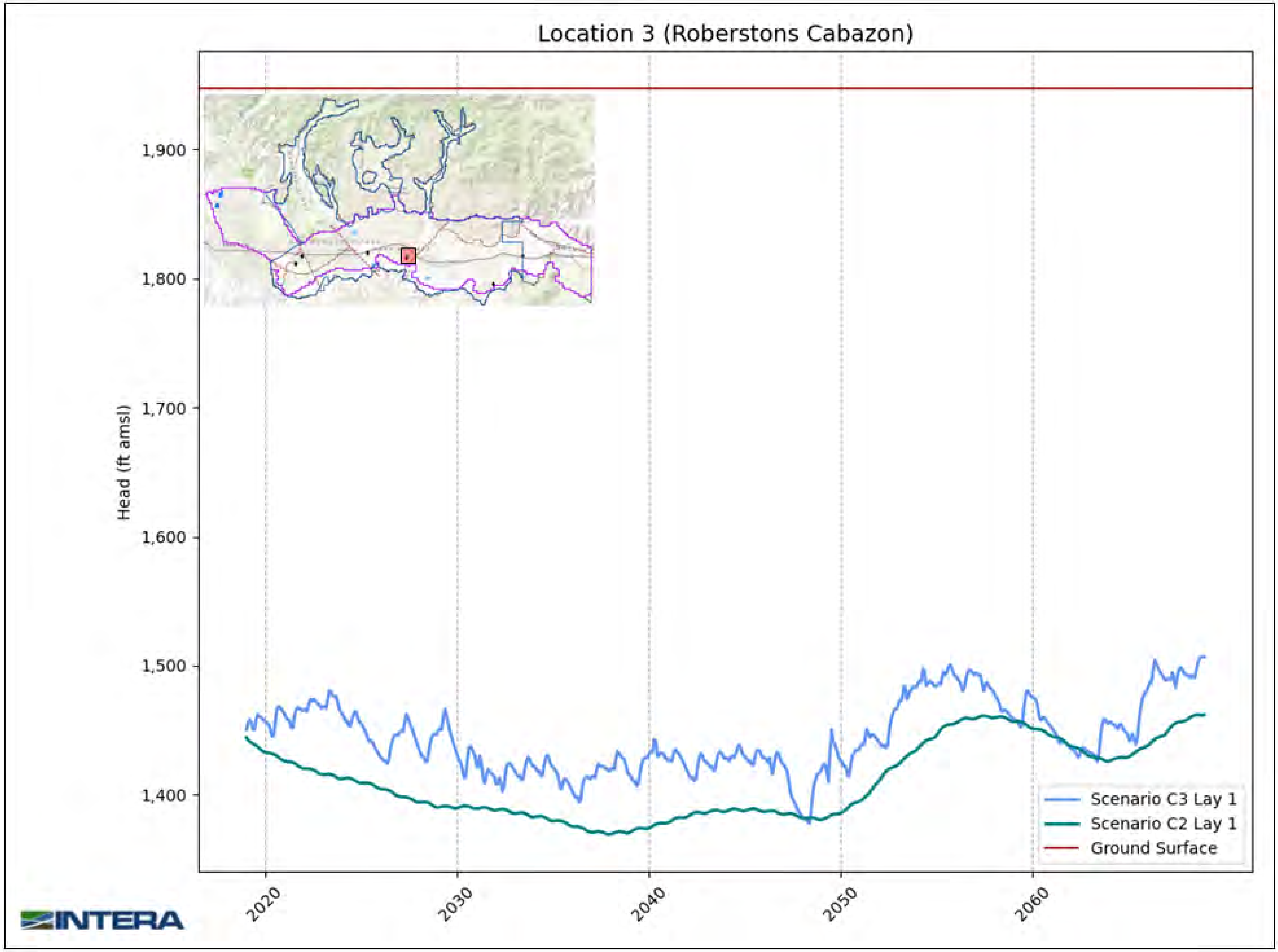

Figure 3.10j Hydrographs for Location 3 (Robertson's Ready Mix Cabazon Pit) - Scenarios C2 and C3.

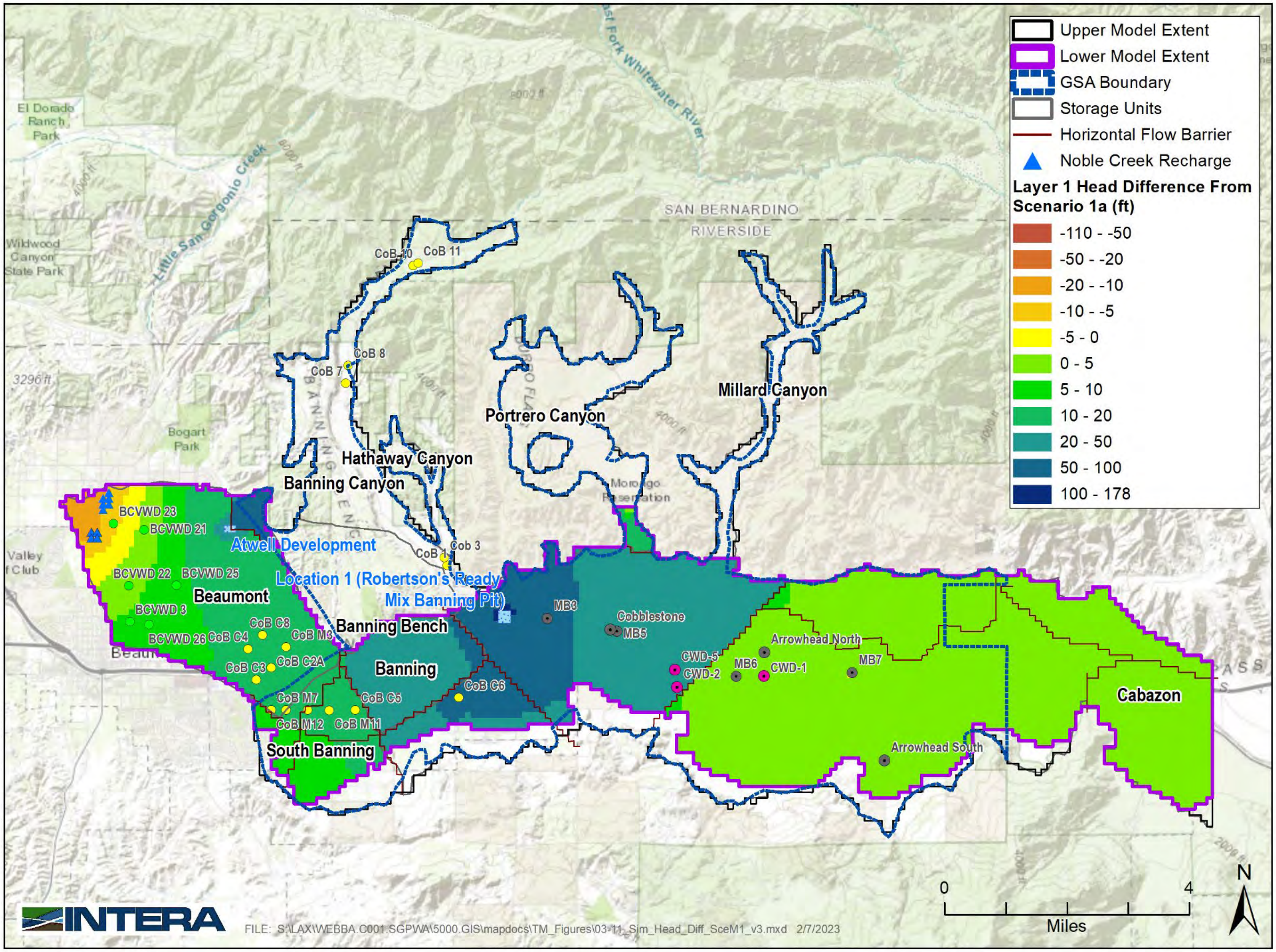

Figure 3.11 Simulated Head Difference - Scenarios 1a and M1.

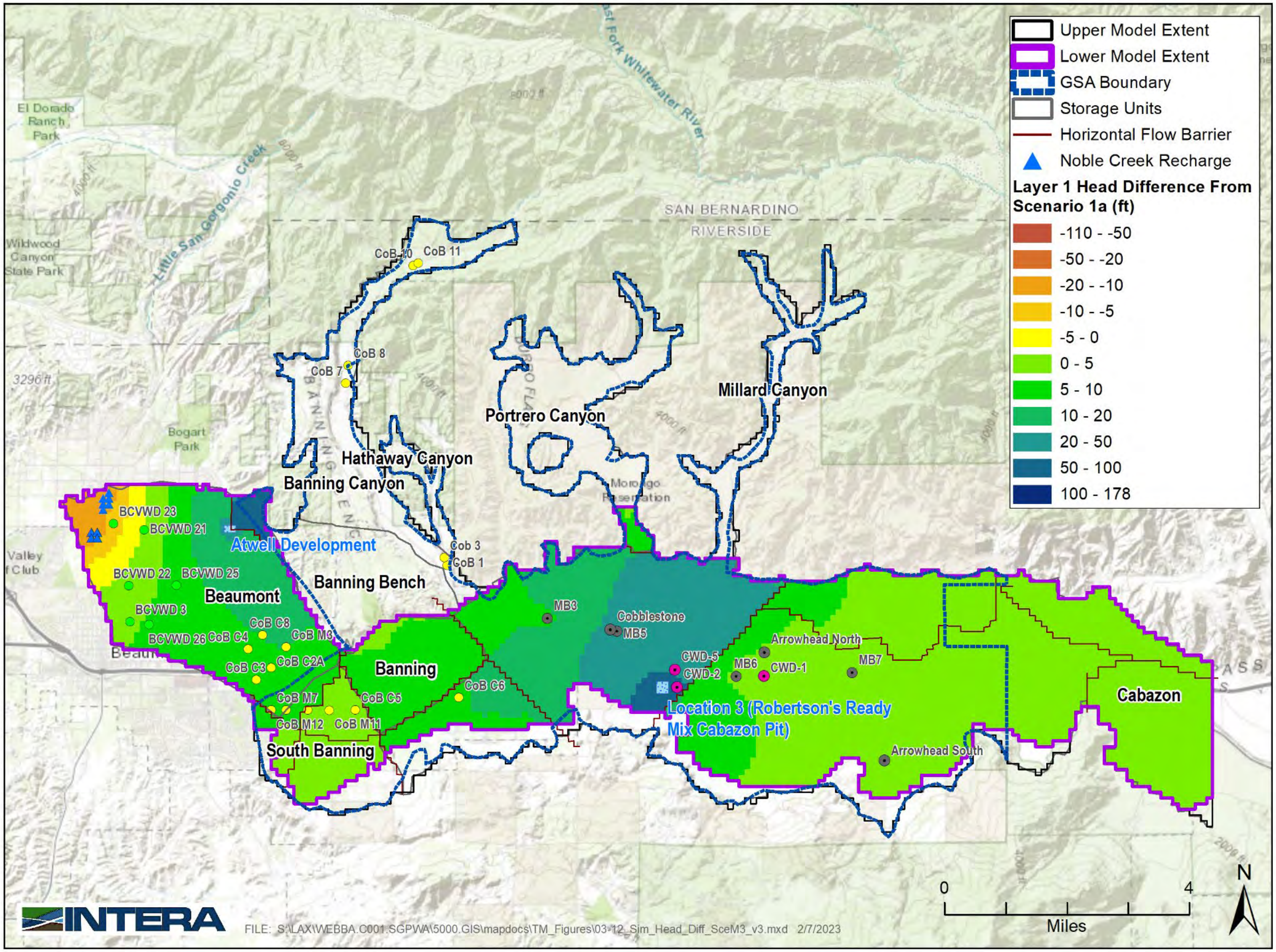

Figure 3.12 Simulated Head Difference - Scenarios 1a and M3.

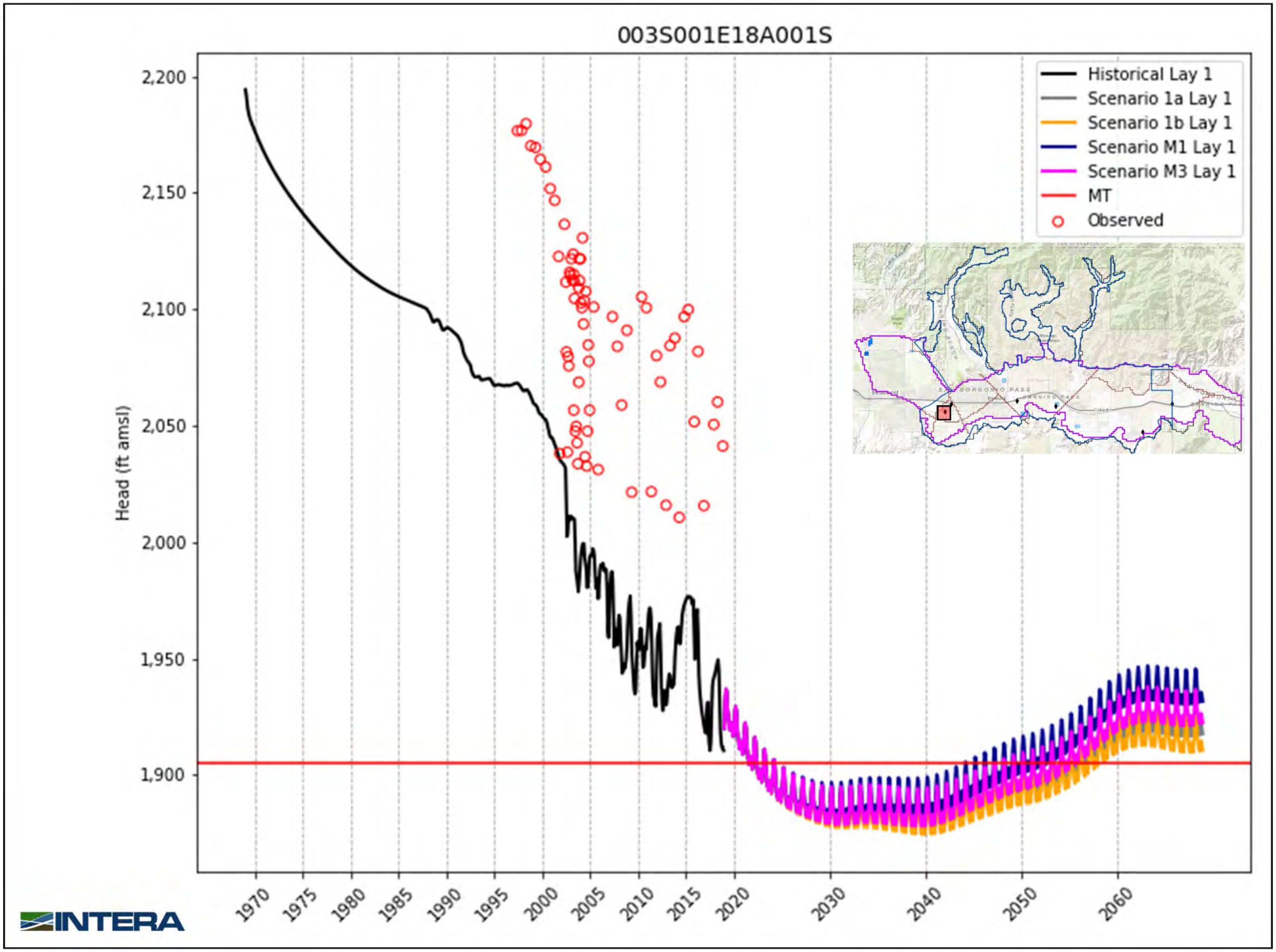

Figure 3.13a Hydrographs for 18A1 - Scenarios 1a, 1b, M1, and M3.

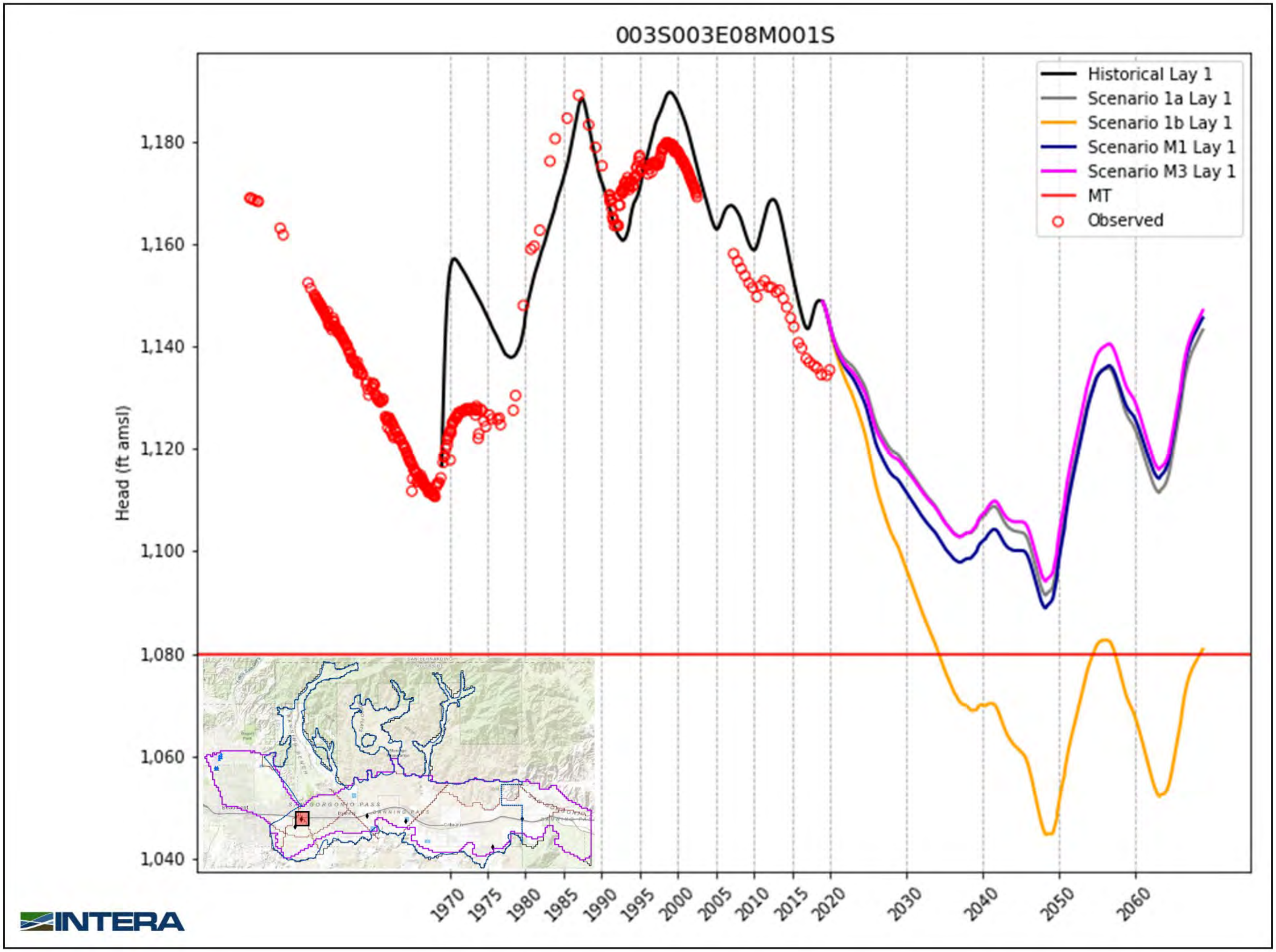

Figure 3.13b Hydrographs for 8M1 - Scenarios 1a, 1b, M1, and M3.

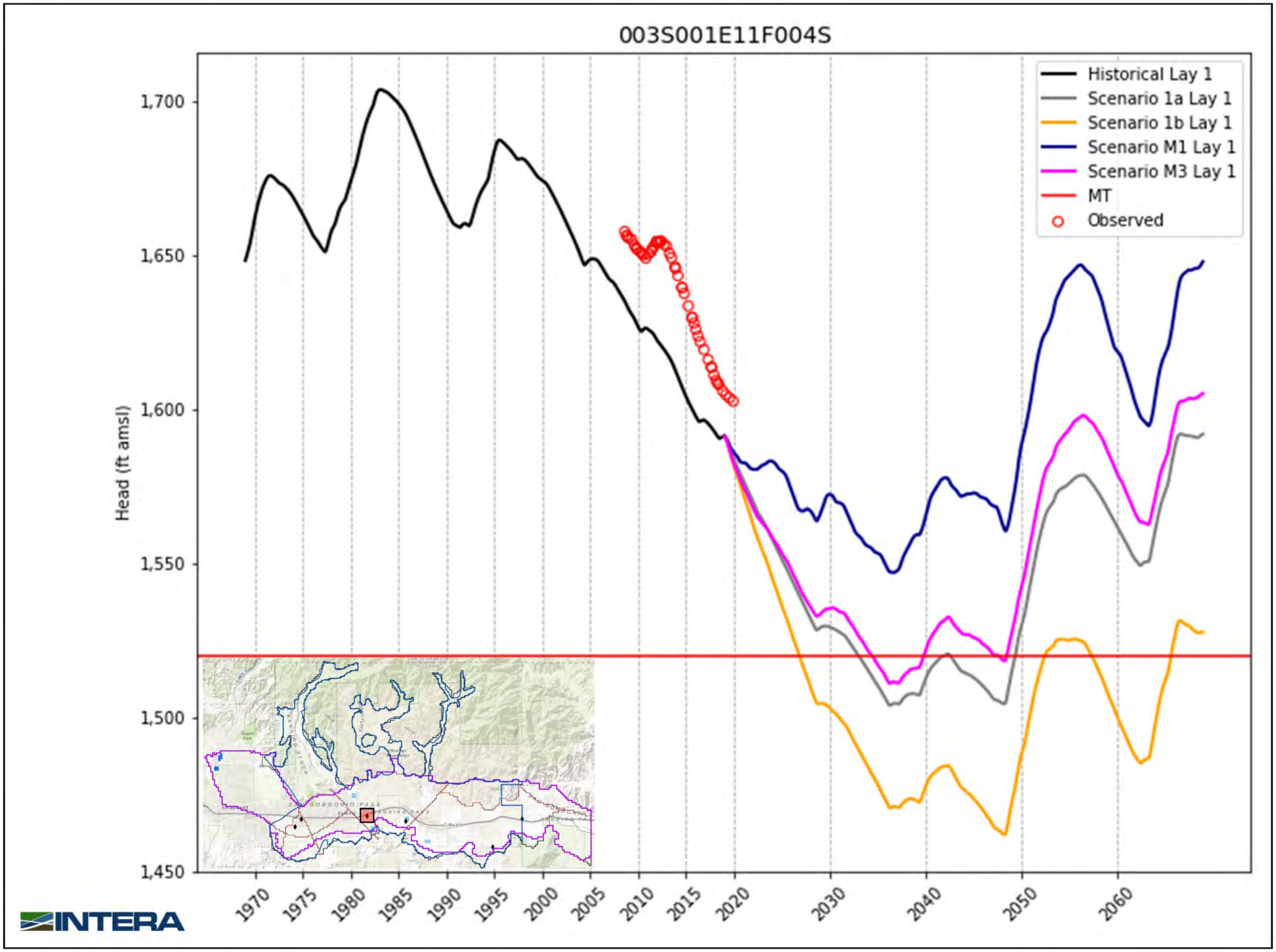

Figure 3.13c Hydrographs for 11F4 - Scenarios 1a, 1b, M1, and M3.

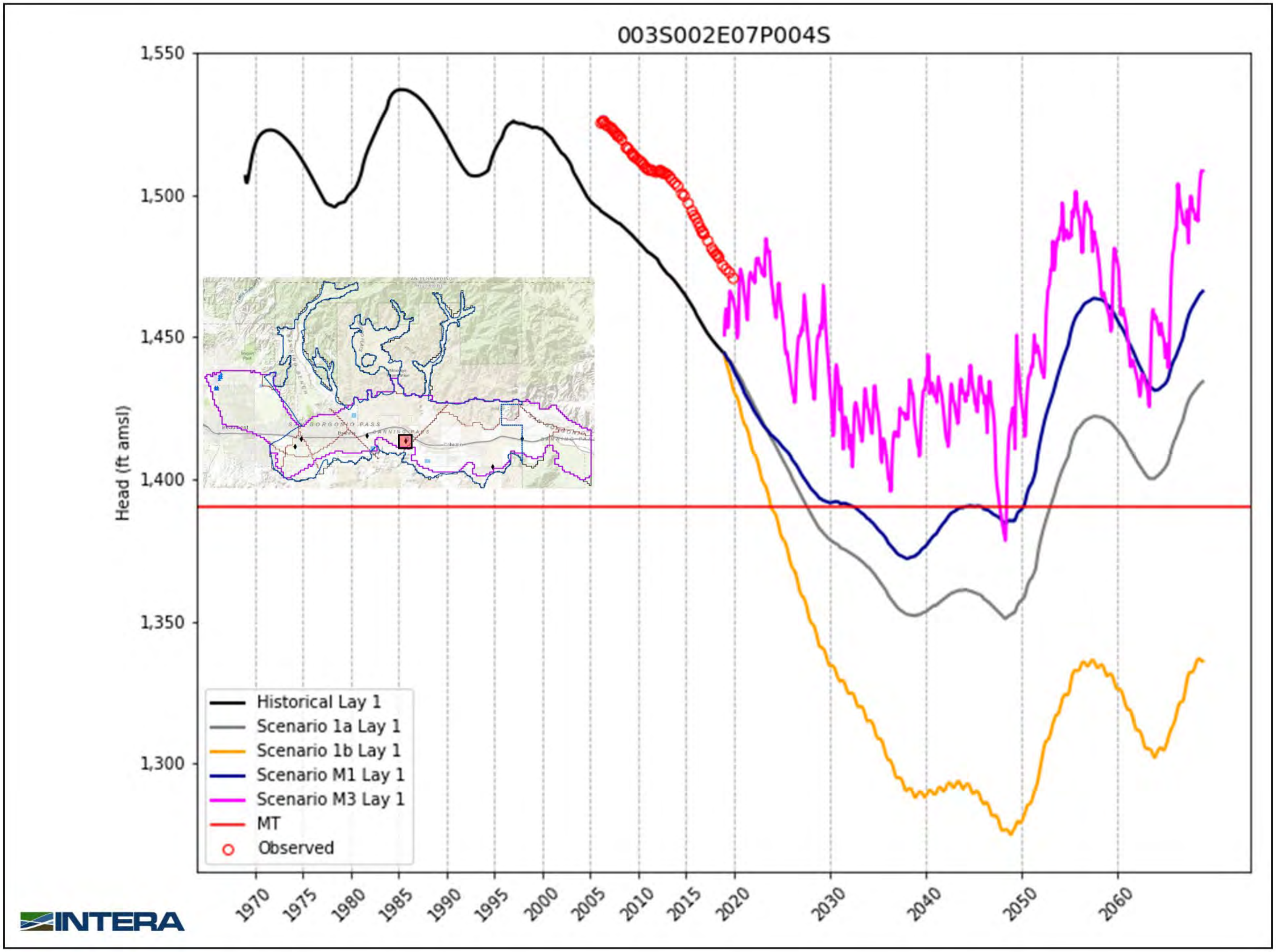

Figure 3.13d Hydrographs for 7P4 - Scenarios 1a, 1b, M1, and M3.

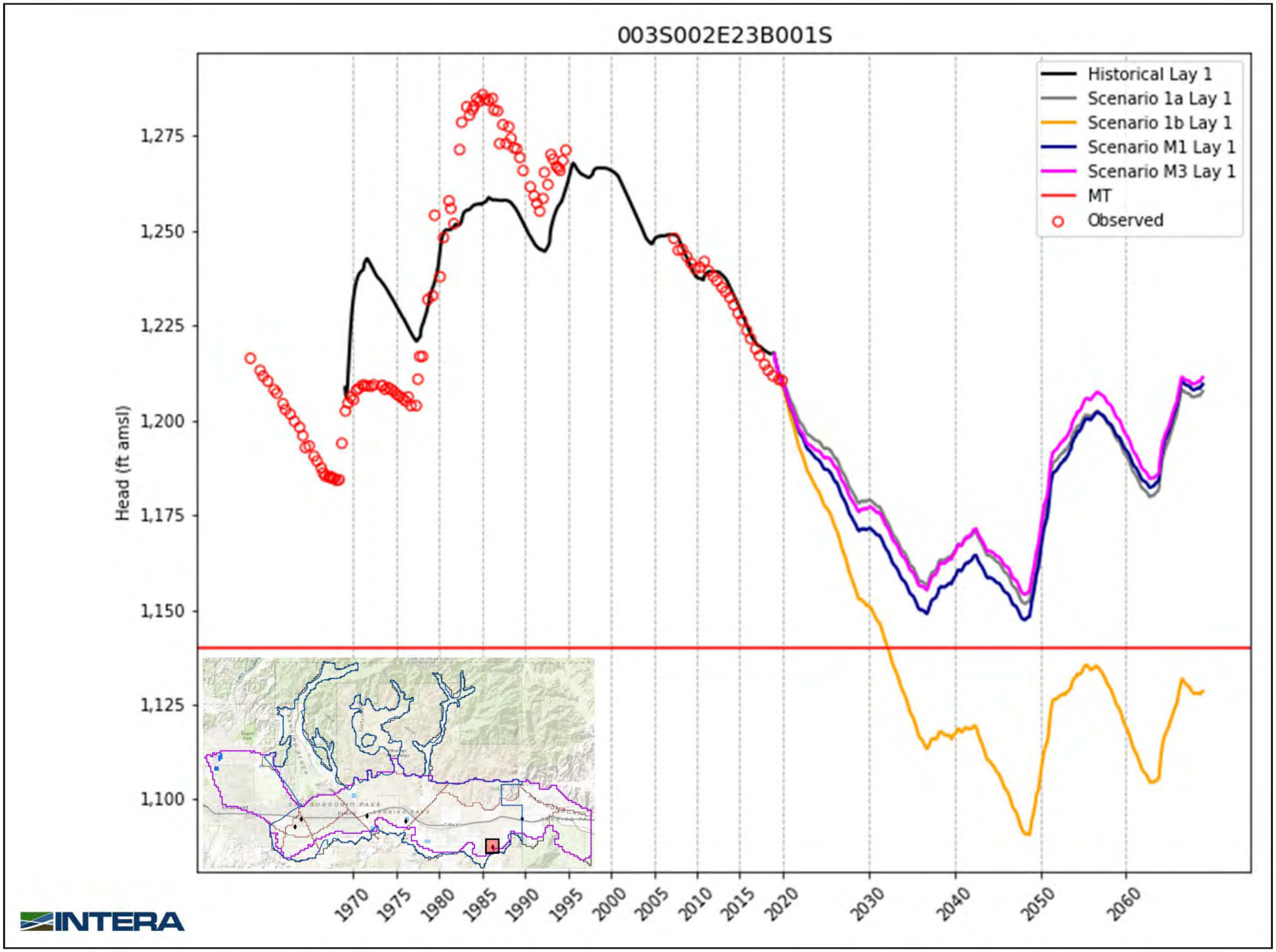

Figure 3.13e Hydrographs for 23B1 - Scenarios 1a, 1b, M1, and M3.

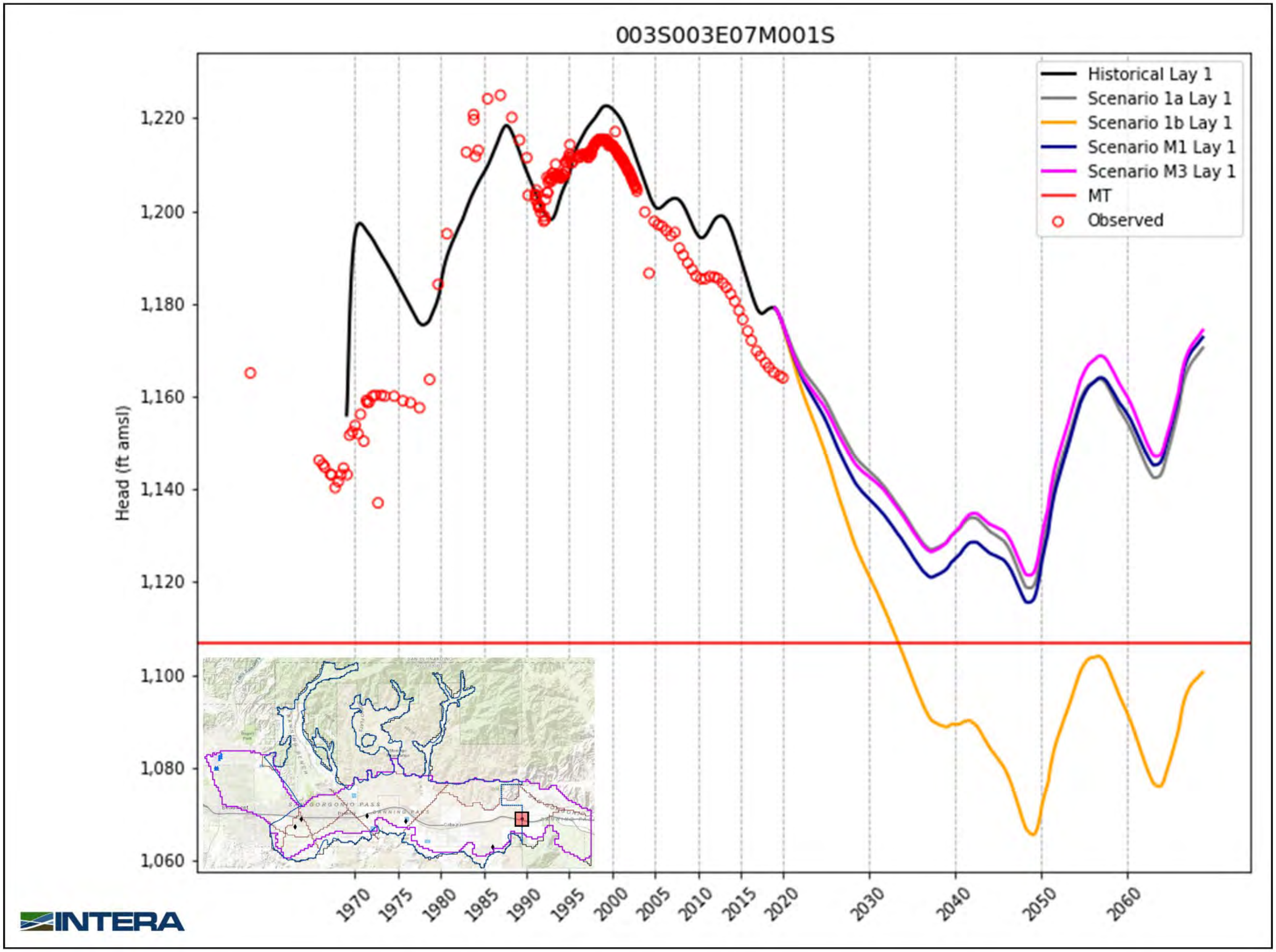

Figure 3.13f Hydrographs for 7M1 - Scenarios 1a, 1b, M1, and M3.

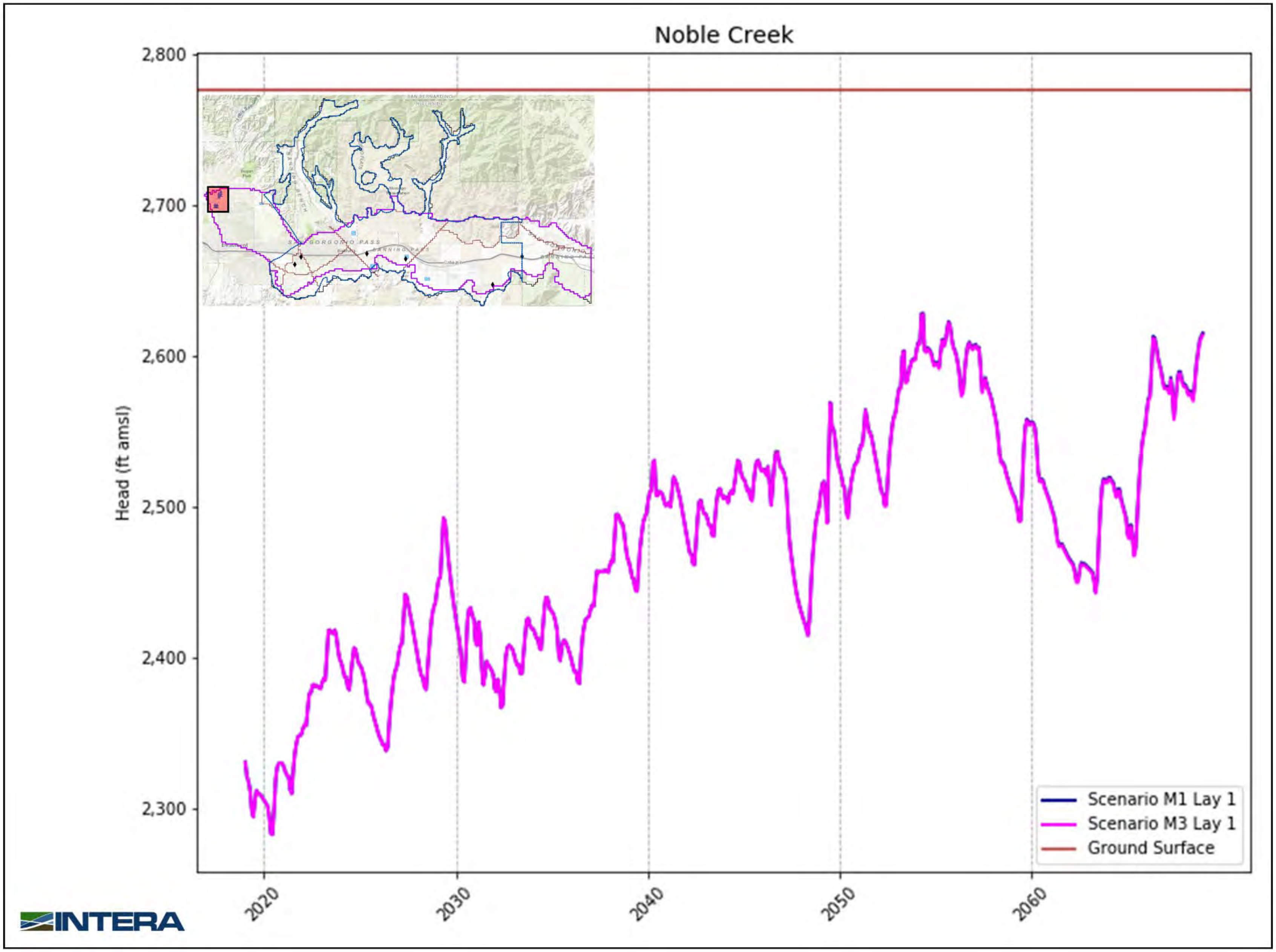

Figure 3.13g Hydrographs for Noble Creek - Scenarios M1 and M3.

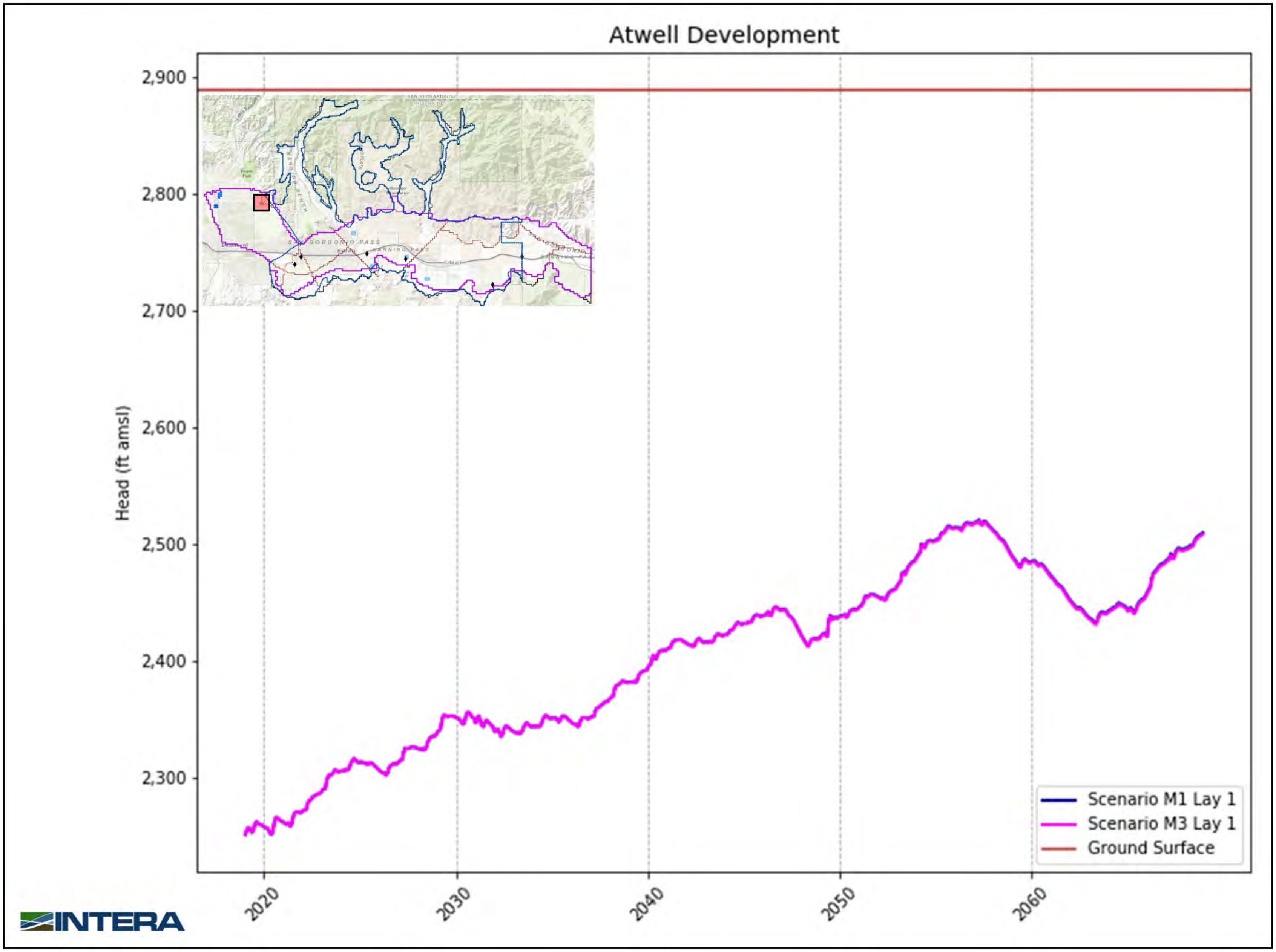

Figure 3.13h Hydrographs for Atwell Development - Scenarios M1 and M3.

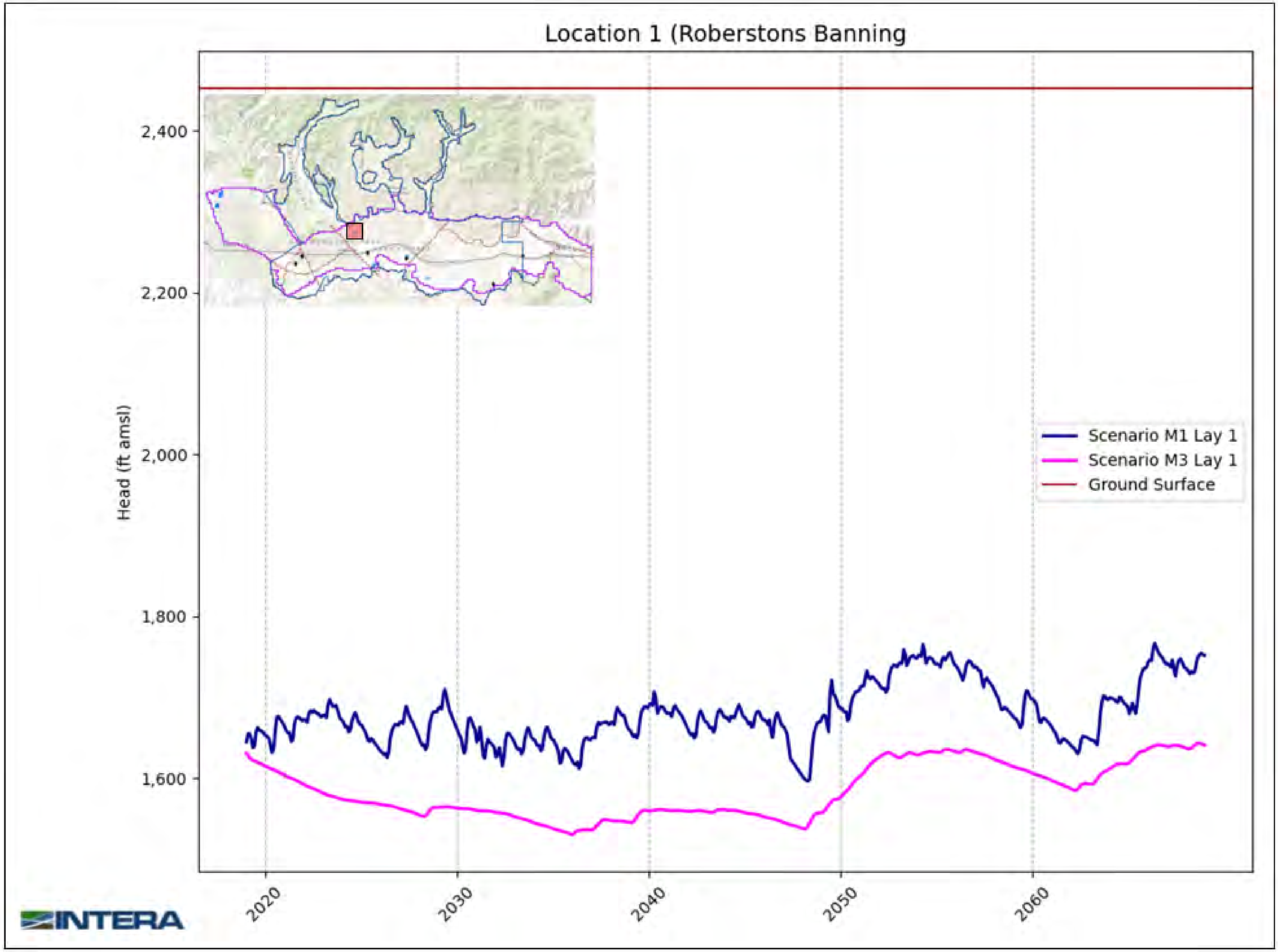

Figure 3.13i Hydrographs for Location 1 (Robertson's Ready Mix Banning Pit) - Scenarios M1 and M3.

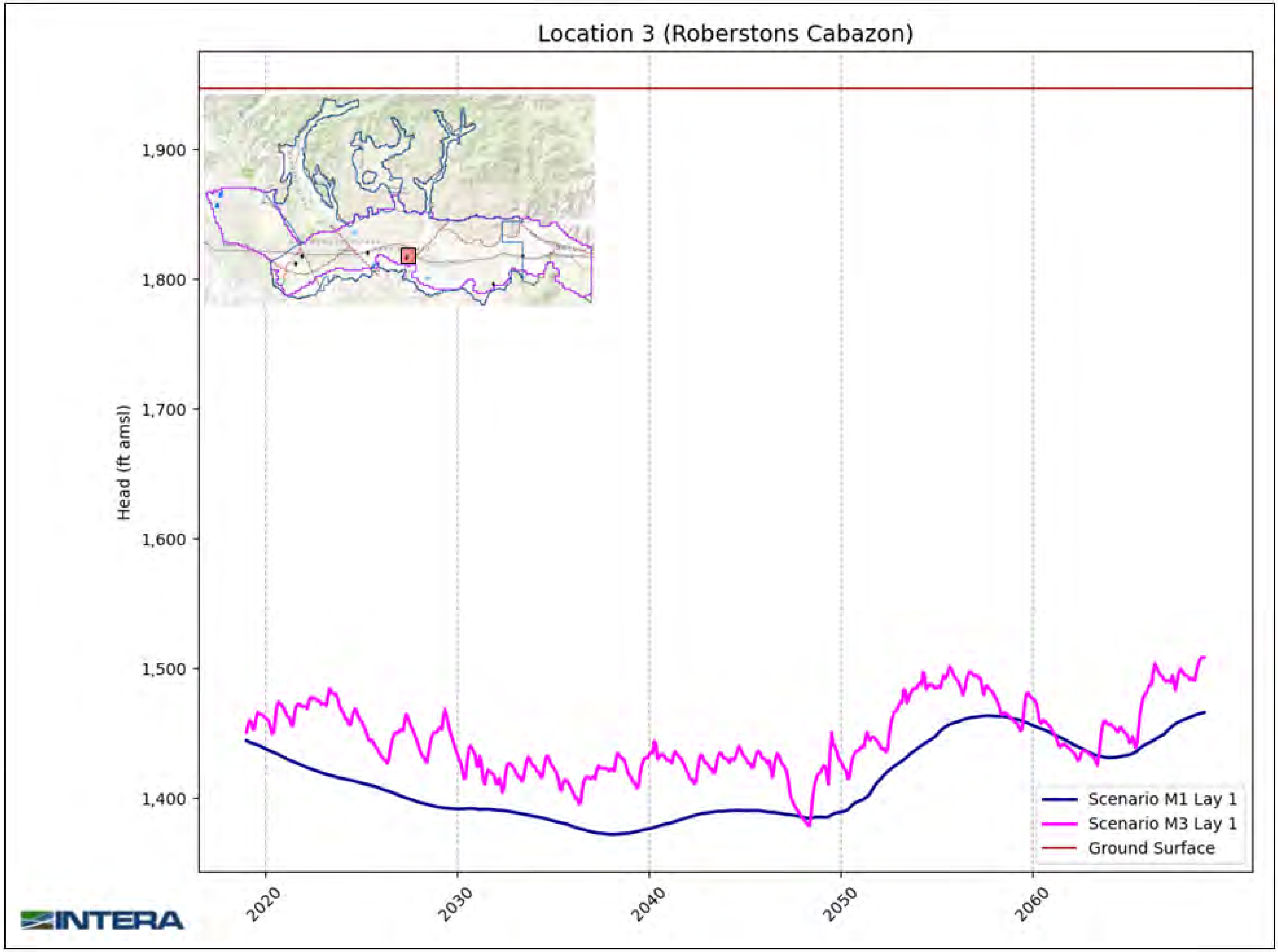

Figure 3.13j Hydrographs for Location 3 (Robertson's Ready Mix Cabazon Pit) - Scenarios M1 and M3.

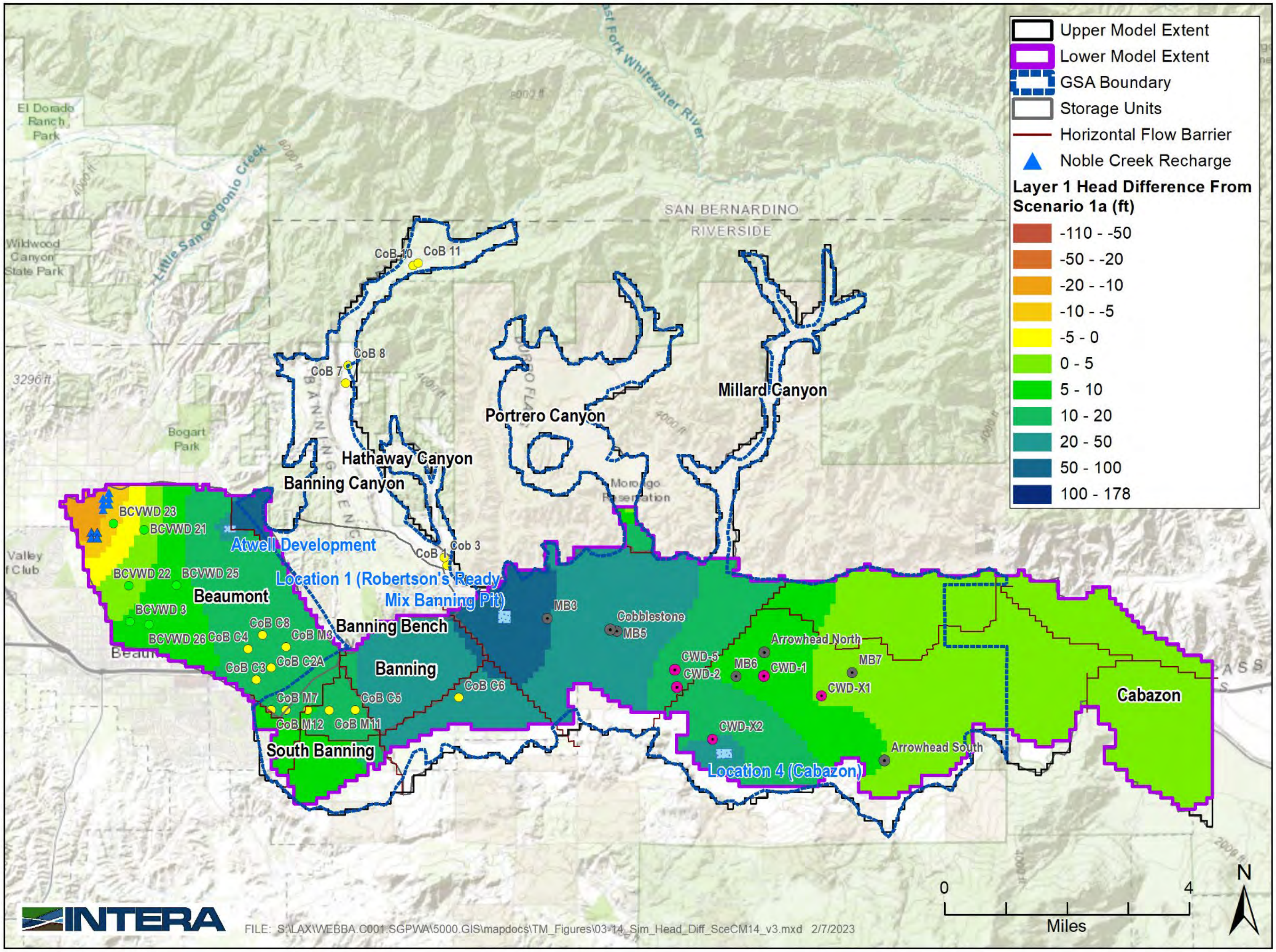

Figure 3.14 Simulated Head Difference - Scenarios 1a and CM14.

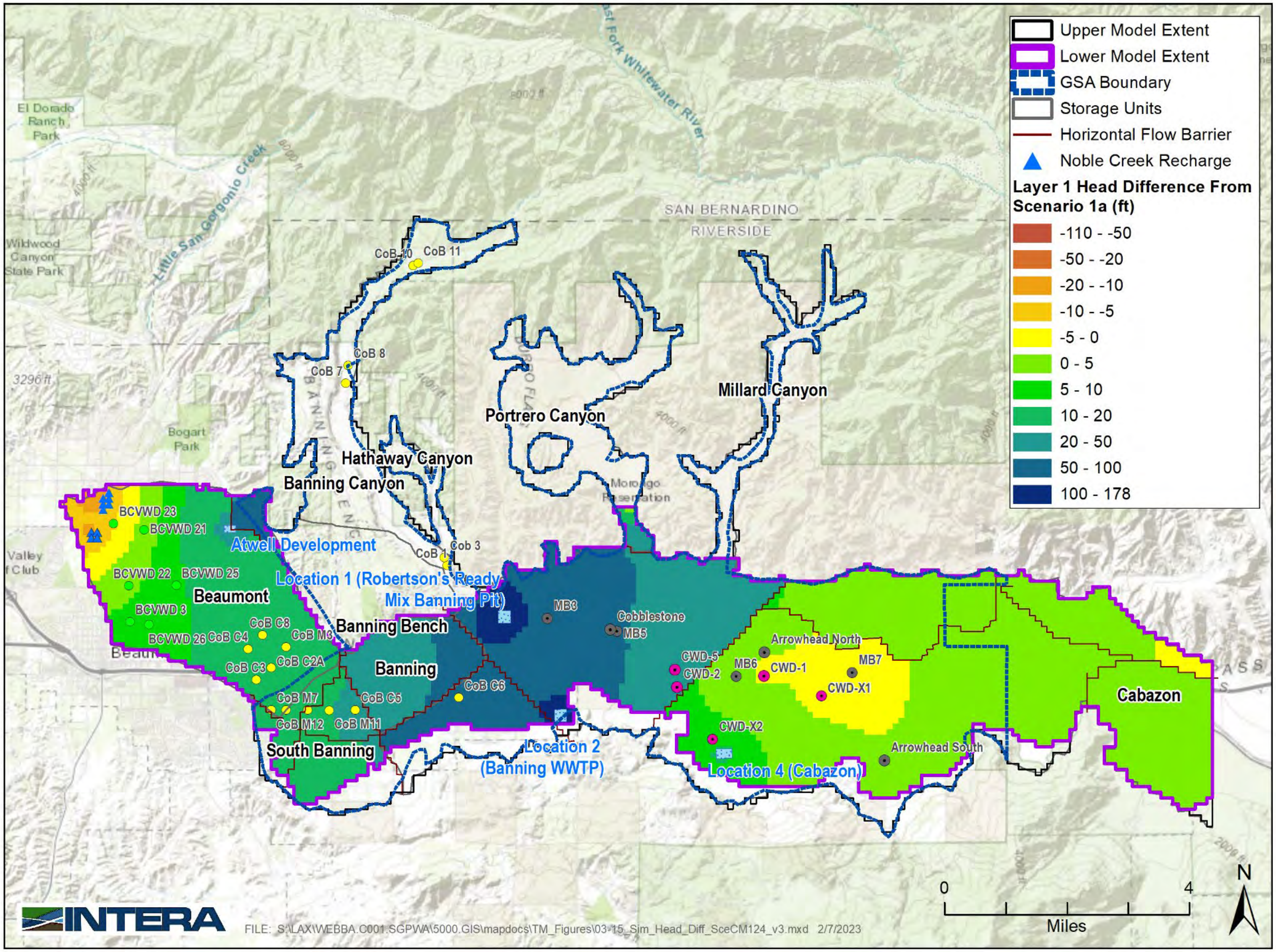

Figure 3.15 Simulated Head Difference - Scenarios 1a and CM124.

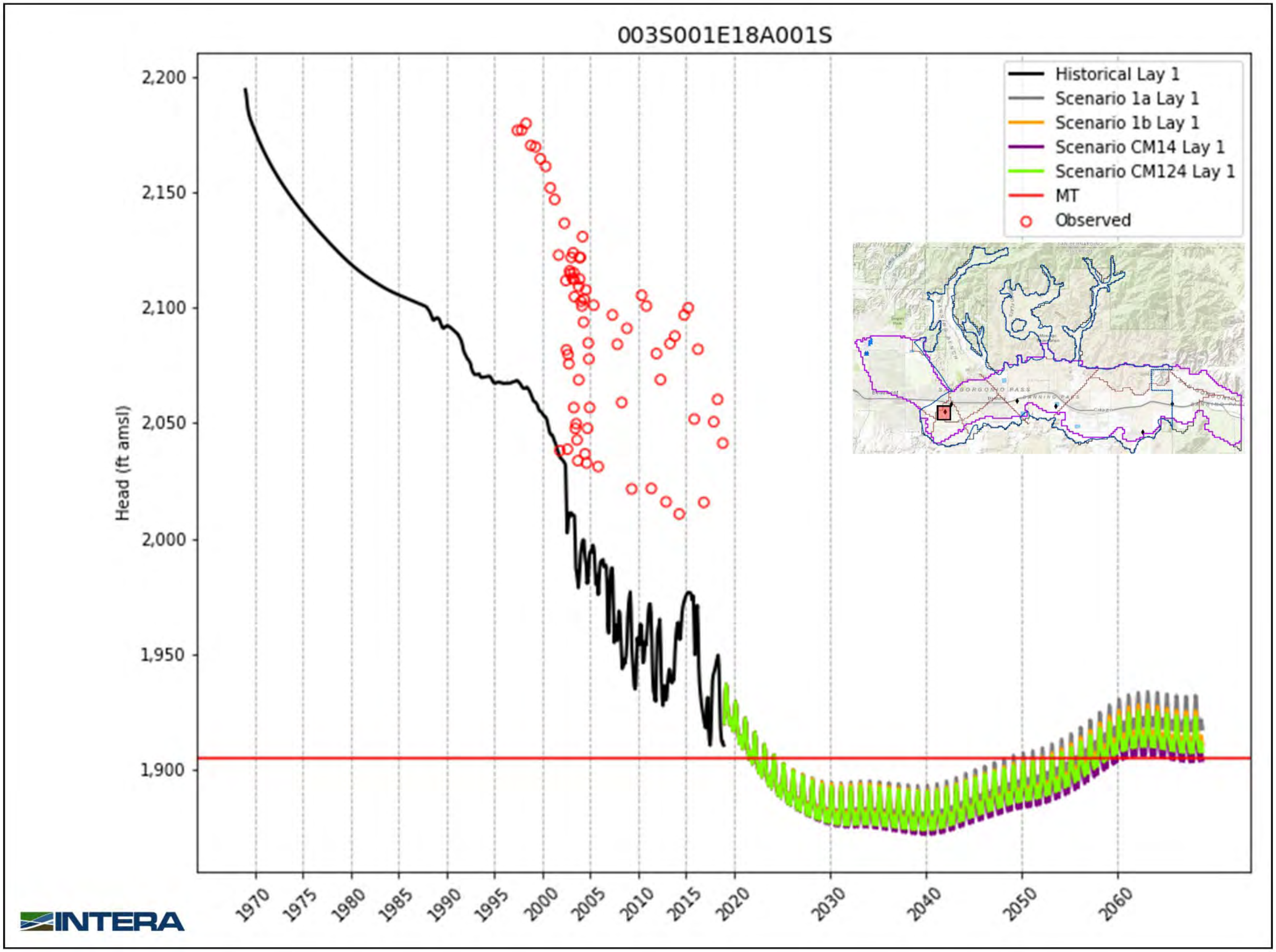

Figure 3.16a Hydrographs for 18A1 - Scenarios 1a, 1b, CM14, and CM124.

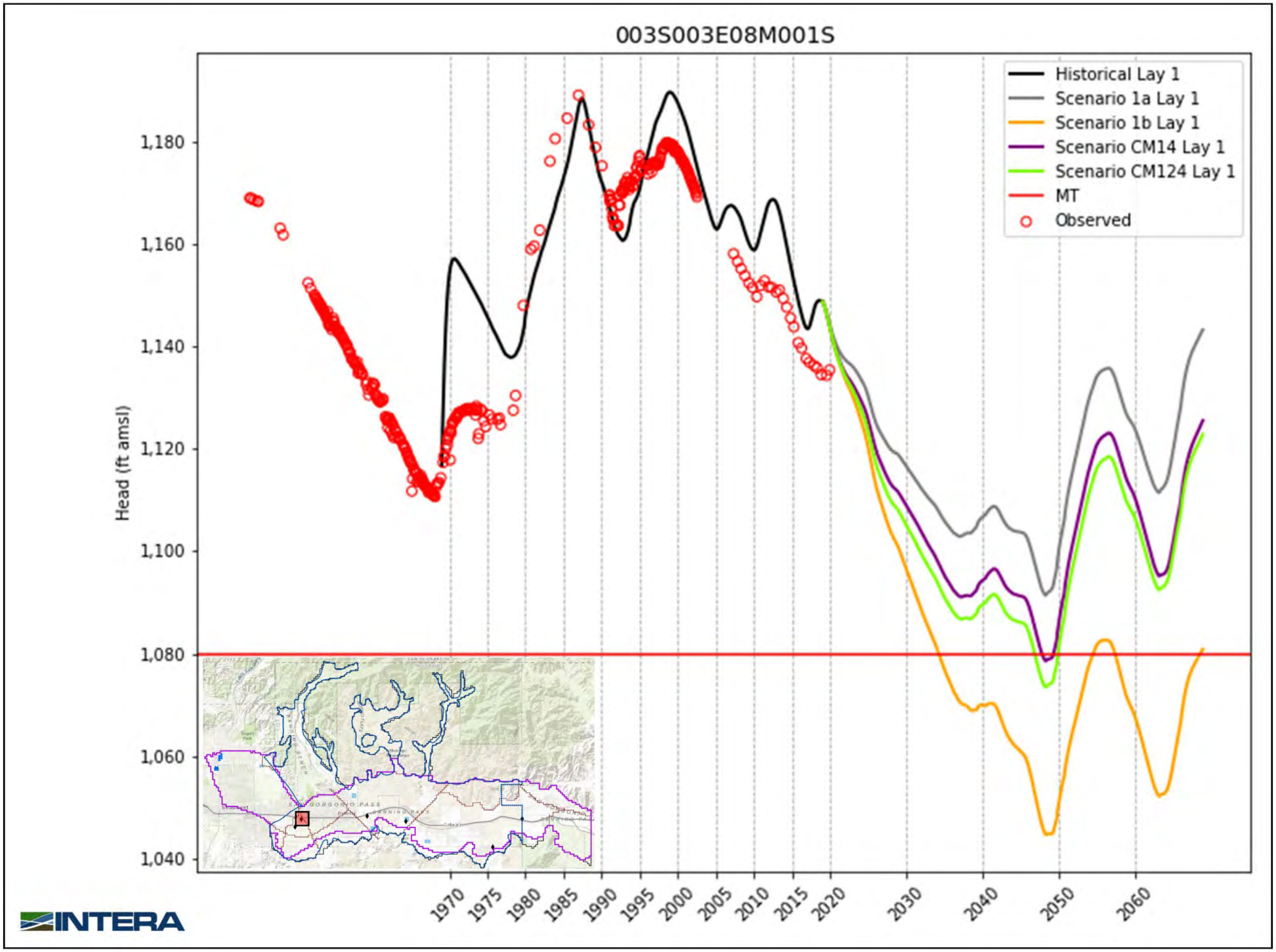

Figure 3.16b Hydrographs for 8M1 - Scenarios 1a, 1b, CM14, and CM124.

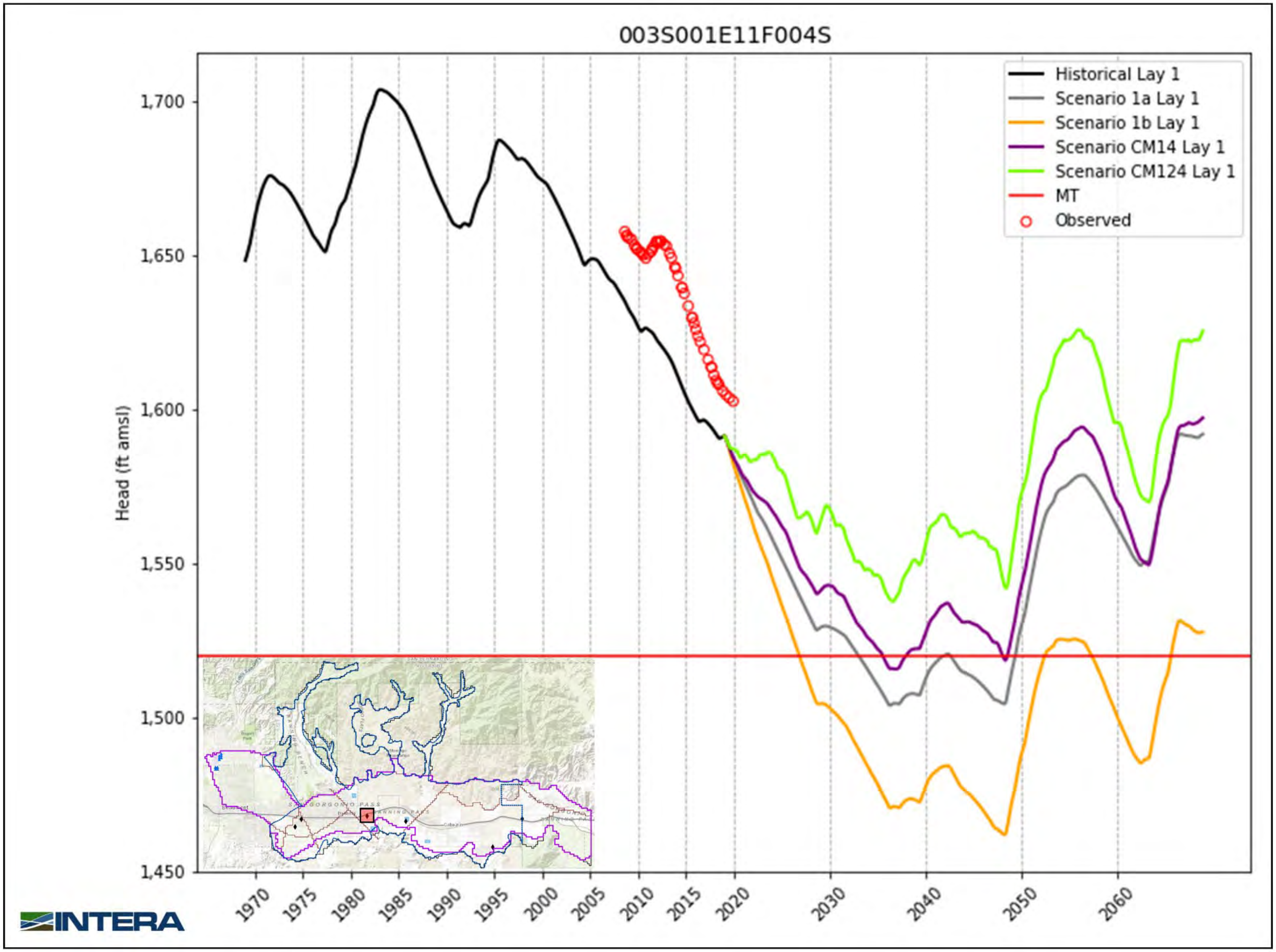

Figure 3.16c Hydrographs for 11F4 - Scenarios 1a, 1b, CM14, and CM124.

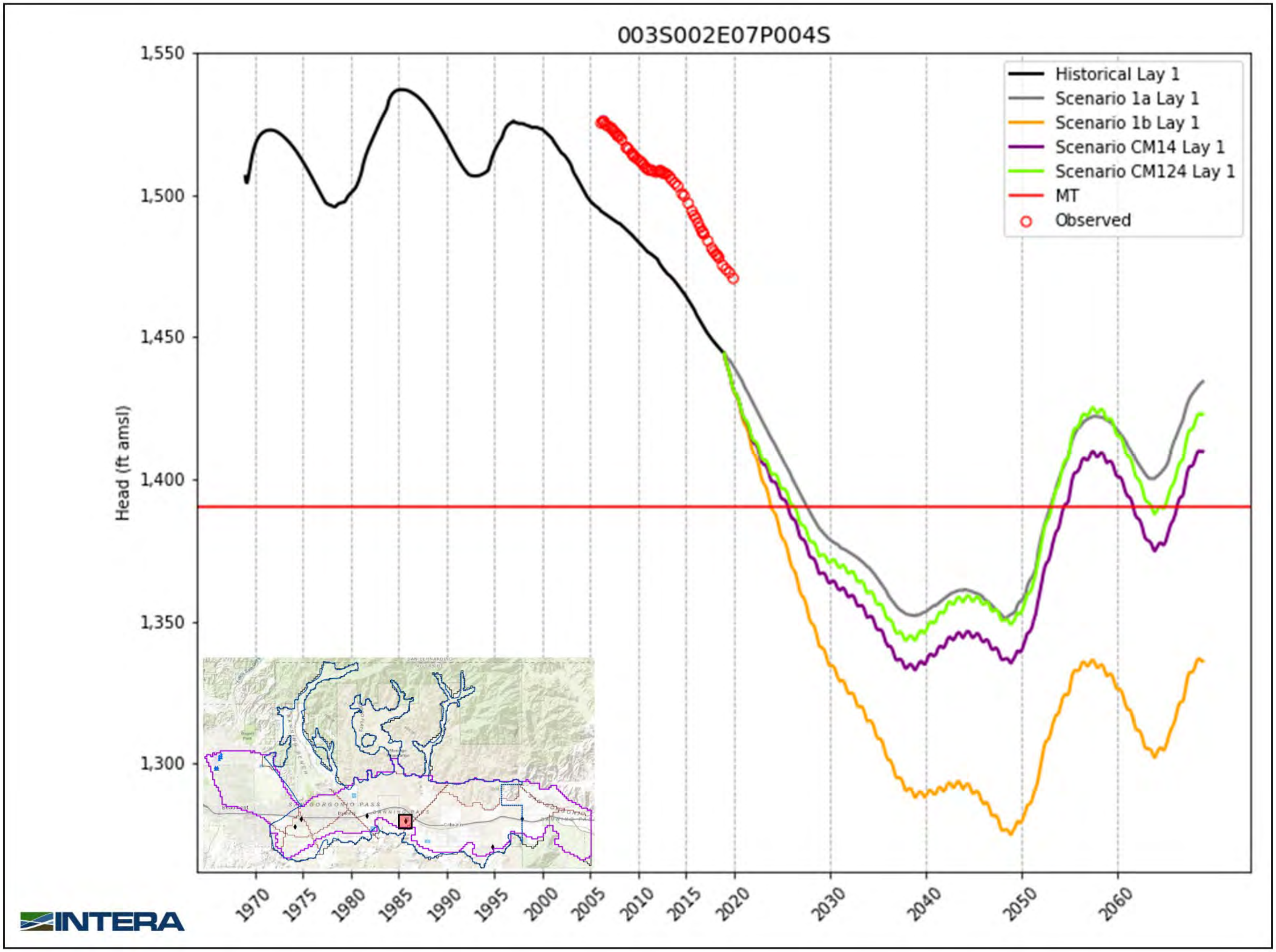

Figure 3.16d Hydrographs for 7P4 - Scenarios 1a, 1b, CM14, and CM124.

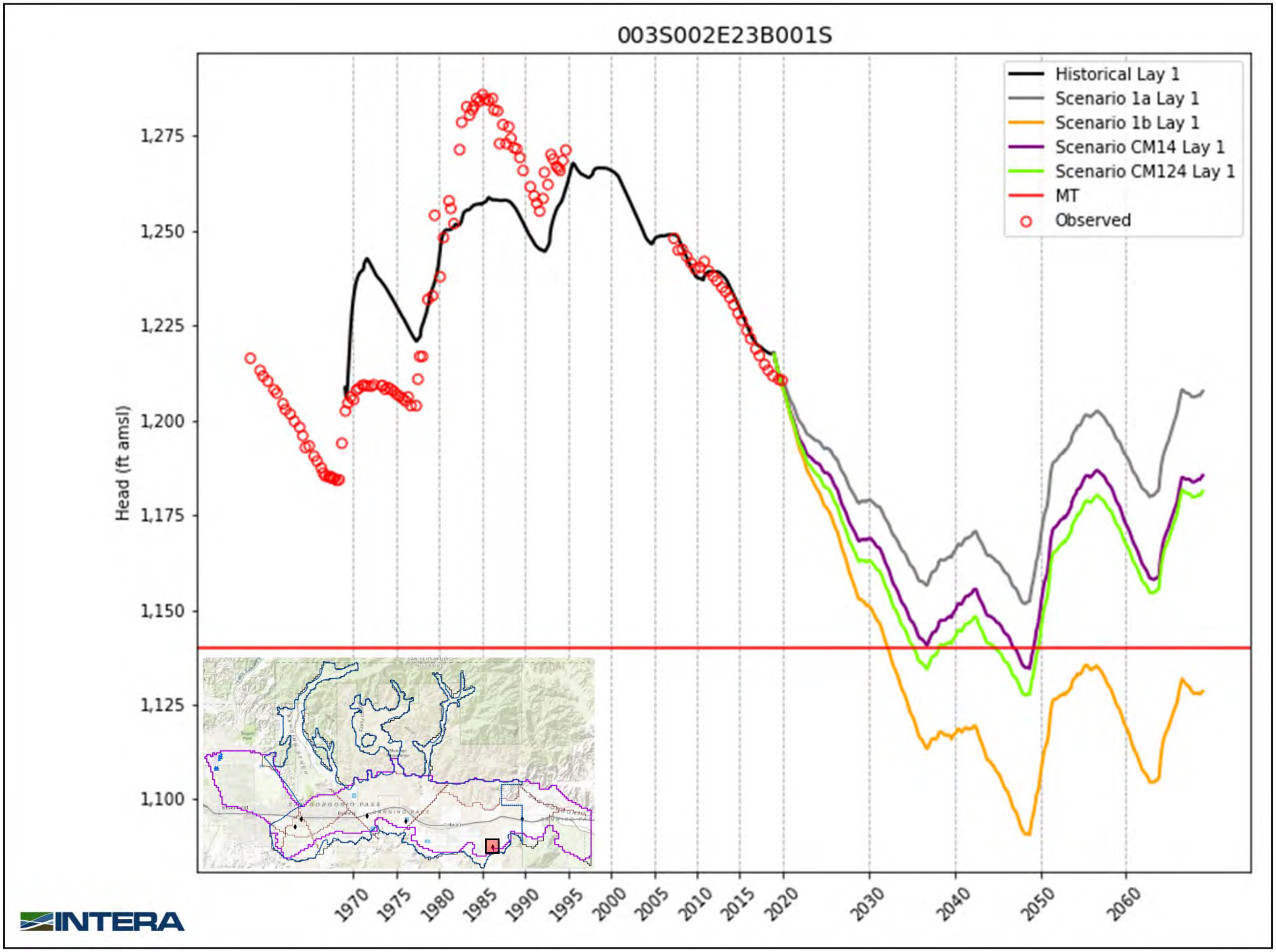

Figure 3.16e Hydrographs for 23B1 - Scenarios 1a, 1b, CM14, and CM124.

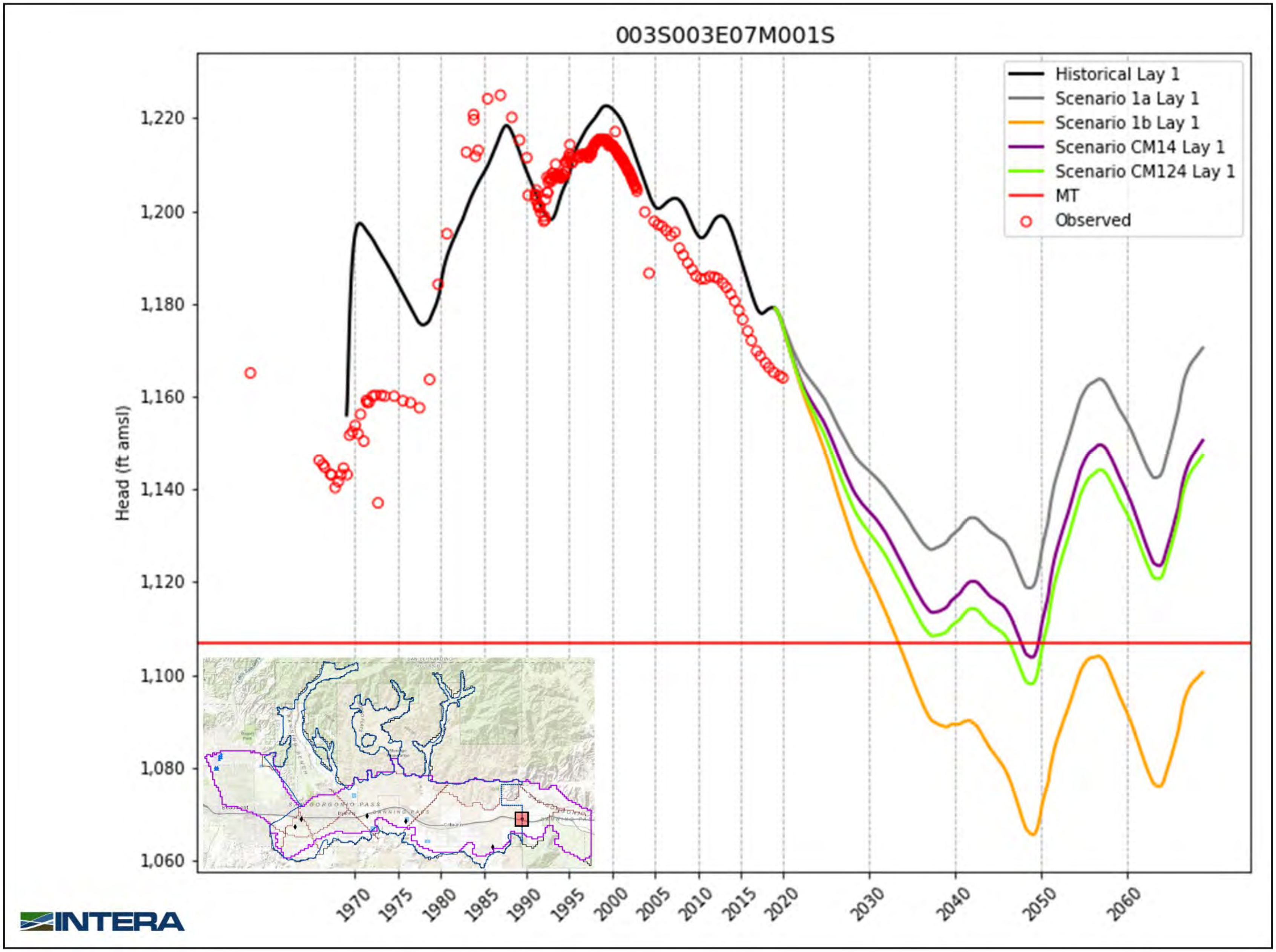

Figure 3.16f Hydrographs for 7M1 - Scenarios 1a, 1b, CM14, and CM124.

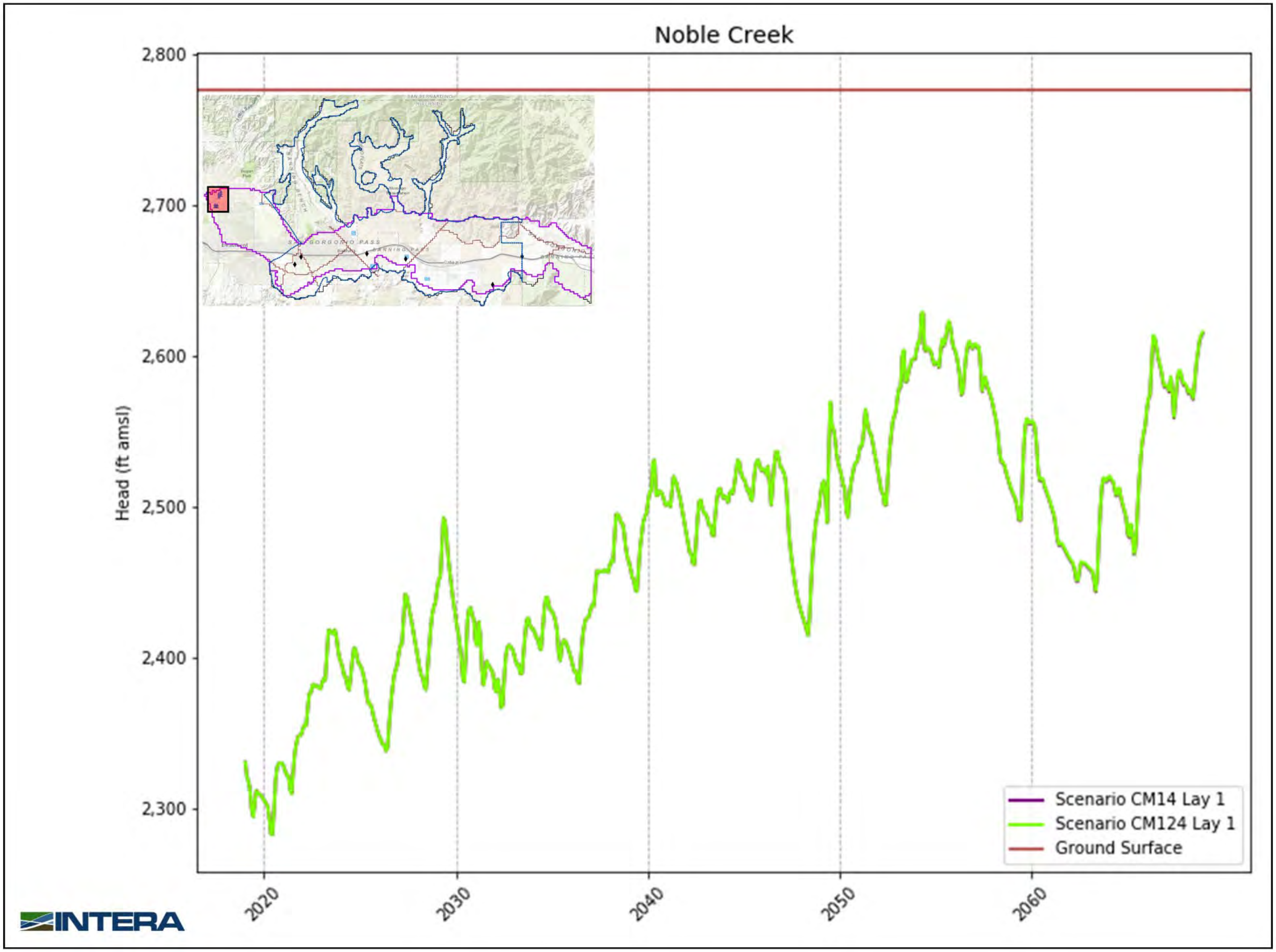

Figure 3.16g Hydrographs for Noble Creek - Scenarios CM14 and CM124.

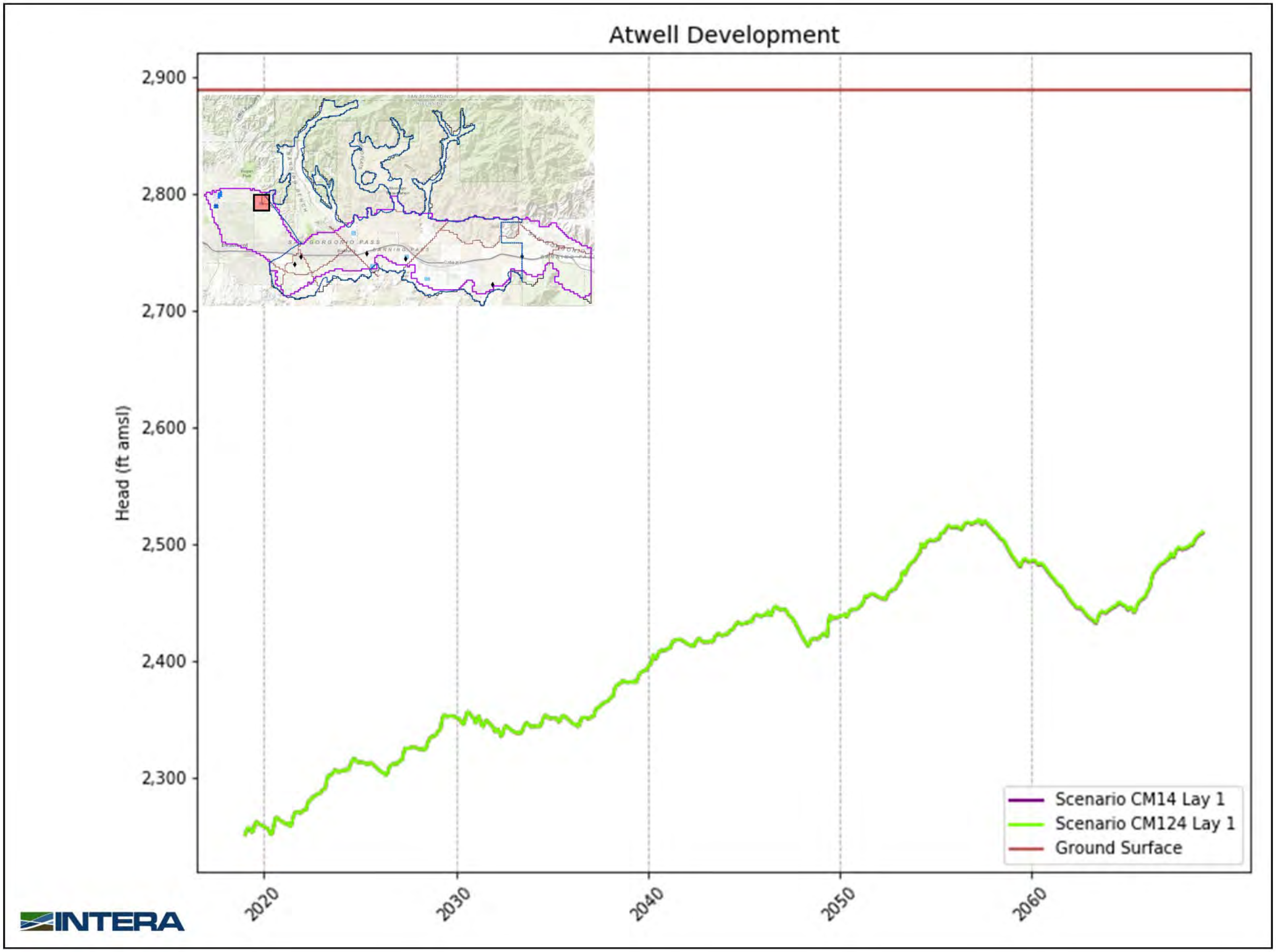

Figure 3.16h Hydrographs for Atwell Development - Scenarios CM14 and CM124.

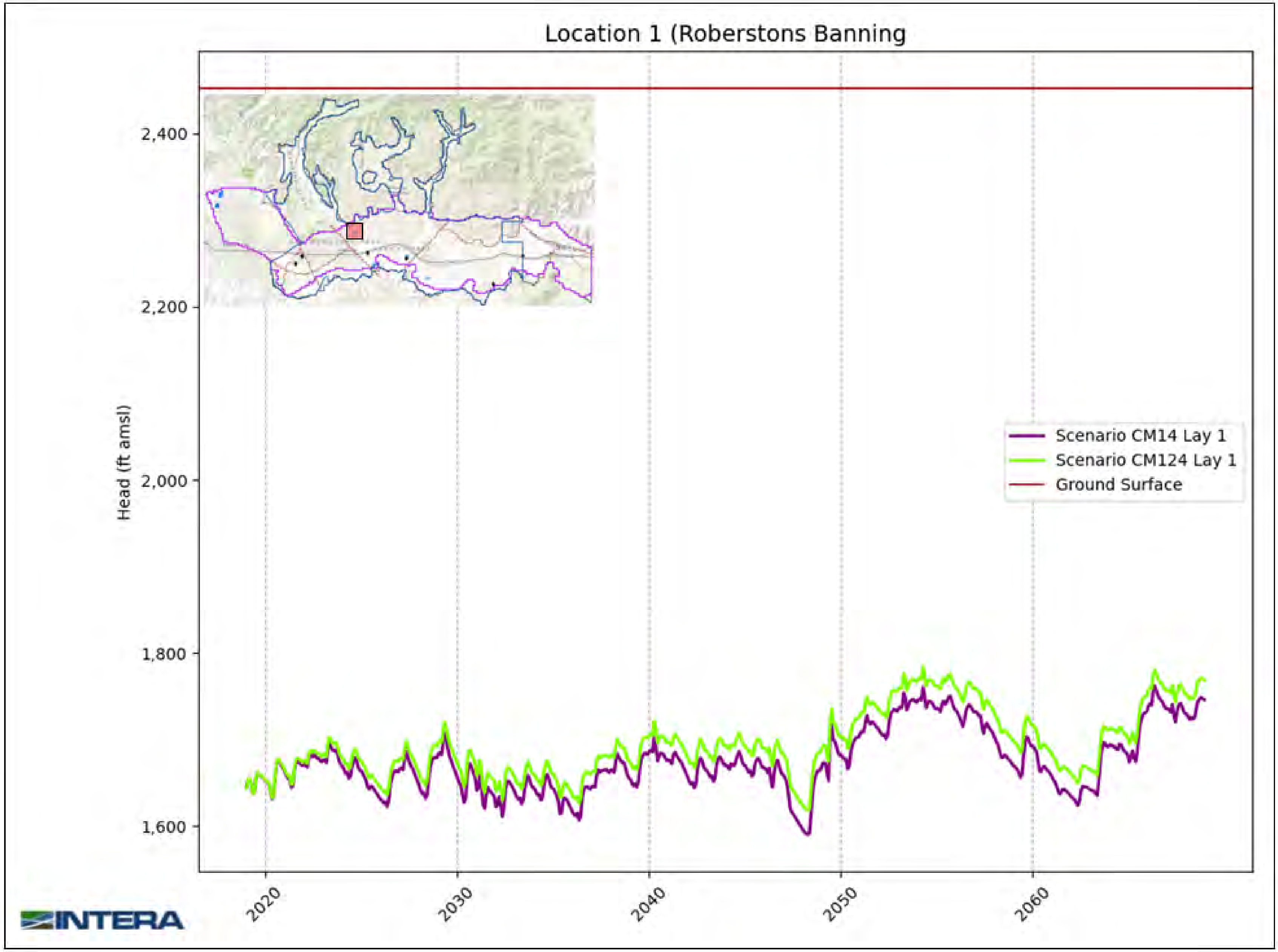

Figure 3.16i Hydrographs for Location 1 (Robertson's Ready Mix Banning Pit) - Scenarios CM14 and CM124.

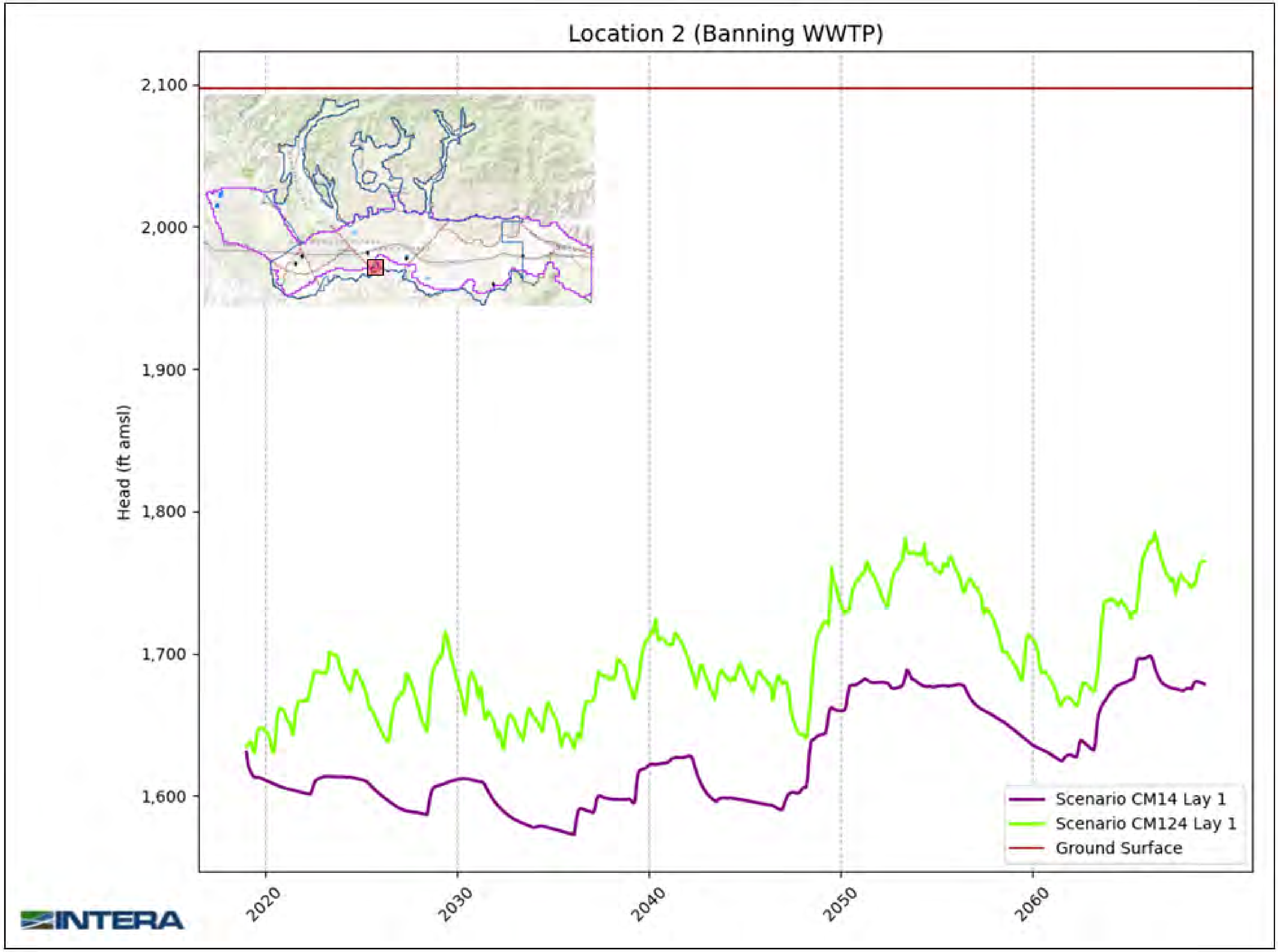

Figure 3.16j Hydrographs for Location 2 (Banning WWTP) - Scenarios CM14 and CM124.

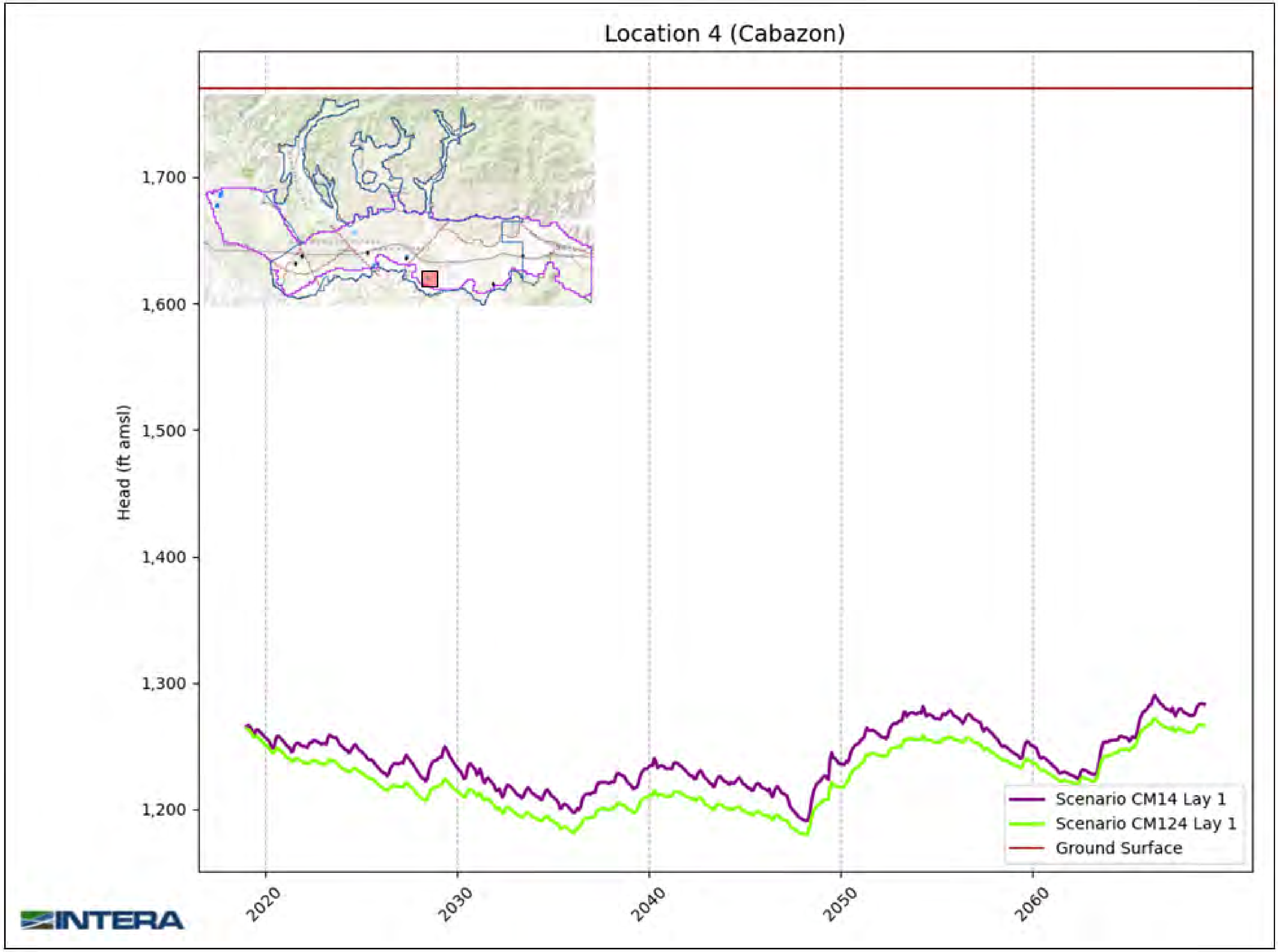

Figure 3.16k Hydrographs for Location 4 (Cabazon) - Scenarios CM14 and CM124.

TABLES

Table 2.1 Model Boundary Conditions by Scenario

<table>
<tr><th rowspan="2">Acre-feet per year (AFY)</th><th></th><th colspan="15">Modeling Assumption for Boundary Conditions</th></tr>
<tr><th>Natural Recharge</th><th>Indio Water Levels</th><th>Return Flows (Distributed)</th><th>Return Flows (WWTP)</th><th>Pumping – City of Banning</th><th>Pumping - BCVWD</th><th>Pumping - MBMI</th><th>Pumping - CWD</th><th>Total Pumping</th><th>Managed Recharge – Noble Creek</th><th>Managed Recharge – Atwell</th><th>Managed Recharge – Location 1</th><th>Managed Recharge – Location 2</th><th>Managed Recharge – Location 3</th><th>Managed Recharge – Location 4</th><th>Total Managed Recharge</th></tr>
<tr><td>Scenario 1a</td><td rowspan="9">Historical impacted by 2030s Climate Change Factors</td><td rowspan="9">2030-Level</td><td rowspan="9">Repeat last 5 years of Historical Model</td><td rowspan="9">4,034</td><td rowspan="9">11,896</td><td rowspan="9">16,797</td><td>2,500</td><td>500</td><td>31,694</td><td rowspan="2">18,550</td><td rowspan="2">-</td><td rowspan="3" colspan="4">-</td><td rowspan="3">18.550</td></tr>
<tr><td>Scenario 1b</td><td>6,300</td><td>4,809</td><td>39,803</td></tr>
<tr><td>Scenario 2</td><td rowspan="3">2,500</td><td>500</td><td>31,694</td><td rowspan="7">16,050</td><td rowspan="7">2,500</td></tr>
<tr><td>Scenario C2</td><td rowspan="2">4,809</td><td rowspan="2">36,003</td><td>-</td><td>4,300</td><td>-</td><td>-</td><td rowspan="2">22.850</td></tr>
<tr><td>Scenario C3</td><td>-</td><td>-</td><td>4,300</td><td>-</td></tr>
<tr><td>Scenario M1</td><td rowspan="4">6,300</td><td rowspan="2">500</td><td rowspan="2">35,494</td><td>4,500</td><td>-</td><td>-</td><td>-</td><td>23.050</td></tr>
<tr><td>Scenario M3</td><td>-</td><td>-</td><td>4,300</td><td>-</td><td>22,850</td></tr>
<tr><td>Scenario CM14</td><td rowspan="2">4,809</td><td rowspan="2">39,803</td><td rowspan="2">4,500</td><td>-</td><td>-</td><td>4,300</td><td rowspan="2">27,350</td></tr>
<tr><td>Scenario CM124</td><td>2,300</td><td>-</td><td>2,300</td></tr>
</table>

Table 3.1 GSA Key Groundwater Budget Terms Summary

	Average Flux over 50-year Projected Period within GSA (AFY)				
	Recharge from Upper Model	Applied Recharge	Groundwater Pumping*	Flow to Indio Subbasin	Change in Storage
Scenario 1a	21,637	8,202	-6,028	-18,984	-608
Scenario 1b	21,102	8,202	-13,712	-15,173	-5,010
Scenario 2	21,647	8,202	-6,032	-18,985	-554
Scenario C2	21,748	12,738	-10,442	-18,273	342
Scenario C3	21,717	12,738	-10,372	-18,708	-21
Scenario M1	21,806	12,949	-9,909	-18,792	627
Scenario M3	21,731	12,738	-9,844	-19,178	58
Scenario CM14	21,804	17,485	-14,214	-19,090	558
Scenario CM124	21,854	17,485	-14,261	-18,627	1,015

*Simulated pumping may not exactly match the model input due to the groundwater model adjusting the pumping rates for periods of lower water levels.

Table 3.2 Minimum Threshold Exceedance Summary

	Minimum Threshold Exceeded?					
	18A1 (COB #M11)	8M1 (MSWD #26)	11F4	7P4	23B1 (Jensen #2)	7M1 (MSWD #25)
Scenario 1a	✓		✓	✓		
Scenario 1b	✓	✓	✓	✓	✓	✓
Scenario 2	✓		✓	✓		
Scenario C2	✓			✓		
Scenario C3	✓					
Scenario M1	✓			✓		
Scenario M3	✓					
Scenario CM14	✓			✓		
Scenario CM124	✓			✓	✓	✓

Table 4.1 Recharge Site Ranking Matrix

	Ranking		
	Relative Flow to Indio	Impact on Water Levels / MT Exceedance	<u>Cumulative</u>
Location 1 (Robertson's Banning)	2	4	4
Location 2 (Banning WWTP)	1	3	2
Location 3 (Robertson's Cabazon)	3	1	1
Location 4 (New Cabazon)	4	2	3

ATTACHMENT 1:
TABLES OF PROJECTED RECHARGE AND EXTRACTION BY SCENARIO

Projected Managed Recharge From Noble Creek (Acre-Feet) – Applied in Scenarios 1a, 1b

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	2,210	1,916	1,975	736	18	1,453	1,998	1,935	1,805	1,524	1,433	1,264	18,266
1923	1,055	915	943	1,177	422	1,623	2,355	2,024	2,068	2,074	1,790	1,905	18,351
1924	2,160	1,888	1,773	702	702	1,438	1,657	1,316	1,316	1,271	1,234	458	15,916
1925	1,171	448	388	103	16	688	1,092	767	767	711	664	572	7,388
1926	586	560	485	30	40	1,215	1,595	2,327	2,171	1,838	1,730	1,530	14,107
1927	1,252	1,086	1,119	1,262	443	1,689	2,344	2,330	2,328	1,629	1,510	1,432	18,424
1928	1,543	1,138	1,216	1,470	661	1,761	2,501	2,536	2,544	1,922	1,751	1,707	20,751
1929	1,864	1,441	1,484	1,257	192	851	1,436	1,038	1,038	976	924	822	13,322
1930	646	617	535	135	30	836	1,979	1,374	1,340	1,205	1,129	983	10,809
1931	924	859	783	61	61	716	1,118	790	790	736	692	604	8,133
1932	557	532	461	117	109	490	971	686	686	636	594	512	6,352
1933	519	496	430	26	30	1,042	1,905	1,344	1,321	1,201	1,125	977	10,417
1934	933	876	785	57	57	438	717	532	532	497	468	411	6,302
1935	362	346	300	19	26	770	2,332	2,563	2,505	2,250	1,980	2,043	15,497
1936	2,285	0	0	13	80	1,702	1,890	2,509	2,507	1,755	1,626	1,542	15,910
1937	1,662	1,225	1,309	179	179	927	3,650	2,682	2,680	1,876	1,738	1,649	19,755
1938	1,777	1,310	1,400	1,577	685	2,011	2,615	2,615	2,674	2,714	2,337	2,496	24,210
1939	2,833	2,486	2,328	4,288	3,284	1,281	2,549	2,645	2,643	1,902	1,775	0	28,012
1940	0	0	0	13	76	1,359	2,227	2,317	0	2,066	1,914	1,816	11,788
1941	1,956	1,442	1,541	1,368	626	1,866	2,248	2,317	2,369	2,404	2,071	2,211	22,421
1942	2,510	2,202	2,062	4,006	2,904	2,565	2,217	2,358	2,383	2,033	1,807	1,835	28,882
1943	2,039	1,676	1,648	2,670	1,762	2,299	2,170	2,170	2,219	2,252	1,940	2,071	24,915
1944	2,350	2,063	1,932	2,904	444	3,605	1,876	1,140	1,140	1,057	987	850	20,348
1945	871	832	721	763	169	1,574	2,488	2,570	2,578	1,951	1,777	1,734	18,029
1946	1,894	1,466	1,509	2,071	1,147	2,064	2,279	2,654	2,653	1,873	1,732	1,649	22,990
1947	1,779	1,320	1,404	1,420	140	954	2,756	2,862	2,859	2,041	1,901	0	19,434
1948	0	0	0	13	13	106	701	2,573	2,339	1,975	1,857	1,639	11,216
1949	1,367	1,186	1,222	450	69	868	2,015	1,252	1,252	1,166	1,093	951	12,892
1950	904	864	749	47	49	849	2,584	2,480	2,094	1,768	1,663	1,467	15,519
1951	1,224	1,062	1,094	1,229	15	1,615	2,414	2,205	2,237	2,021	1,776	1,836	18,728
1952	2,055	1,730	1,671	3,105	2,048	2,390	2,451	2,073	2,120	2,152	1,853	1,979	25,628
1953	2,246	1,971	1,846	3,870	2,706	2,633	2,276	2,559	2,556	1,789	1,658	1,573	27,683
1954	1,695	1,250	1,335	1,603	713	1,902	2,238	2,501	2,498	1,749	1,620	1,537	20,640
1955	1,656	1,221	1,305	917	693	997	1,273	905	905	839	784	675	12,170
1956	692	661	573	952	149	1,773	2,145	2,299	2,352	2,386	2,056	2,195	18,231
1957	2,491	2,186	2,047	3,783	2,906	2,350	2,093	1,966	1,833	1,548	1,455	1,284	25,940
1958	1,071	929	958	1,265	419	1,610	2,431	2,659	2,719	2,760	2,377	2,538	21,736
1959	2,880	2,528	2,367	4,474	3,283	2,714	1,932	1,778	1,658	1,400	1,316	1,162	27,492
1960	969	841	866	107	107	895	2,938	2,429	2,426	1,698	1,574	1,493	16,342
1961	0	1,964	2,098	53	8	271	1,939	1,182	1,182	1,096	1,024	883	11,700
1962	0	1,337	1,159	179	27	1,466	2,342	2,108	1,965	1,660	1,561	1,377	15,181
1963	1,149	996	1,027	1,293	430	1,724	2,072	2,496	2,494	1,746	1,618	1,534	18,579
1964	1,653	1,219	1,303	1,438	689	1,696	2,425	2,561	2,558	1,791	1,659	1,574	20,565
1965	1,696	1,250	1,336	833	65	1,269	1,721	1,544	1,440	1,216	1,143	1,009	14,522
1966	842	730	752	1,111	15	1,621	2,353	2,172	2,207	2,048	1,792	1,866	17,510
1967	2,096	1,783	1,709	3,130	2,182	2,209	2,214	2,103	2,151	2,183	1,880	2,007	25,648
1968	2,278	1,999	1,872	3,729	2,658	2,629	2,219	2,309	2,306	1,614	1,496	1,419	26,529
1969	1,529	1,127	1,205	1,404	660	1,783	2,628	2,628	2,688	2,728	2,349	2,509	23,237
1970	2,847	2,498	2,340	4,422	1,206	1,614	2,412	2,203	2,235	2,019	1,775	1,834	27,405
1971	2,054	1,729	1,670	3,099	2,045	2,215	1,835	1,839	1,715	1,448	1,362	1,201	22,212
1972	1,002	869	896	1,214	409	1,657	2,422	2,592	2,589	1,813	1,680	1,593	18,736
1973	1,717	1,266	1,353	1,561	718	1,904	2,474	2,425	2,440	1,944	1,751	1,739	21,292
1974	1,914	1,523	1,535	2,365	1,413	2,088	2,212	2,639	2,640	1,900	1,750	1,677	23,657
1975	1,816	1,364	1,437	1,748	878	1,953	2,461	2,403	2,420	1,954	1,756	1,752	21,942
1976	1,932	1,548	1,552	2,350	16	1,507	2,462	2,561	2,559	1,791	1,660	1,574	21,513
1977	1,696	1,251	1,337	35	35	154	236	170	170	160	152	136	5,531

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1978	103	98	85	5	48	1,714	2,290	2,328	2,380	2,416	2,081	2,222	15,770
1979	2,521	2,213	2,072	782	784	6,637	2,409	2,507	2,504	1,753	1,624	1,541	27,347
1980	1,660	1,224	1,308	1,352	15	1,787	2,163	2,166	2,215	2,248	1,936	2,068	20,143
1981	2,347	2,059	1,928	3,072	2,748	1,453	2,109	1,898	1,769	1,494	1,405	1,240	23,522
1982	1,034	897	925	1,163	368	1,777	2,635	2,635	2,695	2,735	2,356	2,515	21,735
1983	2,855	2,505	2,346	4,527	1,426	1,768	2,609	2,609	2,668	2,707	2,332	2,490	30,841
1984	2,826	2,480	2,322	4,529	1,118	1,605	2,398	2,189	2,221	2,008	1,765	1,825	27,288
1985	2,044	1,721	1,662	3,004	2,054	1,987	2,589	2,693	2,691	1,891	1,751	1,663	25,748
1986	1,793	1,326	1,414	831	742	1,954	2,395	2,448	2,472	2,078	1,853	1,873	21,178
1987	2,077	1,696	1,676	1,878	287	859	2,057	1,363	1,363	1,284	1,219	1,089	16,849
1988	822	786	681	170	152	508	776	571	571	530	495	428	6,490
1989	430	411	356	90	14	686	2,573	2,592	2,589	1,813	1,680	1,593	14,826
1990	1,717	1,266	1,353	179	179	645	1,066	785	785	741	704	631	10,051
1991	463	443	384	24	24	204	652	487	487	453	425	369	4,412
1992	354	338	293	17	17	537	1,113	796	796	739	692	598	6,289
1993	595	569	493	121	120	1,734	2,568	2,655	2,661	1,968	1,801	1,743	17,028
1994	1,896	1,448	1,506	1,400	1,015	1,314	1,903	1,169	1,166	1,078	1,008	868	15,772
1995	0	1,317	1,146	197	189	1,534	2,465	2,730	2,793	2,834	2,441	2,606	20,253
1996	2,958	2,596	2,431	4,436	3,233	2,825	2,401	2,229	2,258	2,002	1,766	1,815	30,948
1997	2,027	1,694	1,645	2,921	37	1,634	2,457	2,520	2,528	1,908	1,739	1,695	22,806
1998	1,850	1,430	1,473	1,897	1,130	1,786	2,632	2,632	2,692	2,732	2,353	2,512	25,118
1999	2,851	2,502	2,343	4,460	3,280	2,835	2,492	2,480	2,490	1,910	1,735	1,701	31,081
2000	1,862	1,452	1,486	1,970	1,214	2,090	2,501	2,403	2,421	1,969	1,767	1,767	22,900
2001	1,950	1,568	1,568	1,688	258	870	1,393	989	989	936	891	803	13,903
2002	559	534	463	889	122	1,096	2,428	2,527	2,524	1,767	1,637	1,553	16,098
2003	1,673	1,234	1,318	822	64	1,190	1,692	1,406	1,323	1,132	1,063	935	13,852
2004	805	710	710	1,160	309	1,751	2,186	2,449	2,447	1,713	1,587	1,505	17,333
2005	1,622	1,196	1,278	1,076	691	1,350	2,167	2,172	2,219	2,214	1,912	2,033	19,931
2006	2,302	2,009	1,889	3,598	2,523	2,555	2,634	2,634	2,694	2,734	2,355	2,515	30,443
2007	2,854	2,504	2,345	4,486	3,284	2,854	2,155	2,437	2,435	1,704	1,579	1,498	30,138
2008	1,614	1,190	1,272	420	378	661	1,107	673	673	624	583	502	9,698
2009	514	491	426	109	17	512	1,833	1,121	1,121	1,040	973	840	8,998
2010	844	806	699	173	170	1,204	2,367	2,588	2,585	1,810	1,677	1,591	16,513
2011	1,714	1,264	1,350	1,486	15	1,617	2,640	2,640	2,700	2,740	2,360	2,520	23,045
2012	2,860	2,509	2,350	4,304	3,285	1,353	3,348	2,083	1,942	1,640	1,542	1,361	28,576
2013	1,135	985	1,015	1,286	440	1,607	2,059	1,853	1,727	1,459	1,372	1,210	16,147
2014	1,010	876	0	13	13	13	160	160	160	149	140	123	2,817
2015	112	107	93	20	3	898	1,416	982	982	910	851	733	7,107
Avg.	1,509	1,282	1,247	1,497	773	1,543	2,082	1,996	1,962	1,687	1,527	1,443	18,550
Max	2,958	2,596	2,431	4,529	3,285	6,637	3,650	2,862	2,859	2,834	2,441	2,606	31,081
Min	0	0	0	5	3	13	160	160	0	149	140	0	2,817

Projected Managed Recharge From Noble Creek (Acre-Feet) – Applied in Scenarios 2, C2, C3, M1, M3, CM14, CM124

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	1,912	1,658	1,709	636	15	1,257	1,729	1,675	1,561	1,319	1,240	1,094	15,805
1923	913	792	816	1,018	365	1,404	2,037	1,751	1,790	1,795	1,549	1,649	15,878
1924	1,869	1,634	1,534	608	608	1,244	1,434	1,139	1,139	1,100	1,068	396	13,771
1925	1,013	388	336	89	14	596	945	664	664	615	575	495	6,392
1926	507	484	420	26	35	1,051	1,380	2,013	1,879	1,591	1,497	1,324	12,206
1927	1,083	939	968	1,092	384	1,461	2,028	2,016	2,014	1,410	1,306	1,239	15,941
1928	1,335	985	1,052	1,272	572	1,524	2,164	2,194	2,201	1,663	1,515	1,477	17,954
1929	1,613	1,247	1,284	1,087	166	736	1,242	898	898	844	800	712	11,526
1930	559	534	463	116	26	723	1,712	1,189	1,159	1,043	977	851	9,353
1931	799	743	678	52	52	619	967	683	683	637	599	523	7,037
1932	482	461	399	102	94	424	841	593	593	550	514	443	5,496
1933	449	430	372	23	26	902	1,648	1,162	1,143	1,039	973	846	9,013
1934	807	758	679	49	49	379	620	460	460	430	405	355	5,452
1935	314	300	260	16	22	666	2,018	2,218	2,167	1,947	1,713	1,767	13,408
1936	1,977	0	0	11	70	1,473	1,635	2,171	2,169	1,518	1,407	1,335	13,766
1937	1,438	1,060	1,133	155	155	802	3,158	2,321	2,319	1,623	1,504	1,427	17,093
1938	1,537	1,133	1,211	1,365	592	1,740	2,262	2,262	2,314	2,348	2,022	2,159	20,947
1939	2,451	2,151	2,014	3,710	2,841	1,108	2,205	2,289	2,286	1,645	1,536	0	24,237
1940	0	0	0	11	66	1,176	1,927	2,005	0	1,787	1,656	1,571	10,199
1941	1,693	1,248	1,334	1,184	542	1,614	1,945	2,004	2,050	2,080	1,792	1,913	19,399
1942	2,171	1,905	1,784	3,467	2,513	2,219	1,919	2,040	2,061	1,759	1,563	1,587	24,989
1943	1,764	1,450	1,426	2,310	1,525	1,989	1,877	1,877	1,920	1,948	1,678	1,792	21,558
1944	2,034	1,785	1,671	2,513	384	3,119	1,623	987	987	914	854	736	17,606
1945	754	720	624	660	146	1,361	2,152	2,224	2,231	1,688	1,538	1,501	15,599
1946	1,639	1,268	1,305	1,792	993	1,786	1,972	2,296	2,295	1,621	1,499	1,426	19,892
1947	1,539	1,142	1,215	1,228	121	825	2,384	2,476	2,474	1,766	1,645	0	16,815
1948	0	0	0	11	11	92	606	2,227	2,024	1,709	1,607	1,418	9,705
1949	1,183	1,026	1,057	389	59	751	1,744	1,083	1,083	1,009	946	823	11,154
1950	782	747	648	41	43	735	2,236	2,146	1,812	1,530	1,439	1,269	13,427
1951	1,059	919	947	1,063	13	1,397	2,088	1,908	1,935	1,748	1,537	1,588	16,204
1952	1,778	1,497	1,446	2,687	1,772	2,068	2,120	1,794	1,834	1,862	1,603	1,712	22,174
1953	1,943	1,705	1,597	3,349	2,341	2,278	1,970	2,214	2,212	1,548	1,435	1,361	23,952
1954	1,466	1,081	1,155	1,387	617	1,646	1,937	2,164	2,161	1,513	1,402	1,330	17,859
1955	1,433	1,056	1,129	794	599	862	1,101	783	783	726	678	584	10,529
1956	598	572	496	823	129	1,534	1,856	1,990	2,035	2,065	1,778	1,899	15,774
1957	2,155	1,891	1,771	3,273	2,514	2,033	1,811	1,701	1,586	1,339	1,259	1,111	22,444
1958	927	804	829	1,094	363	1,393	2,103	2,301	2,353	2,388	2,057	2,196	18,806
1959	2,492	2,187	2,048	3,871	2,841	2,348	1,672	1,539	1,434	1,211	1,139	1,005	23,787
1960	839	727	750	92	92	774	2,542	2,102	2,099	1,470	1,362	1,292	14,140
1961	0	1,699	1,816	46	7	235	1,678	1,023	1,023	948	886	764	10,123
1962	0	1,157	1,003	155	24	1,268	2,027	1,824	1,701	1,436	1,350	1,191	13,135
1963	994	862	889	1,119	372	1,492	1,793	2,160	2,158	1,510	1,400	1,328	16,075
1964	1,431	1,055	1,127	1,244	596	1,467	2,098	2,216	2,213	1,549	1,436	1,362	17,794
1965	1,467	1,082	1,156	721	56	1,098	1,489	1,336	1,246	1,052	989	873	12,565
1966	728	632	651	962	13	1,403	2,036	1,880	1,910	1,772	1,550	1,615	15,150
1967	1,814	1,543	1,479	2,708	1,888	1,912	1,916	1,820	1,861	1,889	1,627	1,737	22,192
1968	1,971	1,730	1,620	3,226	2,300	2,274	1,920	1,998	1,995	1,397	1,294	1,228	22,954
1969	1,323	975	1,042	1,215	571	1,542	2,274	2,274	2,325	2,360	2,033	2,170	20,105
1970	2,463	2,162	2,024	3,826	1,043	1,396	2,087	1,906	1,934	1,747	1,536	1,587	23,712
1971	1,777	1,496	1,445	2,681	1,770	1,916	1,588	1,591	1,484	1,253	1,178	1,039	19,218
1972	867	752	775	1,050	354	1,434	2,095	2,243	2,241	1,568	1,453	1,379	16,211
1973	1,485	1,095	1,170	1,351	622	1,648	2,140	2,098	2,111	1,682	1,515	1,505	18,422
1974	1,656	1,318	1,328	2,047	1,222	1,806	1,914	2,283	2,284	1,644	1,514	1,451	20,469
1975	1,571	1,180	1,243	1,513	760	1,689	2,129	2,079	2,094	1,691	1,519	1,516	18,985
1976	1,672	1,339	1,343	2,033	14	1,304	2,130	2,216	2,214	1,550	1,436	1,362	18,614

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1977	1,468	1,082	1,156	31	31	133	204	147	147	139	131	117	4,786
1978	89	85	74	5	42	1,483	1,982	2,014	2,060	2,090	1,800	1,922	13,644
1979	2,182	1,914	1,793	677	678	5,743	2,084	2,169	2,166	1,517	1,405	1,333	23,661
1980	1,436	1,059	1,132	1,170	13	1,546	1,872	1,874	1,917	1,945	1,675	1,789	17,429
1981	2,030	1,782	1,669	2,658	2,378	1,257	1,824	1,642	1,531	1,293	1,216	1,073	20,352
1982	895	776	800	1,006	318	1,538	2,280	2,280	2,332	2,366	2,038	2,176	18,806
1983	2,470	2,167	2,030	3,917	1,233	1,530	2,257	2,257	2,308	2,343	2,018	2,155	26,684
1984	2,445	2,146	2,009	3,919	968	1,389	2,075	1,894	1,921	1,738	1,527	1,579	23,611
1985	1,768	1,489	1,438	2,599	1,777	1,719	2,240	2,330	2,328	1,636	1,515	1,439	22,278
1986	1,552	1,147	1,223	719	642	1,690	2,073	2,118	2,139	1,798	1,603	1,620	18,324
1987	1,797	1,467	1,450	1,625	248	743	1,780	1,179	1,179	1,111	1,054	942	14,578
1988	711	680	589	147	132	440	671	494	494	458	429	370	5,615
1989	372	356	308	78	12	593	2,226	2,243	2,240	1,568	1,453	1,378	12,828
1990	1,485	1,095	1,170	155	155	558	922	680	680	641	609	546	8,696
1991	401	383	332	21	21	177	564	421	421	392	367	319	3,818
1992	306	292	253	15	15	465	963	689	689	639	598	517	5,442
1993	515	492	426	105	104	1,501	2,222	2,297	2,302	1,702	1,558	1,508	14,733
1994	1,641	1,253	1,303	1,212	878	1,137	1,647	1,011	1,009	933	872	751	13,646
1995	0	1,140	991	171	164	1,328	2,132	2,362	2,416	2,452	2,112	2,255	17,523
1996	2,559	2,246	2,103	3,838	2,797	2,444	2,077	1,928	1,953	1,732	1,528	1,570	26,777
1997	1,754	1,466	1,424	2,527	32	1,414	2,126	2,180	2,187	1,651	1,504	1,467	19,733
1998	1,601	1,237	1,275	1,641	978	1,545	2,277	2,277	2,329	2,363	2,036	2,174	21,733
1999	2,467	2,165	2,027	3,859	2,838	2,453	2,156	2,146	2,154	1,653	1,501	1,472	26,892
2000	1,611	1,256	1,285	1,704	1,050	1,808	2,164	2,079	2,094	1,704	1,529	1,529	19,814
2001	1,688	1,357	1,357	1,460	223	753	1,205	856	856	810	771	695	12,030
2002	483	462	400	769	106	948	2,101	2,186	2,184	1,529	1,417	1,344	13,929
2003	1,448	1,067	1,141	712	56	1,030	1,464	1,217	1,145	979	920	809	11,985
2004	696	614	615	1,004	267	1,515	1,891	2,119	2,117	1,482	1,373	1,303	14,997
2005	1,404	1,035	1,106	931	598	1,168	1,875	1,879	1,920	1,915	1,654	1,759	17,245
2006	1,992	1,739	1,635	3,113	2,183	2,211	2,279	2,279	2,331	2,366	2,038	2,176	26,341
2007	2,469	2,167	2,029	3,882	2,842	2,469	1,865	2,109	2,107	1,475	1,367	1,296	26,076
2008	1,397	1,030	1,100	364	327	572	958	583	583	540	504	434	8,391
2009	445	425	369	95	14	443	1,586	970	970	900	842	727	7,786
2010	730	698	605	149	147	1,042	2,048	2,239	2,237	1,566	1,451	1,376	14,288
2011	1,483	1,093	1,168	1,286	13	1,399	2,284	2,284	2,336	2,370	2,042	2,180	19,939
2012	2,474	2,171	2,033	3,724	2,842	1,170	2,897	1,802	1,680	1,419	1,334	1,177	24,725
2013	982	852	878	1,112	380	1,390	1,781	1,603	1,495	1,262	1,187	1,047	13,970
2014	874	758	0	11	11	11	138	139	139	129	121	106	2,438
2015	97	93	81	17	3	777	1,225	850	850	788	736	634	6,149
Avg.	1,306	1,109	1,079	1,296	669	1,335	1,802	1,727	1,697	1,460	1,321	1,249	16,050
Max	2,559	2,246	2,103	3,919	2,842	5,743	3,158	2,476	2,474	2,452	2,112	2,255	26,892
Min	0	0	0	5	3	11	138	139	0	129	121	0	2,438

Projected Managed Recharge From Atwell Development (Acre-Feet) – Applied in Scenarios 2, C2, C3, M1, M3, CM14, CM124

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	298	258	266	99	2	196	269	261	243	205	193	170	2,462
1923	142	123	127	159	57	219	317	273	279	280	241	257	2,473
1924	291	254	239	95	95	194	223	177	177	171	166	62	2,145
1925	158	60	52	14	2	93	147	103	103	96	89	77	996
1926	79	75	65	4	5	164	215	314	293	248	233	206	1,901
1927	169	146	151	170	60	228	316	314	314	220	204	193	2,483
1928	208	153	164	198	89	237	337	342	343	259	236	230	2,797
1929	251	194	200	169	26	115	193	140	140	132	125	111	1,795
1930	87	83	72	18	4	113	267	185	181	162	152	133	1,457
1931	125	116	106	8	8	96	151	106	106	99	93	81	1,096
1932	75	72	62	16	15	66	131	92	92	86	80	69	856
1933	70	67	58	4	4	140	257	181	178	162	152	132	1,404
1934	126	118	106	8	8	59	97	72	72	67	63	55	849
1935	49	47	40	2	3	104	314	345	338	303	267	275	2,088
1936	308	0	0	2	11	229	255	338	338	236	219	208	2,144
1937	224	165	176	24	24	125	492	362	361	253	234	222	2,662
1938	239	177	189	213	92	271	352	352	360	366	315	336	3,263
1939	382	335	314	578	443	173	344	356	356	256	239	0	3,775
1940	0	0	0	2	10	183	300	312	0	278	258	245	1,589
1941	264	194	208	184	84	251	303	312	319	324	279	298	3,022
1942	338	297	278	540	391	346	299	318	321	274	243	247	3,892
1943	275	226	222	360	237	310	292	292	299	303	261	279	3,358
1944	317	278	260	391	60	486	253	154	154	142	133	115	2,742
1945	117	112	97	103	23	212	335	346	347	263	240	234	2,430
1946	255	198	203	279	155	278	307	358	358	252	233	222	3,098
1947	240	178	189	191	19	129	371	386	385	275	256	0	2,619
1948	0	0	0	2	2	14	94	347	315	266	250	221	1,512
1949	184	160	165	61	9	117	272	169	169	157	147	128	1,737
1950	122	116	101	6	7	114	348	334	282	238	224	198	2,091
1951	165	143	147	166	2	218	325	297	301	272	239	247	2,524
1952	277	233	225	418	276	322	330	279	286	290	250	267	3,454
1953	303	266	249	522	365	355	307	345	345	241	223	212	3,731
1954	228	168	180	216	96	256	302	337	337	236	218	207	2,782
1955	223	165	176	124	93	134	171	122	122	113	106	91	1,640
1956	93	89	77	128	20	239	289	310	317	322	277	296	2,457
1957	336	295	276	510	392	317	282	265	247	209	196	173	3,496
1958	144	125	129	170	57	217	328	358	366	372	320	342	2,929
1959	388	341	319	603	443	366	260	240	223	189	177	157	3,705
1960	131	113	117	14	14	121	396	327	327	229	212	201	2,202
1961	0	265	283	7	1	37	261	159	159	148	138	119	1,577
1962	0	180	156	24	4	198	316	284	265	224	210	186	2,046
1963	155	134	138	174	58	232	279	336	336	235	218	207	2,504
1964	223	164	176	194	93	229	327	345	345	241	224	212	2,772
1965	229	169	180	112	9	171	232	208	194	164	154	136	1,957
1966	113	98	101	150	2	219	317	293	297	276	241	251	2,360
1967	283	240	230	422	294	298	298	283	290	294	253	271	3,457
1968	307	269	252	503	358	354	299	311	311	218	202	191	3,575
1969	206	152	162	189	89	240	354	354	362	368	317	338	3,132
1970	384	337	315	596	163	218	325	297	301	272	239	247	3,693
1971	277	233	225	418	276	298	247	248	231	195	183	162	2,994
1972	135	117	121	164	55	223	326	349	349	244	226	215	2,525
1973	231	171	182	210	97	257	333	327	329	262	236	234	2,869
1974	258	205	207	319	190	281	298	356	356	256	236	226	3,188
1975	245	184	194	236	118	263	332	324	326	263	237	236	2,957
1976	260	209	209	317	2	203	332	345	345	241	224	212	2,899

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1977	229	169	180	5	5	21	32	23	23	22	20	18	745
1978	14	13	11	1	7	231	309	314	321	326	280	299	2,125
1979	340	298	279	105	106	895	325	338	337	236	219	208	3,686
1980	224	165	176	182	2	241	292	292	299	303	261	279	2,715
1981	316	278	260	414	370	196	284	256	238	201	189	167	3,170
1982	139	121	125	157	50	240	355	355	363	369	317	339	2,929
1983	385	338	316	610	192	238	352	352	360	365	314	336	4,156
1984	381	334	313	610	151	216	323	295	299	271	238	246	3,678
1985	275	232	224	405	277	268	349	363	363	255	236	224	3,470
1986	242	179	191	112	100	263	323	330	333	280	250	252	2,854
1987	280	229	226	253	39	116	277	184	184	173	164	147	2,271
1988	111	106	92	23	21	69	105	77	77	71	67	58	875
1989	58	55	48	12	2	92	347	349	349	244	226	215	1,998
1990	231	171	182	24	24	87	144	106	106	100	95	85	1,355
1991	62	60	52	3	3	28	88	66	66	61	57	50	595
1992	48	46	39	2	2	72	150	107	107	100	93	81	848
1993	80	77	66	16	16	234	346	358	359	265	243	235	2,295
1994	256	195	203	189	137	177	256	158	157	145	136	117	2,126
1995	0	178	154	27	26	207	332	368	376	382	329	351	2,729
1996	399	350	328	598	436	381	324	300	304	270	238	245	4,171
1997	273	228	222	394	5	220	331	340	341	257	234	228	3,074
1998	249	193	199	256	152	241	355	355	363	368	317	339	3,385
1999	384	337	316	601	442	382	336	334	336	257	234	229	4,189
2000	251	196	200	265	164	282	337	324	326	265	238	238	3,086
2001	263	211	211	227	35	117	188	133	133	126	120	108	1,874
2002	75	72	62	120	16	148	327	341	340	238	221	209	2,170
2003	226	166	178	111	9	160	228	189	178	153	143	126	1,867
2004	108	96	96	156	42	236	295	330	330	231	214	203	2,336
2005	219	161	172	145	93	182	292	293	299	298	258	274	2,686
2006	310	271	255	485	340	344	355	355	363	368	317	339	4,103
2007	385	337	316	605	443	385	290	328	328	230	213	202	4,062
2008	218	160	171	57	51	89	149	91	91	84	79	68	1,307
2009	69	66	57	15	2	69	247	151	151	140	131	113	1,213
2010	114	109	94	23	23	162	319	349	348	244	226	214	2,226
2011	231	170	182	200	2	218	356	356	364	369	318	340	3,106
2012	385	338	317	580	443	182	451	281	262	221	208	183	3,851
2013	153	133	137	173	59	217	277	250	233	197	185	163	2,176
2014	136	118	0	2	2	2	22	22	22	20	19	17	380
2015	15	14	13	3	0	121	191	132	132	123	115	99	958
Avg.	203	173	168	202	104	208	281	269	264	227	206	195	2,500
Max	399	350	328	610	443	895	492	386	385	382	329	351	4,189
Min	0	0	0	1	0	2	22	22	0	20	19	0	380

Projected Managed Recharge From Location 1, Robertson's Ready Mix Banning Pit (Acre-Feet) – Applied in Scenarios M1, CM14, CM124

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	536	465	479	178	4	352	485	470	438	370	348	307	4,431
1923	256	222	229	285	102	394	571	491	502	503	434	462	4,452
1924	524	458	430	170	170	349	402	319	319	308	299	111	3,861
1925	284	109	94	25	4	167	265	186	186	172	161	139	1,792
1926	142	136	118	7	10	295	387	564	527	446	420	371	3,422
1927	304	263	271	306	108	410	569	565	565	395	366	347	4,470
1928	374	276	295	357	160	427	607	615	617	466	425	414	5,034
1929	452	350	360	305	47	206	348	252	252	237	224	199	3,232
1930	157	150	130	33	7	203	480	333	325	292	274	239	2,622
1931	224	208	190	15	15	174	271	192	192	179	168	147	1,973
1932	135	129	112	28	26	119	236	166	166	154	144	124	1,541
1933	126	120	104	6	7	253	462	326	320	291	273	237	2,527
1934	226	212	190	14	14	106	174	129	129	121	114	100	1,529
1935	88	84	73	4	6	187	566	622	608	546	480	496	3,759
1936	554	0	0	3	20	413	458	609	608	426	394	374	3,860
1937	403	297	318	43	43	225	885	651	650	455	422	400	4,792
1938	431	318	340	383	166	488	634	634	649	658	567	605	5,873
1939	687	603	565	1,040	797	311	618	642	641	461	431	0	6,795
1940	0	0	0	3	19	330	540	562	0	501	464	440	2,860
1941	475	350	374	332	152	453	545	562	575	583	502	536	5,439
1942	609	534	500	972	704	622	538	572	578	493	438	445	7,006
1943	495	407	400	648	427	558	526	526	538	546	471	502	6,044
1944	570	500	469	704	108	875	455	277	277	256	240	206	4,936
1945	211	202	175	185	41	382	603	623	625	473	431	421	4,374
1946	459	356	366	502	278	501	553	644	644	454	420	400	5,577
1947	432	320	341	344	34	231	668	694	694	495	461	0	4,715
1948	0	0	0	3	3	26	170	624	567	479	451	398	2,721
1949	332	288	296	109	17	211	489	304	304	283	265	231	3,127
1950	219	210	182	11	12	206	627	602	508	429	403	356	3,765
1951	297	258	265	298	4	392	586	535	543	490	431	445	4,543
1952	499	420	405	753	497	580	594	503	514	522	450	480	6,217
1953	545	478	448	939	656	639	552	621	620	434	402	382	6,715
1954	411	303	324	389	173	461	543	607	606	424	393	373	5,007
1955	402	296	317	223	168	242	309	220	220	204	190	164	2,952
1956	168	160	139	231	36	430	520	558	570	579	499	532	4,423
1957	604	530	497	918	705	570	508	477	445	375	353	311	6,293
1958	260	225	232	307	102	390	590	645	660	669	577	616	5,273
1959	699	613	574	1,085	797	658	469	431	402	340	319	282	6,669
1960	235	204	210	26	26	217	713	589	589	412	382	362	3,964
1961	0	476	509	13	2	66	470	287	287	266	249	214	2,838
1962	0	324	281	43	7	356	568	511	477	403	379	334	3,683
1963	279	242	249	314	104	418	503	606	605	423	392	372	4,507
1964	401	296	316	349	167	411	588	621	621	434	403	382	4,989
1965	411	303	324	202	16	308	418	375	349	295	277	245	3,523
1966	204	177	182	270	4	393	571	527	535	497	435	453	4,248
1967	509	433	415	759	529	536	537	510	522	530	456	487	6,222
1968	553	485	454	905	645	638	538	560	559	392	363	344	6,436
1969	371	273	292	341	160	432	638	638	652	662	570	609	5,637
1970	691	606	568	1,073	293	392	585	535	542	490	431	445	6,648
1971	498	419	405	752	496	537	445	446	416	351	330	291	5,388
1972	243	211	217	294	99	402	587	629	628	440	407	387	4,545
1973	416	307	328	379	174	462	600	588	592	472	425	422	5,165
1974	464	369	372	574	343	506	537	640	640	461	424	407	5,739
1975	441	331	349	424	213	474	597	583	587	474	426	425	5,323
1976	469	376	377	570	4	366	597	621	621	435	403	382	5,219

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1977	412	303	324	9	9	37	57	41	41	39	37	33	1,342
1978	25	24	21	1	12	416	556	565	577	586	505	539	3,826
1979	612	537	503	190	190	1,610	584	608	607	425	394	374	6,634
1980	403	297	317	328	4	434	525	525	537	545	470	502	4,887
1981	569	500	468	745	667	352	512	460	429	363	341	301	5,706
1982	251	218	224	282	89	431	639	639	654	663	571	610	5,273
1983	692	608	569	1,098	346	429	633	633	647	657	566	604	7,482
1984	686	602	563	1,099	271	389	582	531	539	487	428	443	6,620
1985	496	418	403	729	498	482	628	653	653	459	425	403	6,246
1986	435	322	343	201	180	474	581	594	600	504	449	454	5,138
1987	504	411	407	456	70	208	499	331	331	312	296	264	4,087
1988	199	191	165	41	37	123	188	139	139	129	120	104	1,574
1989	104	100	86	22	3	166	624	629	628	440	407	386	3,597
1990	416	307	328	43	43	156	258	191	191	180	171	153	2,438
1991	112	107	93	6	6	50	158	118	118	110	103	89	1,070
1992	86	82	71	4	4	130	270	193	193	179	168	145	1,526
1993	144	138	120	29	29	421	623	644	645	477	437	423	4,131
1994	460	351	365	340	246	319	462	284	283	262	244	211	3,826
1995	0	320	278	48	46	372	598	662	677	687	592	632	4,913
1996	718	630	590	1,076	784	685	582	541	548	486	428	440	7,508
1997	492	411	399	708	9	397	596	611	613	463	422	411	5,533
1998	449	347	357	460	274	433	638	638	653	663	571	609	6,093
1999	692	607	568	1,082	796	688	605	602	604	463	421	413	7,540
2000	452	352	360	478	295	507	607	583	587	478	429	429	5,555
2001	473	380	380	409	63	211	338	240	240	227	216	195	3,373
2002	136	130	112	216	30	266	589	613	612	429	397	377	3,905
2003	406	299	320	200	16	289	410	341	321	275	258	227	3,360
2004	195	172	172	281	75	425	530	594	594	415	385	365	4,205
2005	394	290	310	261	168	328	526	527	538	537	464	493	4,835
2006	559	487	458	873	612	620	639	639	654	663	571	610	7,385
2007	692	607	569	1,088	797	692	523	591	591	413	383	363	7,311
2008	392	289	309	102	92	160	269	163	163	151	141	122	2,353
2009	125	119	103	26	4	124	445	272	272	252	236	204	2,183
2010	205	196	170	42	41	292	574	628	627	439	407	386	4,006
2011	416	307	328	360	4	392	640	640	655	665	572	611	5,590
2012	694	609	570	1,044	797	328	812	505	471	398	374	330	6,932
2013	275	239	246	312	107	390	499	449	419	354	333	294	3,917
2014	245	212	0	3	3	3	39	39	39	36	34	30	683
2015	27	26	23	5	1	218	343	238	238	221	206	178	1,724
Avg.	366	311	303	363	188	374	505	484	476	409	371	350	4,500
Max	718	630	590	1,099	797	1,610	885	694	694	687	592	632	7,540
Min	0	0	0	1	1	3	39	39	0	36	34	0	683

Projected Managed Recharge From Location 2, Banning WWTP (Acre-Feet) – Applied in Scenario C2

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	512	444	458	171	4	337	463	449	418	353	332	293	4,234
1923	245	212	219	273	98	376	546	469	479	481	415	442	4,254
1924	501	438	411	163	163	333	384	305	305	295	286	106	3,689
1925	272	104	90	24	4	160	253	178	178	165	154	133	1,713
1926	136	130	112	7	9	282	370	539	503	426	401	355	3,270
1927	290	252	259	293	103	392	543	540	540	378	350	332	4,271
1928	358	264	282	341	153	408	580	588	590	445	406	396	4,810
1929	432	334	344	291	45	197	333	241	241	226	214	191	3,088
1930	150	143	124	31	7	194	459	318	311	279	262	228	2,506
1931	214	199	182	14	14	166	259	183	183	171	160	140	1,885
1932	129	123	107	27	25	114	225	159	159	147	138	119	1,472
1933	120	115	100	6	7	242	442	311	306	278	261	227	2,415
1934	216	203	182	13	13	102	166	123	123	115	108	95	1,461
1935	84	80	70	4	6	178	541	594	581	522	459	473	3,592
1936	530	0	0	3	19	395	438	582	581	407	377	358	3,688
1937	385	284	304	41	41	215	846	622	621	435	403	382	4,579
1938	412	304	324	366	159	466	606	606	620	629	542	579	5,612
1939	657	576	540	994	761	297	591	613	613	441	411	0	6,493
1940	0	0	0	3	18	315	516	537	0	479	444	421	2,732
1941	454	334	357	317	145	432	521	537	549	557	480	513	5,197
1942	582	511	478	929	673	595	514	547	552	471	419	425	6,695
1943	473	388	382	619	408	533	503	503	514	522	450	480	5,776
1944	545	478	448	673	103	836	435	264	264	245	229	197	4,717
1945	202	193	167	177	39	365	577	596	598	452	412	402	4,179
1946	439	340	350	480	266	478	528	615	615	434	402	382	5,329
1947	412	306	325	329	32	221	639	663	663	473	441	0	4,505
1948	0	0	0	3	3	25	162	597	542	458	430	380	2,600
1949	317	275	283	104	16	201	467	290	290	270	253	220	2,988
1950	210	200	174	11	11	197	599	575	485	410	385	340	3,597
1951	284	246	254	285	4	374	560	511	518	468	412	426	4,341
1952	476	401	387	720	475	554	568	481	491	499	430	459	5,941
1953	521	457	428	897	627	610	528	593	593	415	384	365	6,417
1954	393	290	310	372	165	441	519	580	579	405	376	356	4,785
1955	384	283	302	213	161	231	295	210	210	195	182	156	2,821
1956	160	153	133	221	34	411	497	533	545	553	476	509	4,226
1957	577	507	475	877	674	545	485	456	425	359	337	298	6,013
1958	248	215	222	293	97	373	564	616	630	640	551	588	5,038
1959	668	586	549	1,037	761	629	448	412	384	325	305	269	6,373
1960	225	195	201	25	25	207	681	563	562	394	365	346	3,788
1961	0	455	486	12	2	63	449	274	274	254	237	205	2,712
1962	0	310	269	41	6	340	543	489	456	385	362	319	3,519
1963	266	231	238	300	100	400	480	579	578	405	375	356	4,307
1964	383	283	302	333	160	393	562	594	593	415	385	365	4,767
1965	393	290	310	193	15	294	399	358	334	282	265	234	3,366
1966	195	169	174	258	4	376	545	504	512	475	415	433	4,059
1967	486	413	396	726	506	512	513	488	499	506	436	465	5,945
1968	528	463	434	864	616	609	514	535	535	374	347	329	6,150
1969	354	261	279	326	153	413	609	609	623	632	545	581	5,386
1970	660	579	542	1,025	280	374	559	511	518	468	411	425	6,353
1971	476	401	387	718	474	513	425	426	397	336	316	278	5,149
1972	232	202	208	281	95	384	561	601	600	420	389	369	4,343
1973	398	293	314	362	167	441	573	562	566	451	406	403	4,936
1974	444	353	356	548	327	484	513	612	612	440	406	389	5,484
1975	421	316	333	405	204	453	570	557	561	453	407	406	5,086
1976	448	359	360	545	4	349	571	594	593	415	385	365	4,987
1977	393	290	310	8	8	36	55	39	39	37	35	31	1,282

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1978	24	23	20	1	11	397	531	540	552	560	482	515	3,656
1979	584	513	480	181	182	1,539	558	581	580	406	377	357	6,339
1980	385	284	303	313	4	414	501	502	514	521	449	479	4,669
1981	544	477	447	712	637	337	489	440	410	346	326	287	5,452
1982	240	208	214	270	85	412	611	611	625	634	546	583	5,038
1983	662	581	544	1,049	330	410	605	605	618	628	541	577	7,149
1984	655	575	538	1,050	259	372	556	507	515	466	409	423	6,326
1985	474	399	385	696	476	461	600	624	624	438	406	385	5,969
1986	416	307	328	193	172	453	555	568	573	482	429	434	4,909
1987	481	393	388	435	67	199	477	316	316	298	283	252	3,906
1988	191	182	158	39	35	118	180	132	132	123	115	99	1,504
1989	100	95	83	21	3	159	596	601	600	420	389	369	3,437
1990	398	293	314	42	42	149	247	182	182	172	163	146	2,330
1991	107	103	89	6	6	47	151	113	113	105	98	85	1,023
1992	82	78	68	4	4	124	258	185	185	171	160	139	1,458
1993	138	132	114	28	28	402	595	616	617	456	417	404	3,947
1994	440	336	349	325	235	305	441	271	270	250	234	201	3,656
1995	0	305	266	46	44	356	571	633	647	657	566	604	4,695
1996	686	602	563	1,028	749	655	557	517	523	464	409	421	7,174
1997	470	393	381	677	9	379	570	584	586	442	403	393	5,287
1998	429	331	342	440	262	414	610	610	624	633	545	582	5,823
1999	661	580	543	1,034	760	657	578	575	577	443	402	394	7,205
2000	432	337	344	457	281	484	580	557	561	456	410	410	5,308
2001	452	363	363	391	60	202	323	229	229	217	207	186	3,223
2002	129	124	107	206	28	254	563	586	585	410	380	360	3,732
2003	388	286	306	191	15	276	392	326	307	262	246	217	3,211
2004	187	165	165	269	72	406	507	568	567	397	368	349	4,018
2005	376	277	296	249	160	313	502	503	514	513	443	471	4,620
2006	534	466	438	834	585	592	611	611	625	634	546	583	7,057
2007	662	580	544	1,040	761	662	500	565	564	395	366	347	6,986
2008	374	276	295	97	88	153	257	156	156	145	135	116	2,248
2009	119	114	99	25	4	119	425	260	260	241	226	195	2,086
2010	196	187	162	40	39	279	549	600	599	420	389	369	3,828
2011	397	293	313	344	4	375	612	612	626	635	547	584	5,342
2012	663	582	545	998	761	314	776	483	450	380	357	315	6,624
2013	263	228	235	298	102	373	477	429	400	338	318	281	3,743
2014	234	203	0	3	3	3	37	37	37	35	33	28	653
2015	26	25	22	5	1	208	328	228	228	211	197	170	1,647
Avg.	350	297	289	347	179	358	483	463	455	391	354	335	4,300
Max	686	602	563	1,050	761	1,539	846	663	663	657	566	604	7,205
Min	0	0	0	1	1	3	37	37	0	35	33	0	653

Projected Managed Recharge From Location 2, Banning WWTP (Acre-Feet) – Applied in Scenario CM124

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	238	207	213	79	2	157	215	209	195	164	154	136	1,969
1923	114	99	102	127	46	175	254	218	223	224	193	205	1,979
1924	233	204	191	76	76	155	179	142	142	137	133	49	1,716
1925	126	48	42	11	2	74	118	83	83	77	72	62	797
1926	63	60	52	3	4	131	172	251	234	198	187	165	1,521
1927	135	117	121	136	48	182	253	251	251	176	163	154	1,986
1928	166	123	131	159	71	190	270	273	274	207	189	184	2,237
1929	201	155	160	135	21	92	155	112	112	105	100	89	1,436
1930	70	67	58	15	3	90	213	148	144	130	122	106	1,165
1931	100	93	84	7	7	77	121	85	85	79	75	65	877
1932	60	57	50	13	12	53	105	74	74	69	64	55	685
1933	56	54	46	3	3	112	205	145	142	129	121	105	1,123
1934	101	94	85	6	6	47	77	57	57	54	50	44	679
1935	39	37	32	2	3	83	251	276	270	243	213	220	1,671
1936	246	0	0	1	9	184	204	271	270	189	175	166	1,715
1937	179	132	141	19	19	100	393	289	289	202	187	178	2,130
1938	192	141	151	170	74	217	282	282	288	293	252	269	2,610
1939	305	268	251	462	354	138	275	285	285	205	191	0	3,020
1940	0	0	0	1	8	146	240	250	0	223	206	196	1,271
1941	211	156	166	147	68	201	242	250	255	259	223	238	2,417
1942	271	237	222	432	313	277	239	254	257	219	195	198	3,114
1943	220	181	178	288	190	248	234	234	239	243	209	223	2,686
1944	253	222	208	313	48	389	202	123	123	114	106	92	2,194
1945	94	90	78	82	18	170	268	277	278	210	192	187	1,944
1946	204	158	163	223	124	222	246	286	286	202	187	178	2,479
1947	192	142	151	153	15	103	297	309	308	220	205	0	2,095
1948	0	0	0	1	1	11	76	277	252	213	200	177	1,209
1949	147	128	132	49	7	94	217	135	135	126	118	103	1,390
1950	97	93	81	5	5	92	279	267	226	191	179	158	1,673
1951	132	114	118	132	2	174	260	238	241	218	192	198	2,019
1952	222	187	180	335	221	258	264	224	229	232	200	213	2,763
1953	242	212	199	417	292	284	245	276	276	193	179	170	2,985
1954	183	135	144	173	77	205	241	270	269	189	175	166	2,225
1955	179	132	141	99	75	107	137	98	98	90	85	73	1,312
1956	75	71	62	103	16	191	231	248	254	257	222	237	1,966
1957	269	236	221	408	313	253	226	212	198	167	157	138	2,797
1958	116	100	103	136	45	174	262	287	293	298	256	274	2,343
1959	311	273	255	482	354	293	208	192	179	151	142	125	2,964
1960	104	91	93	11	11	96	317	262	262	183	170	161	1,762
1961	0	212	226	6	1	29	209	127	127	118	110	95	1,261
1962	0	144	125	19	3	158	253	227	212	179	168	148	1,637
1963	124	107	111	139	46	186	223	269	269	188	174	165	2,003
1964	178	131	140	155	74	183	261	276	276	193	179	170	2,217
1965	183	135	144	90	7	137	186	166	155	131	123	109	1,566
1966	91	79	81	120	2	175	254	234	238	221	193	201	1,888
1967	226	192	184	337	235	238	239	227	232	235	203	216	2,765
1968	246	216	202	402	287	283	239	249	249	174	161	153	2,860
1969	165	122	130	151	71	192	283	283	290	294	253	270	2,505
1970	307	269	252	477	130	174	260	238	241	218	191	198	2,955
1971	221	186	180	334	221	239	198	198	185	156	147	130	2,395
1972	108	94	97	131	44	179	261	279	279	195	181	172	2,020
1973	185	136	146	168	77	205	267	261	263	210	189	188	2,296
1974	206	164	165	255	152	225	239	285	285	205	189	181	2,551
1975	196	147	155	189	95	211	265	259	261	211	189	189	2,366
1976	208	167	167	253	2	163	265	276	276	193	179	170	2,319
1977	183	135	144	4	4	17	25	18	18	17	16	15	596

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1978	11	11	9	1	5	185	247	251	257	260	224	240	1,700
1979	272	239	223	84	85	716	260	270	270	189	175	166	2,948
1980	179	132	141	146	2	193	233	234	239	242	209	223	2,172
1981	253	222	208	331	296	157	227	205	191	161	151	134	2,536
1982	112	97	100	125	40	192	284	284	291	295	254	271	2,343
1983	308	270	253	488	154	191	281	281	288	292	251	268	3,325
1984	305	267	250	488	121	173	259	236	239	217	190	197	2,942
1985	220	186	179	324	221	214	279	290	290	204	189	179	2,776
1986	193	143	152	90	80	211	258	264	267	224	200	202	2,283
1987	224	183	181	202	31	93	222	147	147	138	131	117	1,817
1988	89	85	73	18	16	55	84	62	62	57	53	46	700
1989	46	44	38	10	1	74	277	279	279	195	181	172	1,598
1990	185	136	146	19	19	70	115	85	85	80	76	68	1,084
1991	50	48	41	3	3	22	70	52	52	49	46	40	476
1992	38	36	32	2	2	58	120	86	86	80	75	64	678
1993	64	61	53	13	13	187	277	286	287	212	194	188	1,836
1994	204	156	162	151	109	142	205	126	126	116	109	94	1,700
1995	0	142	124	21	20	165	266	294	301	306	263	281	2,184
1996	319	280	262	478	349	305	259	240	243	216	190	196	3,337
1997	219	183	177	315	4	176	265	272	273	206	187	183	2,459
1998	199	154	159	205	122	193	284	284	290	295	254	271	2,708
1999	307	270	253	481	354	306	269	267	268	206	187	183	3,351
2000	201	157	160	212	131	225	270	259	261	212	190	190	2,469
2001	210	169	169	182	28	94	150	107	107	101	96	87	1,499
2002	60	58	50	96	13	118	262	272	272	190	177	167	1,736
2003	180	133	142	89	7	128	182	152	143	122	115	101	1,493
2004	87	77	77	125	33	189	236	264	264	185	171	162	1,869
2005	175	129	138	116	75	146	234	234	239	239	206	219	2,149
2006	248	217	204	388	272	275	284	284	290	295	254	271	3,282
2007	308	270	253	484	354	308	232	263	263	184	170	162	3,249
2008	174	128	137	45	41	71	119	73	73	67	63	54	1,046
2009	55	53	46	12	2	55	198	121	121	112	105	91	970
2010	91	87	75	19	18	130	255	279	279	195	181	172	1,780
2011	185	136	146	160	2	174	285	285	291	295	254	272	2,485
2012	308	271	253	464	354	146	361	225	209	177	166	147	3,081
2013	122	106	109	139	47	173	222	200	186	157	148	130	1,741
2014	109	94	0	1	1	1	17	17	17	16	15	13	304
2015	12	12	10	2	0	97	153	106	106	98	92	79	766
Avg.	163	138	134	161	83	166	224	215	212	182	165	156	2,000
Max	319	280	262	488	354	716	393	309	308	306	263	281	3,351
Min	0	0	0	1	0	1	17	17	0	16	15	0	304

Projected Managed Recharge From Location 3, Robertson's Ready Mix Cabazon Pit (Acre-Feet) – Applied in Scenarios C3, M3

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	512	444	458	171	4	337	463	449	418	353	332	293	4,234
1923	245	212	219	273	98	376	546	469	479	481	415	442	4,254
1924	501	438	411	163	163	333	384	305	305	295	286	106	3,689
1925	272	104	90	24	4	160	253	178	178	165	154	133	1,713
1926	136	130	112	7	9	282	370	539	503	426	401	355	3,270
1927	290	252	259	293	103	392	543	540	540	378	350	332	4,271
1928	358	264	282	341	153	408	580	588	590	445	406	396	4,810
1929	432	334	344	291	45	197	333	241	241	226	214	191	3,088
1930	150	143	124	31	7	194	459	318	311	279	262	228	2,506
1931	214	199	182	14	14	166	259	183	183	171	160	140	1,885
1932	129	123	107	27	25	114	225	159	159	147	138	119	1,472
1933	120	115	100	6	7	242	442	311	306	278	261	227	2,415
1934	216	203	182	13	13	102	166	123	123	115	108	95	1,461
1935	84	80	70	4	6	178	541	594	581	522	459	473	3,592
1936	530	0	0	3	19	395	438	582	581	407	377	358	3,688
1937	385	284	304	41	41	215	846	622	621	435	403	382	4,579
1938	412	304	324	366	159	466	606	606	620	629	542	579	5,612
1939	657	576	540	994	761	297	591	613	613	441	411	0	6,493
1940	0	0	0	3	18	315	516	537	0	479	444	421	2,732
1941	454	334	357	317	145	432	521	537	549	557	480	513	5,197
1942	582	511	478	929	673	595	514	547	552	471	419	425	6,695
1943	473	388	382	619	408	533	503	503	514	522	450	480	5,776
1944	545	478	448	673	103	836	435	264	264	245	229	197	4,717
1945	202	193	167	177	39	365	577	596	598	452	412	402	4,179
1946	439	340	350	480	266	478	528	615	615	434	402	382	5,329
1947	412	306	325	329	32	221	639	663	663	473	441	0	4,505
1948	0	0	0	3	3	25	162	597	542	458	430	380	2,600
1949	317	275	283	104	16	201	467	290	290	270	253	220	2,988
1950	210	200	174	11	11	197	599	575	485	410	385	340	3,597
1951	284	246	254	285	4	374	560	511	518	468	412	426	4,341
1952	476	401	387	720	475	554	568	481	491	499	430	459	5,941
1953	521	457	428	897	627	610	528	593	593	415	384	365	6,417
1954	393	290	310	372	165	441	519	580	579	405	376	356	4,785
1955	384	283	302	213	161	231	295	210	210	195	182	156	2,821
1956	160	153	133	221	34	411	497	533	545	553	476	509	4,226
1957	577	507	475	877	674	545	485	456	425	359	337	298	6,013
1958	248	215	222	293	97	373	564	616	630	640	551	588	5,038
1959	668	586	549	1,037	761	629	448	412	384	325	305	269	6,373
1960	225	195	201	25	25	207	681	563	562	394	365	346	3,788
1961	0	455	486	12	2	63	449	274	274	254	237	205	2,712
1962	0	310	269	41	6	340	543	489	456	385	362	319	3,519
1963	266	231	238	300	100	400	480	579	578	405	375	356	4,307
1964	383	283	302	333	160	393	562	594	593	415	385	365	4,767
1965	393	290	310	193	15	294	399	358	334	282	265	234	3,366
1966	195	169	174	258	4	376	545	504	512	475	415	433	4,059
1967	486	413	396	726	506	512	513	488	499	506	436	465	5,945
1968	528	463	434	864	616	609	514	535	535	374	347	329	6,150
1969	354	261	279	326	153	413	609	609	623	632	545	581	5,386
1970	660	579	542	1,025	280	374	559	511	518	468	411	425	6,353
1971	476	401	387	718	474	513	425	426	397	336	316	278	5,149
1972	232	202	208	281	95	384	561	601	600	420	389	369	4,343
1973	398	293	314	362	167	441	573	562	566	451	406	403	4,936
1974	444	353	356	548	327	484	513	612	612	440	406	389	5,484
1975	421	316	333	405	204	453	570	557	561	453	407	406	5,086
1976	448	359	360	545	4	349	571	594	593	415	385	365	4,987

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1977	393	290	310	8	8	36	55	39	39	37	35	31	1,282
1978	24	23	20	1	11	397	531	540	552	560	482	515	3,656
1979	584	513	480	181	182	1,539	558	581	580	406	377	357	6,339
1980	385	284	303	313	4	414	501	502	514	521	449	479	4,669
1981	544	477	447	712	637	337	489	440	410	346	326	287	5,452
1982	240	208	214	270	85	412	611	611	625	634	546	583	5,038
1983	662	581	544	1,049	330	410	605	605	618	628	541	577	7,149
1984	655	575	538	1,050	259	372	556	507	515	466	409	423	6,326
1985	474	399	385	696	476	461	600	624	624	438	406	385	5,969
1986	416	307	328	193	172	453	555	568	573	482	429	434	4,909
1987	481	393	388	435	67	199	477	316	316	298	283	252	3,906
1988	191	182	158	39	35	118	180	132	132	123	115	99	1,504
1989	100	95	83	21	3	159	596	601	600	420	389	369	3,437
1990	398	293	314	42	42	149	247	182	182	172	163	146	2,330
1991	107	103	89	6	6	47	151	113	113	105	98	85	1,023
1992	82	78	68	4	4	124	258	185	185	171	160	139	1,458
1993	138	132	114	28	28	402	595	616	617	456	417	404	3,947
1994	440	336	349	325	235	305	441	271	270	250	234	201	3,656
1995	0	305	266	46	44	356	571	633	647	657	566	604	4,695
1996	686	602	563	1,028	749	655	557	517	523	464	409	421	7,174
1997	470	393	381	677	9	379	570	584	586	442	403	393	5,287
1998	429	331	342	440	262	414	610	610	624	633	545	582	5,823
1999	661	580	543	1,034	760	657	578	575	577	443	402	394	7,205
2000	432	337	344	457	281	484	580	557	561	456	410	410	5,308
2001	452	363	363	391	60	202	323	229	229	217	207	186	3,223
2002	129	124	107	206	28	254	563	586	585	410	380	360	3,732
2003	388	286	306	191	15	276	392	326	307	262	246	217	3,211
2004	187	165	165	269	72	406	507	568	567	397	368	349	4,018
2005	376	277	296	249	160	313	502	503	514	513	443	471	4,620
2006	534	466	438	834	585	592	611	611	625	634	546	583	7,057
2007	662	580	544	1,040	761	662	500	565	564	395	366	347	6,986
2008	374	276	295	97	88	153	257	156	156	145	135	116	2,248
2009	119	114	99	25	4	119	425	260	260	241	226	195	2,086
2010	196	187	162	40	39	279	549	600	599	420	389	369	3,828
2011	397	293	313	344	4	375	612	612	626	635	547	584	5,342
2012	663	582	545	998	761	314	776	483	450	380	357	315	6,624
2013	263	228	235	298	102	373	477	429	400	338	318	281	3,743
2014	234	203	0	3	3	3	37	37	37	35	33	28	653
2015	26	25	22	5	1	208	328	228	228	211	197	170	1,647
Avg.	350	297	289	347	179	358	483	463	455	391	354	335	4,300
Max	686	602	563	1,050	761	1,539	846	663	663	657	566	604	7,205
Min	0	0	0	1	1	3	37	37	0	35	33	0	653

Projected Managed Recharge From Location 4, New Cabazon Area (Acre-Feet) – Applied in Scenario CM14

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	512	444	458	171	4	337	463	449	418	353	332	293	4,234
1923	245	212	219	273	98	376	546	469	479	481	415	442	4,254
1924	501	438	411	163	163	333	384	305	305	295	286	106	3,689
1925	272	104	90	24	4	160	253	178	178	165	154	133	1,713
1926	136	130	112	7	9	282	370	539	503	426	401	355	3,270
1927	290	252	259	293	103	392	543	540	540	378	350	332	4,271
1928	358	264	282	341	153	408	580	588	590	445	406	396	4,810
1929	432	334	344	291	45	197	333	241	241	226	214	191	3,088
1930	150	143	124	31	7	194	459	318	311	279	262	228	2,506
1931	214	199	182	14	14	166	259	183	183	171	160	140	1,885
1932	129	123	107	27	25	114	225	159	159	147	138	119	1,472
1933	120	115	100	6	7	242	442	311	306	278	261	227	2,415
1934	216	203	182	13	13	102	166	123	123	115	108	95	1,461
1935	84	80	70	4	6	178	541	594	581	522	459	473	3,592
1936	530	0	0	3	19	395	438	582	581	407	377	358	3,688
1937	385	284	304	41	41	215	846	622	621	435	403	382	4,579
1938	412	304	324	366	159	466	606	606	620	629	542	579	5,612
1939	657	576	540	994	761	297	591	613	613	441	411	0	6,493
1940	0	0	0	3	18	315	516	537	0	479	444	421	2,732
1941	454	334	357	317	145	432	521	537	549	557	480	513	5,197
1942	582	511	478	929	673	595	514	547	552	471	419	425	6,695
1943	473	388	382	619	408	533	503	503	514	522	450	480	5,776
1944	545	478	448	673	103	836	435	264	264	245	229	197	4,717
1945	202	193	167	177	39	365	577	596	598	452	412	402	4,179
1946	439	340	350	480	266	478	528	615	615	434	402	382	5,329
1947	412	306	325	329	32	221	639	663	663	473	441	0	4,505
1948	0	0	0	3	3	25	162	597	542	458	430	380	2,600
1949	317	275	283	104	16	201	467	290	290	270	253	220	2,988
1950	210	200	174	11	11	197	599	575	485	410	385	340	3,597
1951	284	246	254	285	4	374	560	511	518	468	412	426	4,341
1952	476	401	387	720	475	554	568	481	491	499	430	459	5,941
1953	521	457	428	897	627	610	528	593	593	415	384	365	6,417
1954	393	290	310	372	165	441	519	580	579	405	376	356	4,785
1955	384	283	302	213	161	231	295	210	210	195	182	156	2,821
1956	160	153	133	221	34	411	497	533	545	553	476	509	4,226
1957	577	507	475	877	674	545	485	456	425	359	337	298	6,013
1958	248	215	222	293	97	373	564	616	630	640	551	588	5,038
1959	668	586	549	1,037	761	629	448	412	384	325	305	269	6,373
1960	225	195	201	25	25	207	681	563	562	394	365	346	3,788
1961	0	455	486	12	2	63	449	274	274	254	237	205	2,712
1962	0	310	269	41	6	340	543	489	456	385	362	319	3,519
1963	266	231	238	300	100	400	480	579	578	405	375	356	4,307
1964	383	283	302	333	160	393	562	594	593	415	385	365	4,767
1965	393	290	310	193	15	294	399	358	334	282	265	234	3,366
1966	195	169	174	258	4	376	545	504	512	475	415	433	4,059
1967	486	413	396	726	506	512	513	488	499	506	436	465	5,945
1968	528	463	434	864	616	609	514	535	535	374	347	329	6,150
1969	354	261	279	326	153	413	609	609	623	632	545	581	5,386
1970	660	579	542	1,025	280	374	559	511	518	468	411	425	6,353
1971	476	401	387	718	474	513	425	426	397	336	316	278	5,149
1972	232	202	208	281	95	384	561	601	600	420	389	369	4,343
1973	398	293	314	362	167	441	573	562	566	451	406	403	4,936
1974	444	353	356	548	327	484	513	612	612	440	406	389	5,484
1975	421	316	333	405	204	453	570	557	561	453	407	406	5,086
1976	448	359	360	545	4	349	571	594	593	415	385	365	4,987
1977	393	290	310	8	8	36	55	39	39	37	35	31	1,282

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1978	24	23	20	1	11	397	531	540	552	560	482	515	3,656
1979	584	513	480	181	182	1,539	558	581	580	406	377	357	6,339
1980	385	284	303	313	4	414	501	502	514	521	449	479	4,669
1981	544	477	447	712	637	337	489	440	410	346	326	287	5,452
1982	240	208	214	270	85	412	611	611	625	634	546	583	5,038
1983	662	581	544	1,049	330	410	605	605	618	628	541	577	7,149
1984	655	575	538	1,050	259	372	556	507	515	466	409	423	6,326
1985	474	399	385	696	476	461	600	624	624	438	406	385	5,969
1986	416	307	328	193	172	453	555	568	573	482	429	434	4,909
1987	481	393	388	435	67	199	477	316	316	298	283	252	3,906
1988	191	182	158	39	35	118	180	132	132	123	115	99	1,504
1989	100	95	83	21	3	159	596	601	600	420	389	369	3,437
1990	398	293	314	42	42	149	247	182	182	172	163	146	2,330
1991	107	103	89	6	6	47	151	113	113	105	98	85	1,023
1992	82	78	68	4	4	124	258	185	185	171	160	139	1,458
1993	138	132	114	28	28	402	595	616	617	456	417	404	3,947
1994	440	336	349	325	235	305	441	271	270	250	234	201	3,656
1995	0	305	266	46	44	356	571	633	647	657	566	604	4,695
1996	686	602	563	1,028	749	655	557	517	523	464	409	421	7,174
1997	470	393	381	677	9	379	570	584	586	442	403	393	5,287
1998	429	331	342	440	262	414	610	610	624	633	545	582	5,823
1999	661	580	543	1,034	760	657	578	575	577	443	402	394	7,205
2000	432	337	344	457	281	484	580	557	561	456	410	410	5,308
2001	452	363	363	391	60	202	323	229	229	217	207	186	3,223
2002	129	124	107	206	28	254	563	586	585	410	380	360	3,732
2003	388	286	306	191	15	276	392	326	307	262	246	217	3,211
2004	187	165	165	269	72	406	507	568	567	397	368	349	4,018
2005	376	277	296	249	160	313	502	503	514	513	443	471	4,620
2006	534	466	438	834	585	592	611	611	625	634	546	583	7,057
2007	662	580	544	1,040	761	662	500	565	564	395	366	347	6,986
2008	374	276	295	97	88	153	257	156	156	145	135	116	2,248
2009	119	114	99	25	4	119	425	260	260	241	226	195	2,086
2010	196	187	162	40	39	279	549	600	599	420	389	369	3,828
2011	397	293	313	344	4	375	612	612	626	635	547	584	5,342
2012	663	582	545	998	761	314	776	483	450	380	357	315	6,624
2013	263	228	235	298	102	373	477	429	400	338	318	281	3,743
2014	234	203	0	3	3	3	37	37	37	35	33	28	653
2015	26	25	22	5	1	208	328	228	228	211	197	170	1,647
Avg.	350	297	289	347	179	358	483	463	455	391	354	335	4,300
Max	686	602	563	1,050	761	1,539	846	663	663	657	566	604	7,205
Min	0	0	0	1	1	3	37	37	0	35	33	0	653

Projected Managed Recharge From Site 4, New Cabazon Area (Acre-Feet) – Applied in Scenario CM124

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	274	238	245	91	2	180	248	240	224	189	178	157	2,265
1923	131	113	117	146	52	201	292	251	256	257	222	236	2,275
1924	268	234	220	87	87	178	205	163	163	158	153	57	1,973
1925	145	56	48	13	2	85	135	95	95	88	82	71	916
1926	73	69	60	4	5	151	198	288	269	228	215	190	1,749
1927	155	135	139	156	55	209	291	289	289	202	187	178	2,284
1928	191	141	151	182	82	218	310	314	315	238	217	212	2,573
1929	231	179	184	156	24	106	178	129	129	121	115	102	1,652
1930	80	77	66	17	4	104	245	170	166	149	140	122	1,340
1931	115	106	97	8	8	89	139	98	98	91	86	75	1,008
1932	69	66	57	15	14	61	120	85	85	79	74	64	788
1933	64	62	53	3	4	129	236	167	164	149	139	121	1,292
1934	116	109	97	7	7	54	89	66	66	62	58	51	781
1935	45	43	37	2	3	95	289	318	311	279	246	253	1,921
1936	283	0	0	2	10	211	234	311	311	218	202	191	1,973
1937	206	152	162	22	22	115	453	333	332	233	216	204	2,449
1938	220	162	174	196	85	249	324	324	332	336	290	309	3,002
1939	351	308	289	532	407	159	316	328	328	236	220	0	3,473
1940	0	0	0	2	9	168	276	287	0	256	237	225	1,462
1941	243	179	191	170	78	231	279	287	294	298	257	274	2,780
1942	311	273	256	497	360	318	275	292	295	252	224	227	3,581
1943	253	208	204	331	218	285	269	269	275	279	240	257	3,089
1944	291	256	239	360	55	447	233	141	141	131	122	105	2,523
1945	108	103	89	95	21	195	308	319	320	242	220	215	2,235
1946	235	182	187	257	142	256	283	329	329	232	215	204	2,851
1947	221	164	174	176	17	118	342	355	355	253	236	0	2,410
1948	0	0	0	2	2	13	87	319	290	245	230	203	1,391
1949	170	147	152	56	9	108	250	155	155	145	136	118	1,598
1950	112	107	93	6	6	105	320	308	260	219	206	182	1,924
1951	152	132	136	152	2	200	299	273	277	251	220	228	2,322
1952	255	215	207	385	254	296	304	257	263	267	230	245	3,178
1953	278	244	229	480	335	326	282	317	317	222	206	195	3,432
1954	210	155	166	199	88	236	278	310	310	217	201	191	2,559
1955	205	151	162	114	86	124	158	112	112	104	97	84	1,509
1956	86	82	71	118	18	220	266	285	292	296	255	272	2,260
1957	309	271	254	469	360	291	259	244	227	192	180	159	3,216
1958	133	115	119	157	52	200	301	330	337	342	295	315	2,695
1959	357	313	293	555	407	336	240	220	206	174	163	144	3,409
1960	120	104	107	13	13	111	364	301	301	211	195	185	2,026
1961	0	243	260	7	1	34	240	147	147	136	127	109	1,451
1962	0	166	144	22	3	182	290	261	244	206	194	171	1,882
1963	142	124	127	160	53	214	257	310	309	216	201	190	2,304
1964	205	151	162	178	85	210	301	317	317	222	206	195	2,550
1965	210	155	166	103	8	157	213	191	179	151	142	125	1,801
1966	104	91	93	138	2	201	292	269	274	254	222	231	2,171
1967	260	221	212	388	271	274	275	261	267	271	233	249	3,180
1968	282	248	232	462	330	326	275	286	286	200	185	176	3,289
1969	190	140	149	174	82	221	326	326	333	338	291	311	2,881
1970	353	310	290	548	150	200	299	273	277	250	220	227	3,398
1971	255	214	207	384	254	275	228	228	213	180	169	149	2,754
1972	124	108	111	151	51	205	300	321	321	225	208	198	2,323
1973	213	157	168	194	89	236	307	301	303	241	217	216	2,640
1974	237	189	190	293	175	259	274	327	327	236	217	208	2,933
1975	225	169	178	217	109	242	305	298	300	242	218	217	2,721
1976	240	192	192	291	2	187	305	318	317	222	206	195	2,667
1977	210	155	166	4	4	19	29	21	21	20	19	17	686

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1978	13	12	11	1	6	212	284	289	295	300	258	275	1,955
1979	313	274	257	97	97	823	299	311	310	217	201	191	3,391
1980	206	152	162	168	2	222	268	269	275	279	240	256	2,498
1981	291	255	239	381	341	180	261	235	219	185	174	154	2,916
1982	128	111	115	144	46	220	327	327	334	339	292	312	2,695
1983	354	311	291	561	177	219	323	323	331	336	289	309	3,824
1984	350	307	288	562	139	199	297	271	275	249	219	226	3,383
1985	253	213	206	372	255	246	321	334	334	234	217	206	3,193
1986	222	164	175	103	92	242	297	304	306	258	230	232	2,626
1987	258	210	208	233	36	107	255	169	169	159	151	135	2,089
1988	102	97	84	21	19	63	96	71	71	66	61	53	805
1989	53	51	44	11	2	85	319	321	321	225	208	198	1,838
1990	213	157	168	22	22	80	132	97	97	92	87	78	1,246
1991	57	55	48	3	3	25	81	60	60	56	53	46	547
1992	44	42	36	2	2	67	138	99	99	92	86	74	780
1993	74	71	61	15	15	215	318	329	330	244	223	216	2,111
1994	235	180	187	174	126	163	236	145	145	134	125	108	1,956
1995	0	163	142	24	23	190	306	339	346	351	303	323	2,511
1996	367	322	301	550	401	350	298	276	280	248	219	225	3,837
1997	251	210	204	362	5	203	305	312	313	237	216	210	2,828
1998	229	177	183	235	140	221	326	326	334	339	292	311	3,114
1999	354	310	291	553	407	352	309	307	309	237	215	211	3,854
2000	231	180	184	244	151	259	310	298	300	244	219	219	2,839
2001	242	194	194	209	32	108	173	123	123	116	110	100	1,724
2002	69	66	57	110	15	136	301	313	313	219	203	193	1,996
2003	207	153	163	102	8	148	210	174	164	140	132	116	1,718
2004	100	88	88	144	38	217	271	304	303	212	197	187	2,149
2005	201	148	158	133	86	167	269	269	275	274	237	252	2,471
2006	285	249	234	446	313	317	327	327	334	339	292	312	3,775
2007	354	310	291	556	407	354	267	302	302	211	196	186	3,737
2008	200	148	158	52	47	82	137	83	83	77	72	62	1,202
2009	64	61	53	14	2	63	227	139	139	129	121	104	1,116
2010	105	100	87	21	21	149	293	321	321	224	208	197	2,047
2011	213	157	167	184	2	201	327	327	335	340	293	312	2,857
2012	355	311	291	534	407	168	415	258	241	203	191	169	3,543
2013	141	122	126	159	55	199	255	230	214	181	170	150	2,002
2014	125	109	0	2	2	2	20	20	20	19	17	15	349
2015	14	13	12	2	0	111	176	122	122	113	105	91	881
Avg.	187	159	155	186	96	191	258	247	243	209	189	179	2,300
Max	367	322	301	562	407	823	453	355	355	351	303	323	3,854
Min	0	0	0	1	0	2	20	20	0	19	17	0	349

Projected Groundwater Pumping From City of Banning (Acre-Feet) – Applied in All Scenarios

Month	Banning Bench (Canyon)		Banning Canyon				Banning				Cabazon	Beaumont						Total
	CoB 1	CoB 3	CoB 7	CoB 8	CoB 10	CoB 11	CoB C5	CoB M10	CoB M11	CoB M12	CoB C6	CoB C2A	CoB C3	CoB C4	CoB C8	CoB M3	CoB M7	
Jan	75.7	7.1	181.6	0.0	78.0	0.0	51.3	0.1	11.7	11.5	91.2	4.4	13.4	24.7	17.5	19.2	5.0	592.6
Feb	117.9	0.2	148.7	0.0	76.9	0.0	47.3	0.0	12.2	12.2	101.2	4.0	12.2	22.5	15.9	17.5	4.5	593.1
Mar	55.2	0.7	173.8	90.7	82.1	0.0	57.8	0.1	1.5	8.7	85.9	7.9	24.3	44.9	31.8	34.9	9.0	709.5
Apr	84.9	3.9	175.0	104.9	88.4	0.0	64.8	0.0	29.2	26.8	101.9	13.0	39.8	73.4	52.0	57.1	14.8	929.9
May	75.6	0.0	182.2	35.2	95.0	0.0	61.4	1.7	31.1	22.5	91.3	15.8	48.5	89.5	63.3	69.5	18.0	900.7
Jun	140.2	35.4	208.0	0.0	114.8	0.0	62.7	14.8	34.0	31.9	96.3	29.7	90.9	167.7	118.7	130.3	33.8	1,309.1
Jul	127.8	29.5	223.8	0.0	129.0	0.0	63.6	38.5	39.1	30.5	106.9	33.8	103.4	190.8	135.0	148.2	38.4	1,438.3
Aug	177.2	21.5	220.5	0.0	127.7	0.0	65.5	37.9	35.2	28.4	113.0	33.9	103.8	191.5	135.5	148.8	38.6	1,478.9
Sep	127.7	19.8	208.7	0.0	99.8	18.1	61.3	27.6	25.1	24.8	105.3	29.9	91.7	169.2	119.7	131.4	34.1	1,294.2
Oct	98.0	9.6	182.0	28.6	100.1	14.7	63.7	21.2	26.4	37.0	105.7	22.3	68.4	126.2	89.3	98.1	25.4	1,116.7
Nov	67.5	14.9	144.5	55.3	82.6	0.0	55.0	10.1	35.6	21.1	105.1	15.9	48.7	89.8	63.6	69.8	18.1	897.6
Dec	29.6	10.1	182.5	9.1	67.4	0.0	40.8	0.2	36.4	9.8	104.3	7.6	23.2	42.7	30.2	33.2	8.6	635.7
Total	1,177.3	152.7	2,231.4	323.9	1,141.8	32.8	695.1	152.2	317.5	265.2	1,208.0	218.1	668.3	1,233.0	872.6	958.0	248.4	11,896.4

Projected Groundwater Pumping From Beaumont-Cherry Valley Water District (Acre-Feet) – Applied in All Scenarios

Month	BCVWD 16	BCVWD 21	BCVWD 22	BCVWD 23	BCVWD 24	BCVWD 25	BCVWD 26	BCVWD 29	BCVWD 3	BCVWD New	Total
Jan	27	98	31	88	88	101	98	72	4	175	782
Feb	26	95	30	85	85	98	94	70	4	170	757
Mar	29	107	33	96	104	118	115	78	5	191	877
Apr	41	152	47	137	152	173	167	112	7	272	1,260
May	40	146	46	131	154	174	169	107	7	262	1,236
Jun	59	217	68	195	244	273	265	159	10	388	1,877
Jul	67	245	76	220	276	309	300	180	11	438	2,122
Aug	67	247	77	222	278	311	302	181	11	442	2,138
Sep	59	216	67	194	244	273	265	159	10	387	1,873
Oct	52	189	59	170	204	229	223	139	9	338	1,611
Nov	44	160	50	144	165	187	181	117	7	286	1,341
Dec	31	113	35	102	108	124	120	83	5	203	925
Total	541	1,983	619	1,783	2,103	2,370	2,300	1,457	89	3,552	16,797

Projected Groundwater Pumping From Morongo Band of Mission Indians (Acre-Feet) – Applied in Scenarios 1a, 2, C2, C3

Month	Base Extractions			Total
	Potrero Canyon	Millard Canyon	Cabazon Storage Unit	
Jan	33.3	35.9	59.0	128
Feb	33.1	35.6	58.6	127
Mar	39.9	42.9	70.6	153
Apr	51.7	55.7	91.5	199
May	49.5	53.3	87.6	191
Jun	70.5	75.9	124.8	271
Jul	77.4	83.4	137.0	298
Aug	79.5	85.7	140.7	306
Sep	69.6	75.0	123.2	268
Oct	60.8	65.5	107.6	234
Nov	49.1	52.9	86.9	189
Dec	35.4	38.1	62.6	136
Total	650.0	700.0	1,150.0	2,500

Projected Groundwater Pumping From Morongo Band of Mission Indians (Acre-Feet) – Applied in Scenarios 1b, M1, M3, CM14, CM124

Month	Base Extractions			Additional Extractions				Total
	Potrero Canyon	Millard Canyon	Cabazon Storage Unit	Well MB3	Well MB5	Well MB6	Well MB7	
Jan	33.3	35.9	59.0	48.7	48.7	48.7	48.7	323.1
Feb	33.1	35.6	58.6	48.4	48.4	48.4	48.4	320.8
Mar	39.9	42.9	70.6	58.3	58.3	58.3	58.3	386.5
Apr	51.7	55.7	91.5	75.6	75.6	75.6	75.6	501.3
May	49.5	53.3	87.6	72.4	72.4	72.4	72.4	480.1
Jun	70.5	75.9	124.8	103.1	103.1	103.1	103.1	683.5
Jul	77.4	83.4	137.0	113.2	113.2	113.2	113.2	750.6
Aug	79.5	85.7	140.7	116.2	116.2	116.2	116.2	770.9
Sep	69.6	75.0	123.2	101.8	101.8	101.8	101.8	674.9
Oct	60.8	65.5	107.6	88.9	88.9	88.9	88.9	589.4
Nov	49.1	52.9	86.9	71.8	71.8	71.8	71.8	476.0
Dec	35.4	38.1	62.6	51.7	51.7	51.7	51.7	342.8
Total	650.0	700.0	1,150.0	950.0	950.0	950.0	950.0	6,300.0

Projected Groundwater Pumping From Cabazon Water District (Acre-Feet) – Applied in Scenarios 1b, C2, C3, CM14, CM124

Month	CWD-1	CWD-2	CWD-5	CWD-X1	CWD-X2	Total
Jan	85.2	85.2	48.2	82.2	82.2	383.0
Feb	66.4	66.4	37.5	64.1	64.1	298.4
Mar	65.2	65.2	36.9	62.9	62.9	293.2
Apr	70.1	70.1	39.6	67.6	67.6	315.1
May	74.7	74.7	42.2	72.1	72.1	335.9
Jun	85.0	85.0	48.0	82.0	82.0	382.0
Jul	92.1	92.1	52.1	88.9	88.9	414.2
Aug	110.5	110.5	62.5	106.7	106.7	496.8
Sep	115.0	115.0	65.0	111.0	111.0	517.0
Oct	113.6	113.6	64.2	109.7	109.7	510.9
Nov	105.7	105.7	59.8	102.0	102.0	475.3
Dec	86.1	86.1	48.7	83.1	83.1	387.1
Total	1,069.7	1,069.7	604.6	1,032.5	1,032.5	4,808.9

APPENDIX A:
UNCERTAINTY OF RECHARGE IN MODEL SIMULATIONS

APPENDIX A: UNCERTAINTY OF RECHARGE IN MODEL SIMULATIONS

1.0 BACKGROUND

The San Gorgonio Pass Groundwater Model Framework contains three separate models where the first model represents a land surface-process model using INFILv3 (USGS 2008) that provides infiltration as recharge to the shallow aquifer system. The shallow aquifer system is represented by the second model, a MODFLOW-OWHM (Hanson et al. 2014) groundwater model, that computes a flux that drains out of the shallow aquifer system and may percolate through a vadose zone to the deeper groundwater system where pumping primarily occurs, represented by the third model. This third model represents both the vadose zone beneath the shallow aquifer system and the deeper aquifer system with a MODFLOW-NWT (Niswonger et al. 2011) groundwater model.

The two MODFLOW groundwater models are known as the Upper San Gorgonio Pass Subbasin Groundwater Model and the Lower San Gorgonio Pass Subbasin Groundwater Model. Contained in the lower groundwater model is an unsaturated zone package (UZF) that was calibrated to groundwater level data along with the rest of the modeling framework. This UZF package contains a saturated vertical hydraulic conductivity parameter (K_v) that constrains water passing through the unsaturated zone down to the saturated, deeper aquifer system. If there is a large enough flux passed from the upper groundwater model to the lower groundwater model such that the percolation rate exceeds K_v, the water will either be held temporarily in the unsaturated zone storage or conceptually, it will laterally flow across (or run off) and not reach the deeper aquifer system. Furthermore, in the lower groundwater model, K_v is spatially uniform, whereas this is unlikely to be the case in reality and there is significant uncertainty around this parameter (INTERA 2021). This is how K_v can constrain the connection between the drainage down from the upper model that may flow to the lower model's saturated zone.

The uniform distribution of K_v is not representative of the heterogeneous subsurface stratigraphy that comprises the vadose zone between the shallow and deeper aquifer systems. There may be some areas that are more or less permeable than what the model parameter suggests. Furthermore, the total amount of water that may pass vertically downward to the deeper aquifer may be further constrained if the recharge from other sources (e.g., streams, areal recharge) also contribute to drainage passing from the shallow aquifer system to the lower aquifer system. These other recharge sources are not equivalent near all potential recharge basin locations.

Given the inherent uncertainty in the vadose zone, it may be difficult to evaluate the efficacy of each recharge basin location if the water passing from the shallow aquifer system to the deeper aquifer system is not constrained evenly or in a representative manger. Applying recharge directly to the deeper aquifer system allows for a direct evaluation of the location itself, unencumbered by the complications of the unknown vadose zone dynamics. This provided a basis for applying the recharge for the potential recharge basins directly to the lower groundwater model, rather than to the surface of the system in the upper groundwater model. If the recharge were placed in the upper groundwater model, it would pass through the system first as drainage from the upper model and then as unsaturated flow in the lower model where it could be restricted and result in less recharge reaching the deeper aquifer system than should. The reality is that the conceptual model understands there to be a disconnect between the shallow aquifer system and the deeper aquifer system, so there may be some constraint.

To address this uncertainty regarding how much recharge will pass through the unsaturated zone and impact the lower aquifer system, two simulations for each scenario were executed: 1) a simulation where the new recharge locations' rates were applied to the Lower model ("Recharge in Lower") and 2) a simulation where the new recharge locations' rates were applied to the upper model ("Recharge in Upper"). Recharge at Noble Creek was consistently applied only to the lower model as this existing facility was calibrated to determine that this model set-up better matches observed data.

In Table A1, the applied per-area recharge rate is shown based on the number of cells selected to be representative of that potential recharge basin. Given that the actual area of the potential recharge basins is unknown, this adds additional uncertainty to how much recharge could be constrained, or delayed, as it passes through the vadose zone. Table A1 computes a total recharge rate based on the applied annual recharge volumes and the total area of the cells applied for potentially new recharge locations. If the total new recharge rate exceeds the K_v, it is more likely the recharge in that scenario will be limited by the model. The more the new recharge rate exceeds the K_v, the greater the difference in results between the two model set-ups may be.

2.0 MODEL RESULTS

For each scenario, the results of the two model simulations are compared to evaluate the uncertainty in which part of the modeling framework the potential recharge should be applied to (lower model or upper model). Scenario 1a does not need two simulations since it only applies managed recharge to the Noble Creek facility. All other scenarios will be used for the analysis. The following results will be used for comparison:

- Average Annual Change in Storage (acre-feet per year, AFY)
- Hydrographs and MT exceedances

While overall Subbasin change in storage is not a good metric for evaluating the efficacy of the recharge basins, it can be used here to demonstrate the relative difference between the two types of simulations where recharge may be constrained.

2.1 Change in Storage

Figure A1 shows average annual key water budget terms for the GSA area. Change in storage is plotted as a line for both Recharge in Upper and Recharge in Lower. It shows that all scenarios observe negative change in storage when recharge is placed in the upper model versus the lower model. This decrease in groundwater storage demonstrates that the unsaturated zone of the model is restricting the amount of recharge percolating to the deeper aquifer system.

Table A2 lists the key water budget terms for the GSA area for all scenarios for both Recharge in Lower and Recharge in Upper model results. Here, the differences in change in storage between the two simulations for each scenario are quantified. The first notable change is that when recharge was applied to the lower model, Scenarios M1, M3, C2, CM14, and CM124 all had increases in storage over the model simulation period, on average, and when recharge is placed in the upper model, all five of those scenarios now observe losses in storage. The difference in average annual change in storage ranges from approximately 200-2,400 AFY less for when recharge is placed in the upper model versus the lower model.

Figure A1 also demonstrates that all scenarios compare unfavorably to Scenario 1a when recharge is placed in the upper model in terms of change in storage. They all experience a greater loss of storage on average than Scenario 1a, yet they still all outperform Scenario 1b.

Figure A1 illustrates a greater difference in change in storage between the different scenarios when recharge is placed in the lower model (black line) than when recharge is placed in the upper model (blue line). The restriction of vertical flow in the unsaturated zone also seems to result in less difference in overall change in storage between scenarios.

2.2 Hydrographs & MT Exceedances

Figures A2a-f, A3a-f, A4a-f, and A5a-f show hydrographs for the groups of Scenarios 1a and 2; Scenarios 1a, C3, and C2; Scenarios 1a, M1, and M3; and Scenarios 1a, CM14, and CM124, respectively. These hydrographs show simulated water levels at key wells with minimum threshold (MT) water levels with the results of both recharge applied in the lower model (solid line) and recharge applied in the upper model (dashed line). Except for wells 8M1, 11F4, 7P4, and 23B1 in Scenario 2, all water levels are lower in simulations where recharge is applied in the upper model.

Furthermore, Table A3 counts the MT exceedances for each scenario for both recharge applied in the lower model (black checkmarks) and recharge applied in the upper model (green checkmarks). MTs are considered exceeded if the water levels drop below the MT for a consecutive period of 5 years at any point in the projected simulation period. Only Scenario M1 did not see an increase in the number of wells where the MTs were exceeded. The scenario with the greatest increase in MT exceedances is Scenario C3, with one exceedance when recharge was applied in the lower model to all six wells exceeding MTs when recharge was applied in the upper model. Scenario M3, also applying recharge at Location 3, only increased the number of exceedances by one well. The small change in exceedances in scenarios where only MBMI increased pumping demonstrates how those scenarios actually add more recharge than extraction is increasing, reducing the impact of the sensitivity of recharge basins with regard to MT exceedance evaluation.

3.0 CONCLUSIONS

Table A4 compares the overall rankings of the potential recharge sites with the ranking for results from recharge in the lower model on the left side of the slash and the ranking for the results from recharge in the upper model on the right side of the slash. There is no difference in rankings when considering the Relative Flow to Indio given that this metric is controlled by the recharge basin’s proximity to the eastern boundary more than anything else. Regarding the impact on water levels/MT exceedance rankings, Locations 3 and 4 swapped spots as compared to the rankings for when recharge was applied to the lower model. Otherwise, the rankings remained the same.

Location 4 performed the best regarding both MT exceedances and mitigation of drawdowns. Location 4 mitigated drawdowns most effectively due to its location near the extraction locations. Location 3 similarly did well to mitigate drawdown impacts by placing recharge near extraction locations but did not perform as well regarding MT exceedances. Overall, there was not a clear difference between the well locations regarding MT exceedances so the ability to mitigate drawdown near the increased pumping locations became more important, especially as overall water levels are lower when recharge was placed in the upper model.

In the cumulative rankings of the recharge sites, Location 3 was the preferred option, and all recharge basins are ranked in the same order as when recharge was placed in the lower model. The same reasons as when recharge was placed in the lower model maintain.

1. Location 3 performs best balancing mitigating drawdown without losing too much flow to the Indio Subbasin
2. Location 2 is a runner-up minimizing flow to Indio very effectively while overall mitigating drawdown and MT exceedances relatively well.
3. Location 4 does best to mitigate drawdowns and reduce MT exceedances, however this site leads to the most amount of water leaving out to the east to the Indio Subbasin.
4. Location 1 performs reasonably well to protect MT exceedances and minimize flow to the Indio Subbasin, but its location is too far from the increased production wells to mitigate drawdown effectively.

Recharge in the western locations causes less flow lost to the Indio Subbasin. Recharge in the eastern locations closer to the simulated increases in pumping provide better mitigation of pumping drawdown.

The results from the scenarios where recharge is placed in the upper model provide a lower bound for the impact of recharge. While the relative rankings are consistent between placing recharge in the upper model versus placing recharge in the upper model, scenarios that place recharge in the upper model do perform worse than the baseline in regard to MT exceedances but better in terms of how much flow is lost to the Indio Subbasin. When comparing results with the alternative baseline, Scenario 1b, the benefit of recharging to mitigating drawdown is made clear no matter the recharge location.

Flint (2002) investigated the role of unsaturated flow in artificial recharge projects in Cherry Valley and determined that the hydrogeology beneath the artificial recharge location is critical to transporting and storing the applied water. They performed field site investigations and demonstrated how this type of data, particularly in an area with such faulting and prominent vadose zone constraints, determine whether a site was suitable for artificial recharge.

The overall water levels compared to simulations where recharge is placed in the lower model indicates that the recharge is less able to offset the increase in pumping when it is constrained by the unsaturated zone model properties. This finding of reduced impact of applied recharge is also consistent with Flint (2002). The main takeaway from this finding is that the uncertainty regarding how well the recharge can deeply percolate to the lower aquifer system may play a key factor in the efficacy of the recharge, but it does not have a major impact on the relative performance amongst recharge locations. As such, it is recommended that additional field investigations be performed to assess the subsurface geologic properties at the proposed recharge locations to ensure maximal efficiency and benefit from the recharge basins.

4.0 REFERENCES

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FIGURES

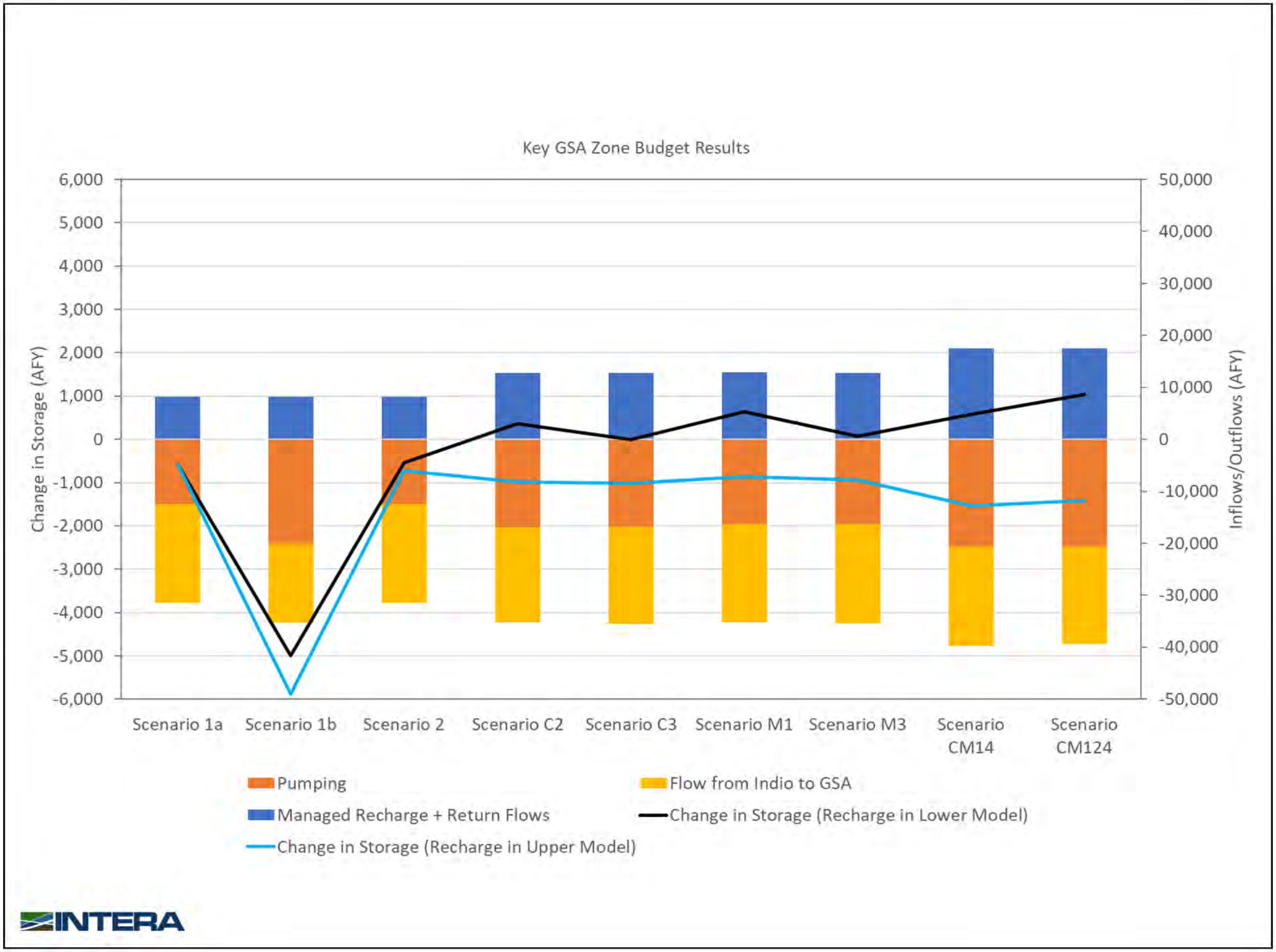


Figure A1 Zone Budget Comparison - Impact of Recharge Placement.

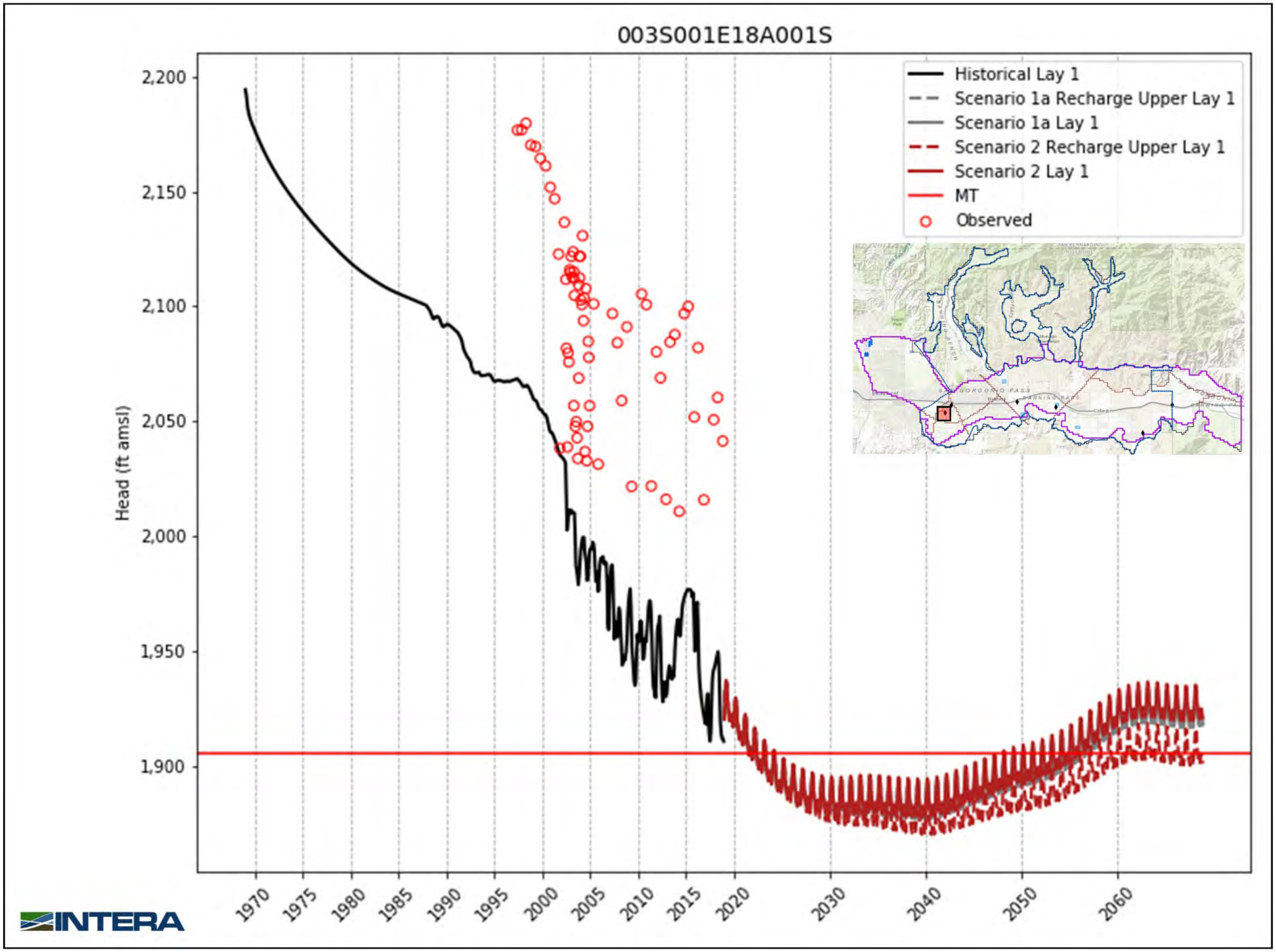


Figure A2a Hydrographs for 18A1 - Scenarios 1a and 2 (Recharge in Upper Model).

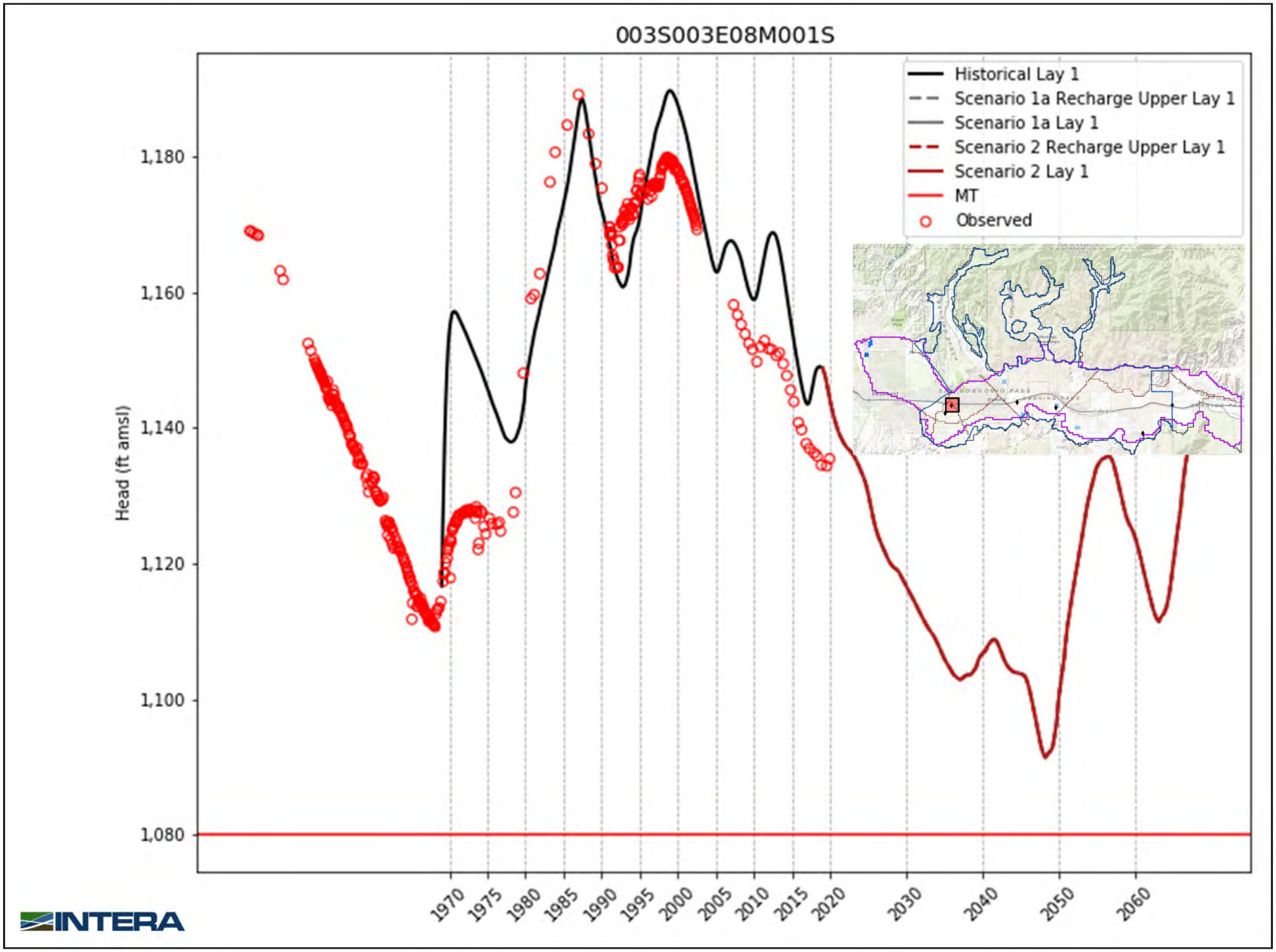


Figure A2b Hydrographs for 8M1 - Scenarios 1a and 2 (Recharge in Upper Model).

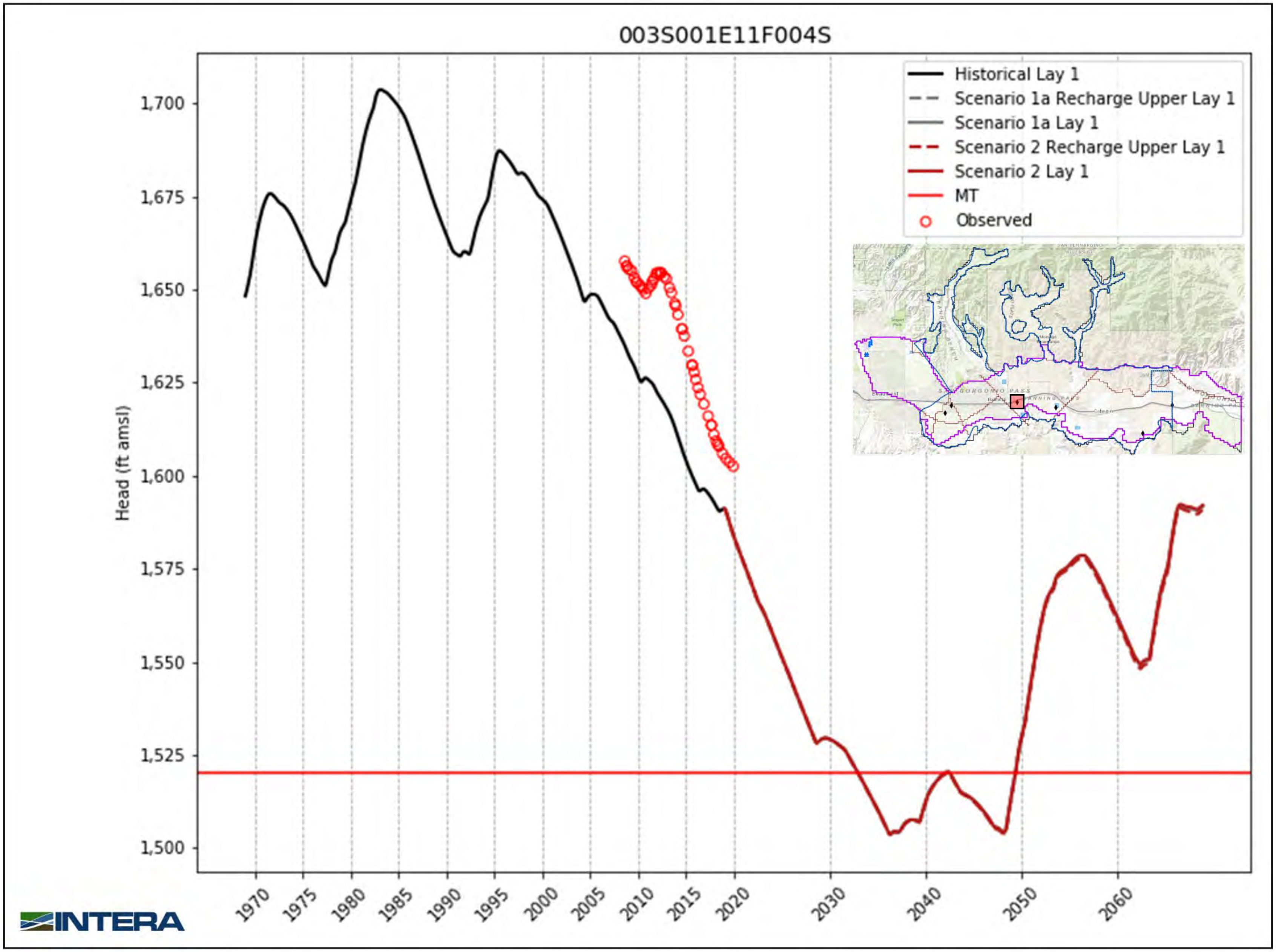


Figure A2c Hydrographs for 11F4 - Scenarios 1a and 2 (Recharge in Upper Model).

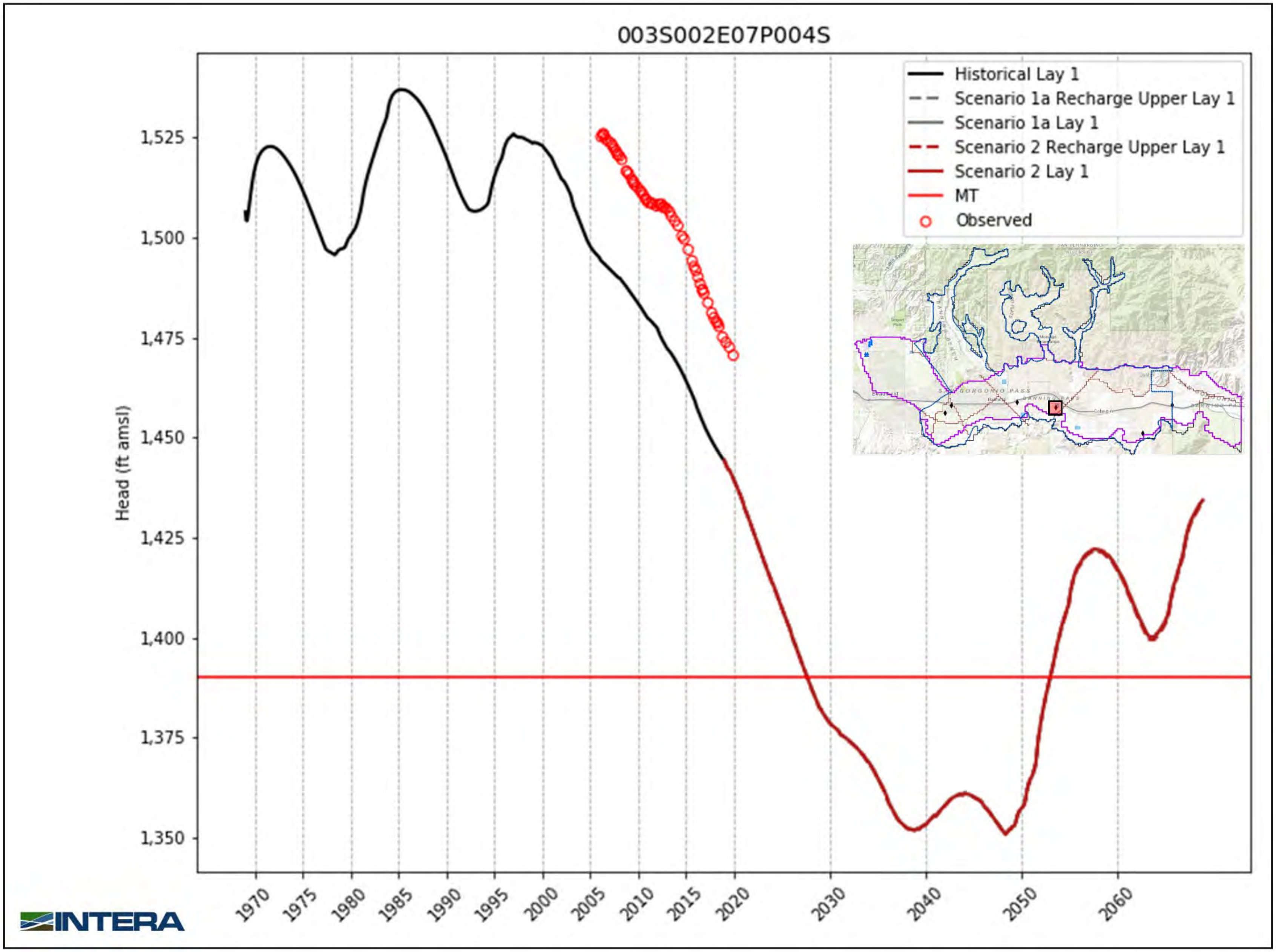


Figure A2d Hydrographs for 7P4 - Scenarios 1a and 2 (Recharge in Upper Model).

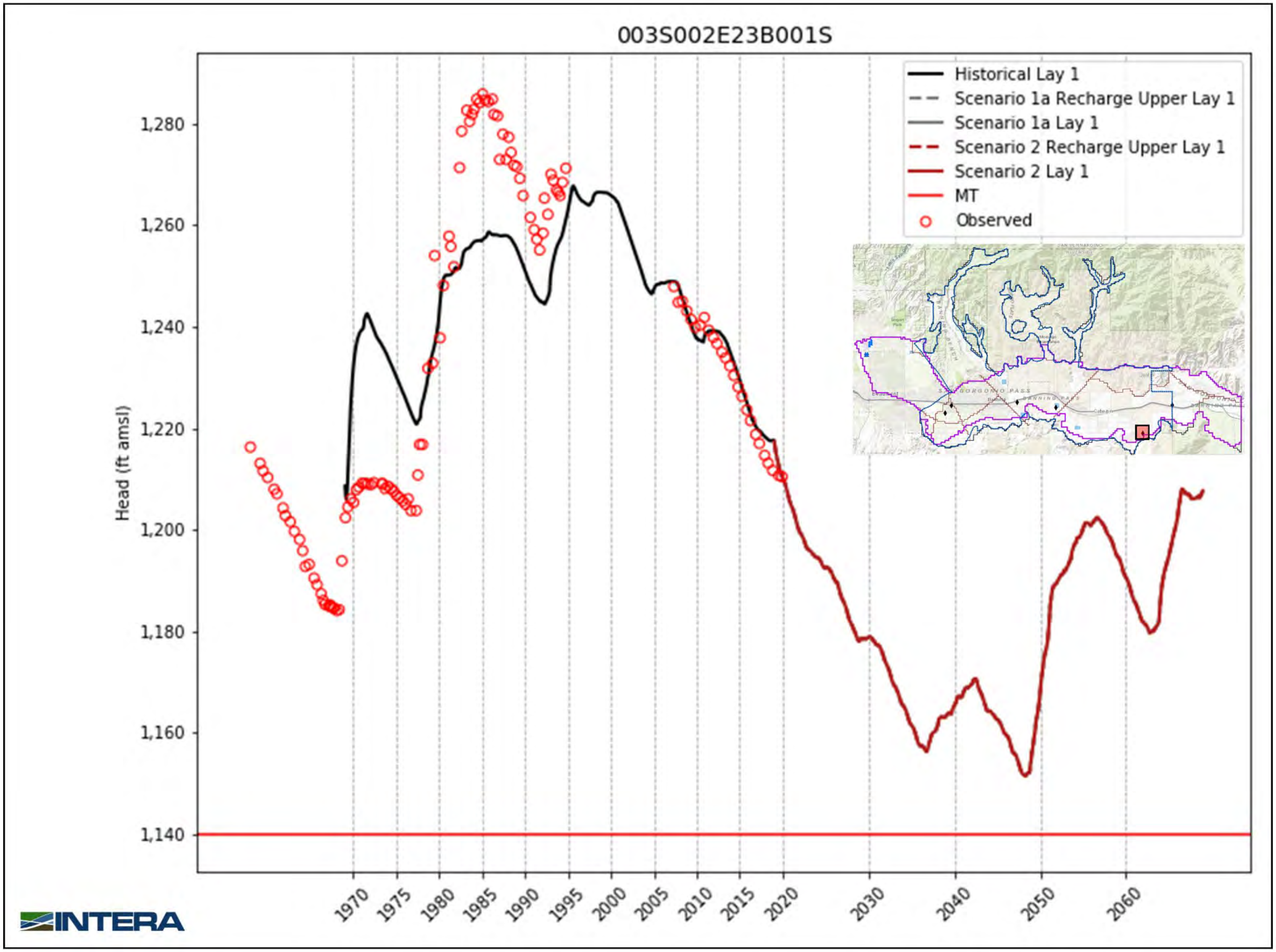


Figure A2e Hydrographs for 23B1 - Scenarios 1a and 2 (Recharge in Upper Model).

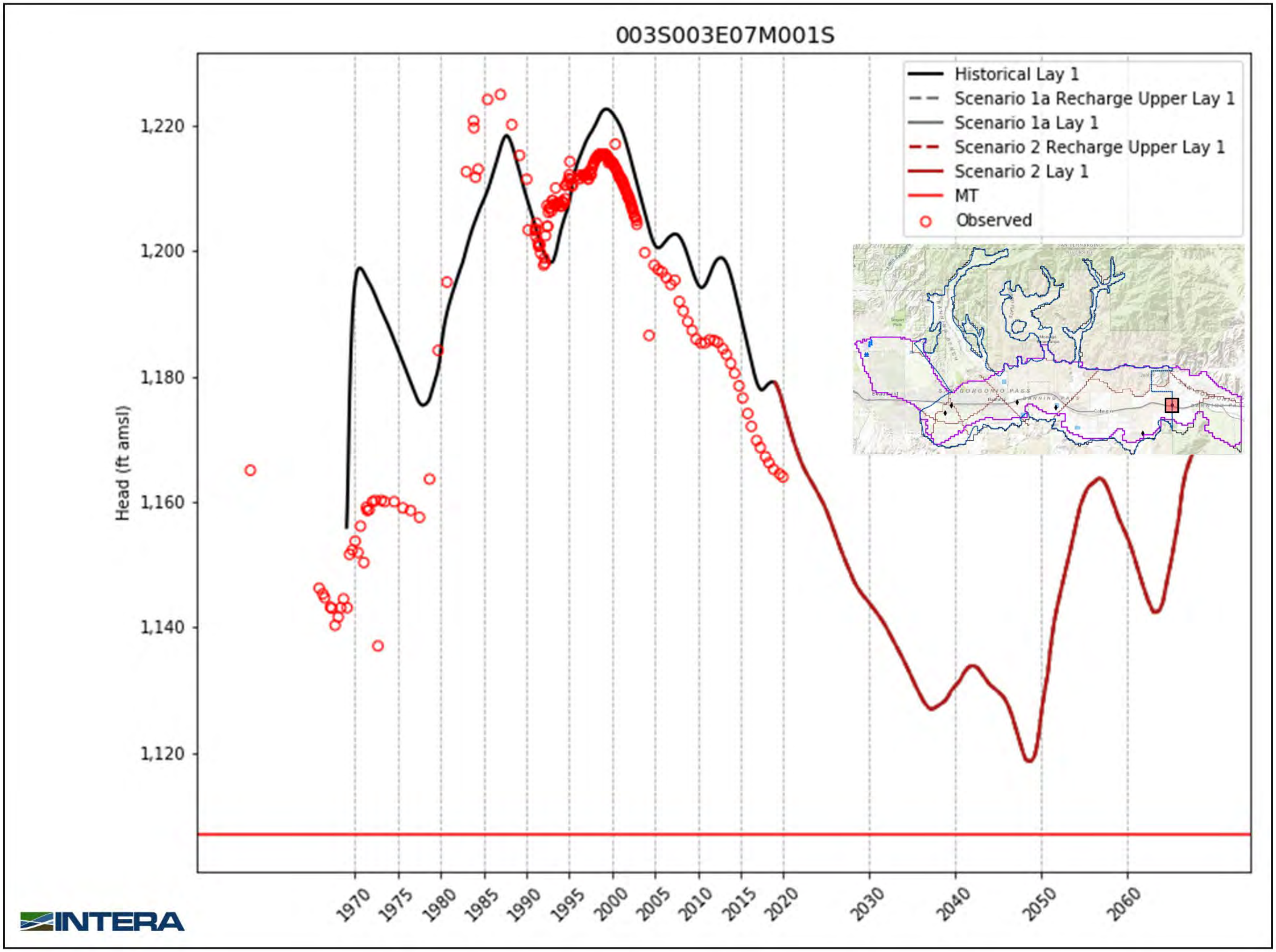


Figure A2f Hydrographs for 7M1 - Scenarios 1a and 2 (Recharge in Upper Model).

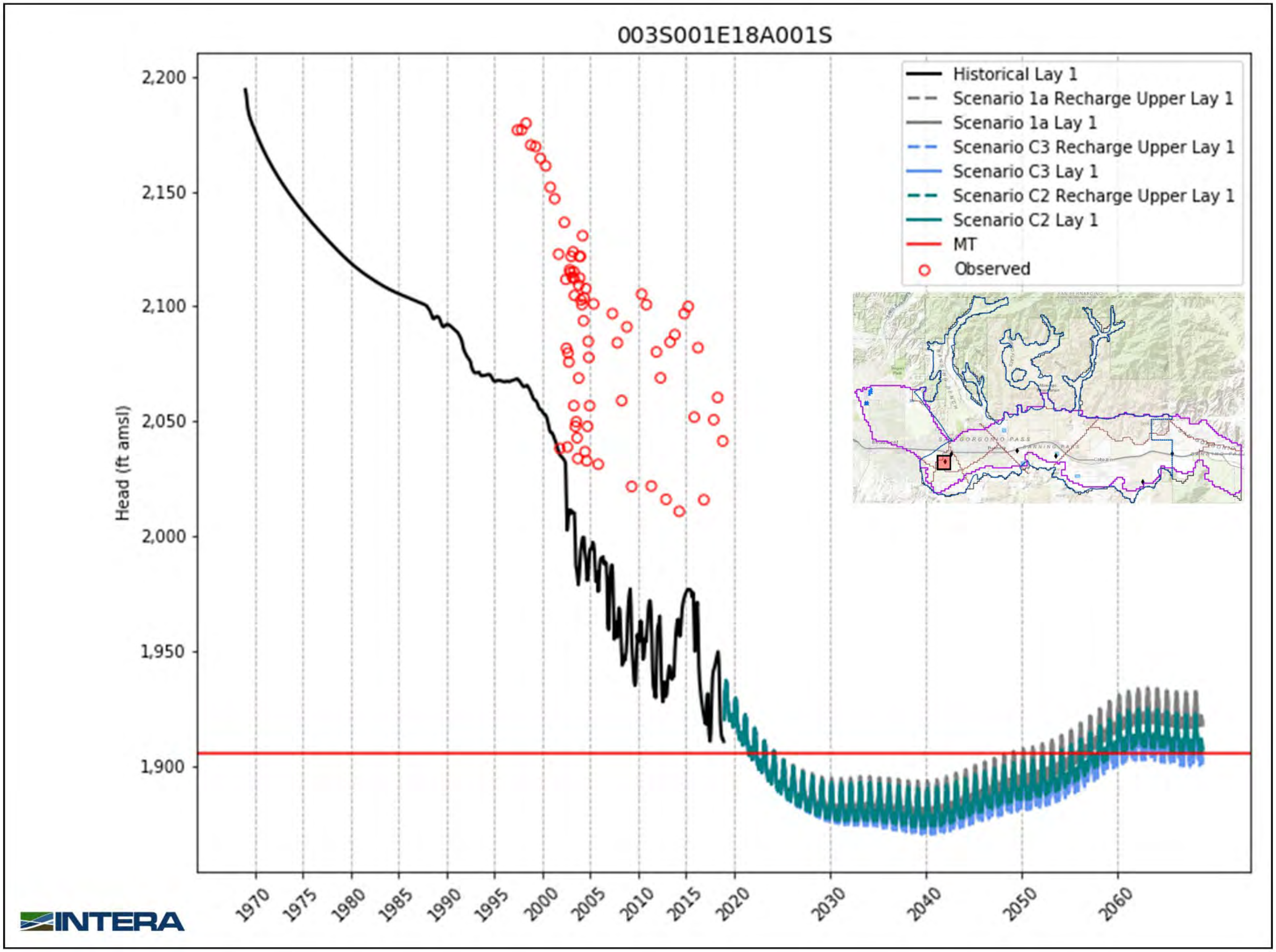


Figure A3a Hydrographs for 18A1 - Scenarios 1a, C2, and C3 (Recharge in Upper Model).

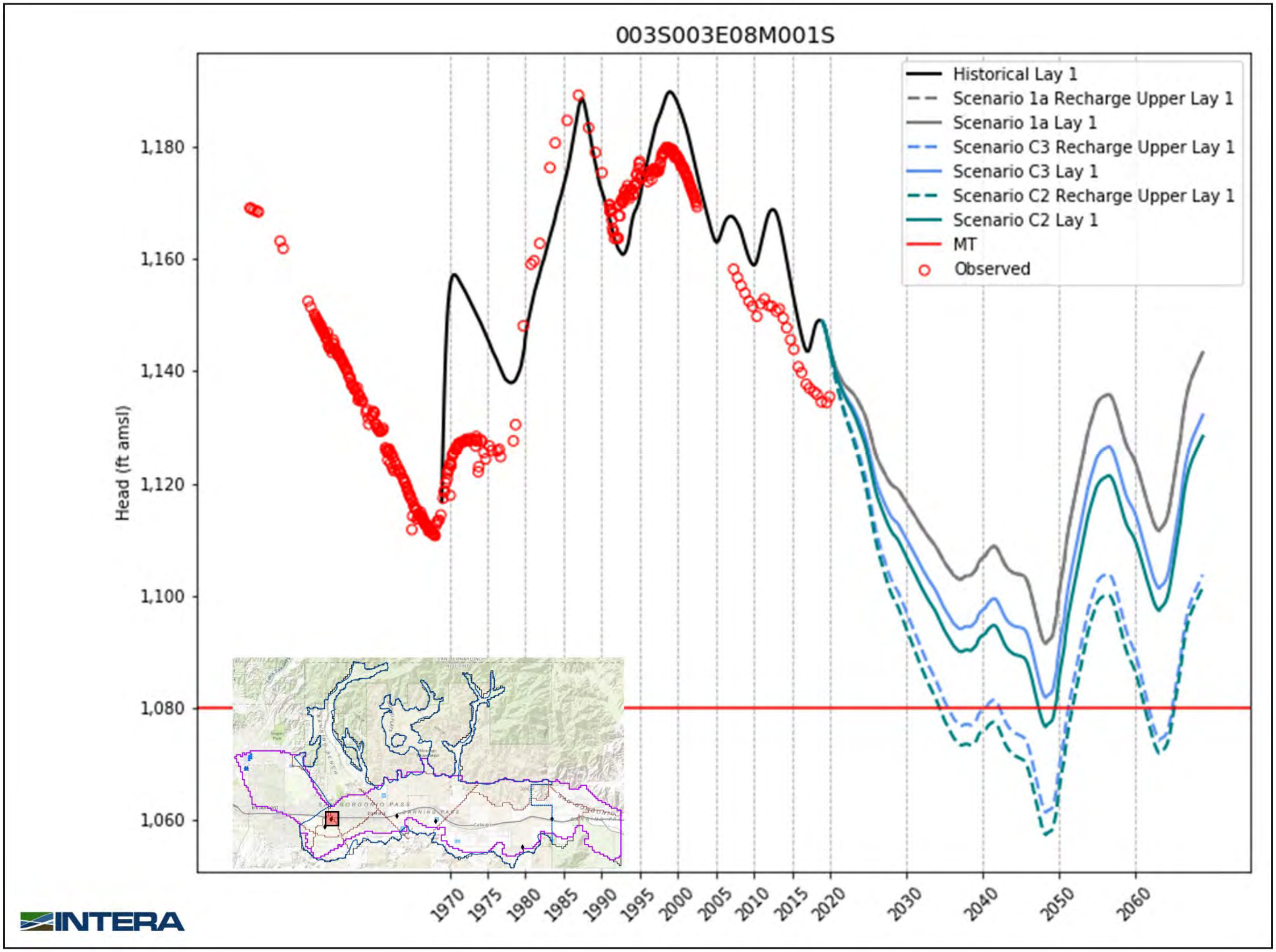


Figure A3b Hydrographs for 8M1 - Scenarios 1a, C2, and C3 (Recharge in Upper Model).

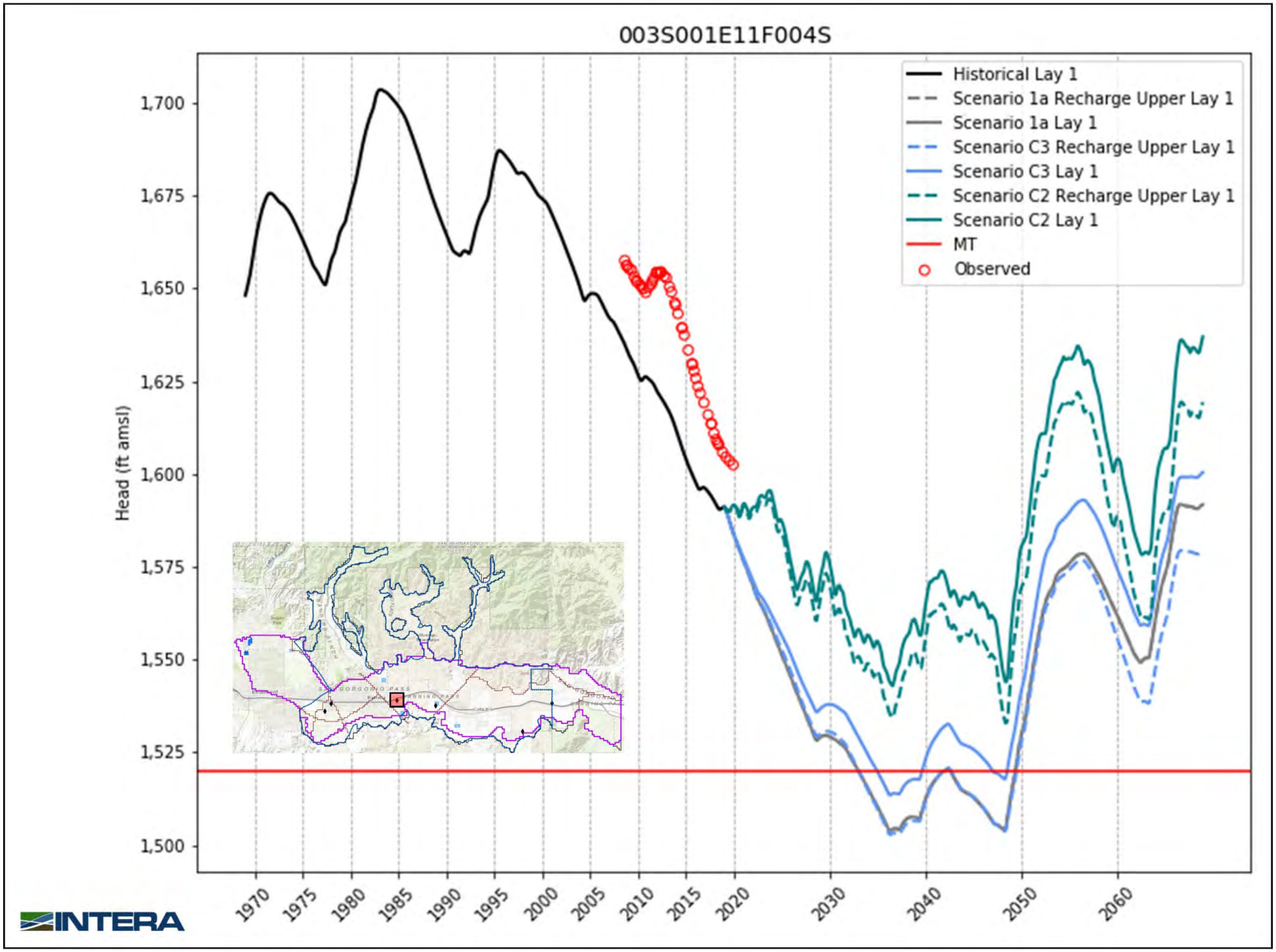


Figure A3c Hydrographs for 11F4 - Scenarios 1a, C2, and C3 (Recharge in Upper Model).

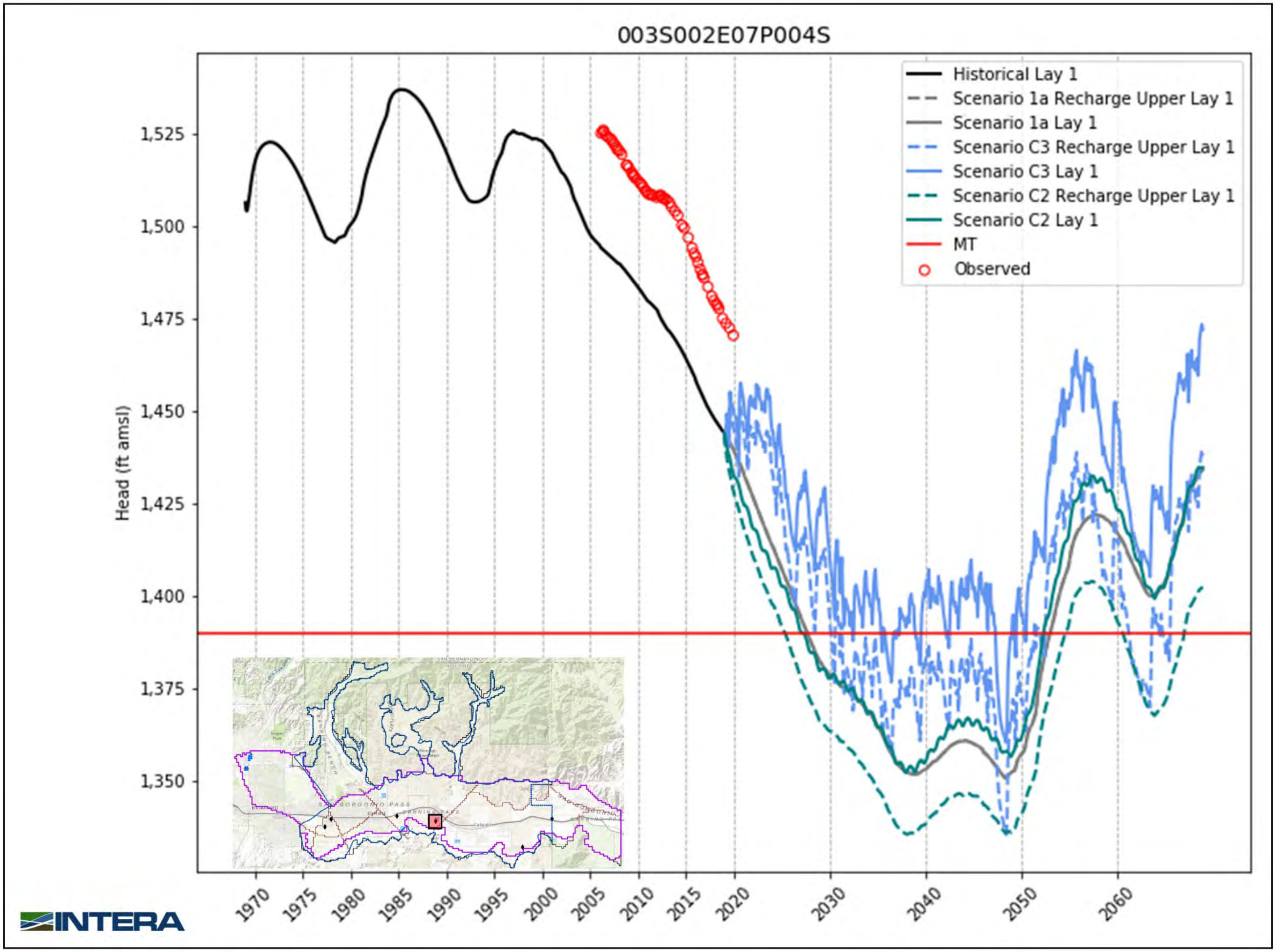


Figure A3d Hydrographs for 7P4 - Scenarios 1a, C2, and C3 (Recharge in Upper Model).

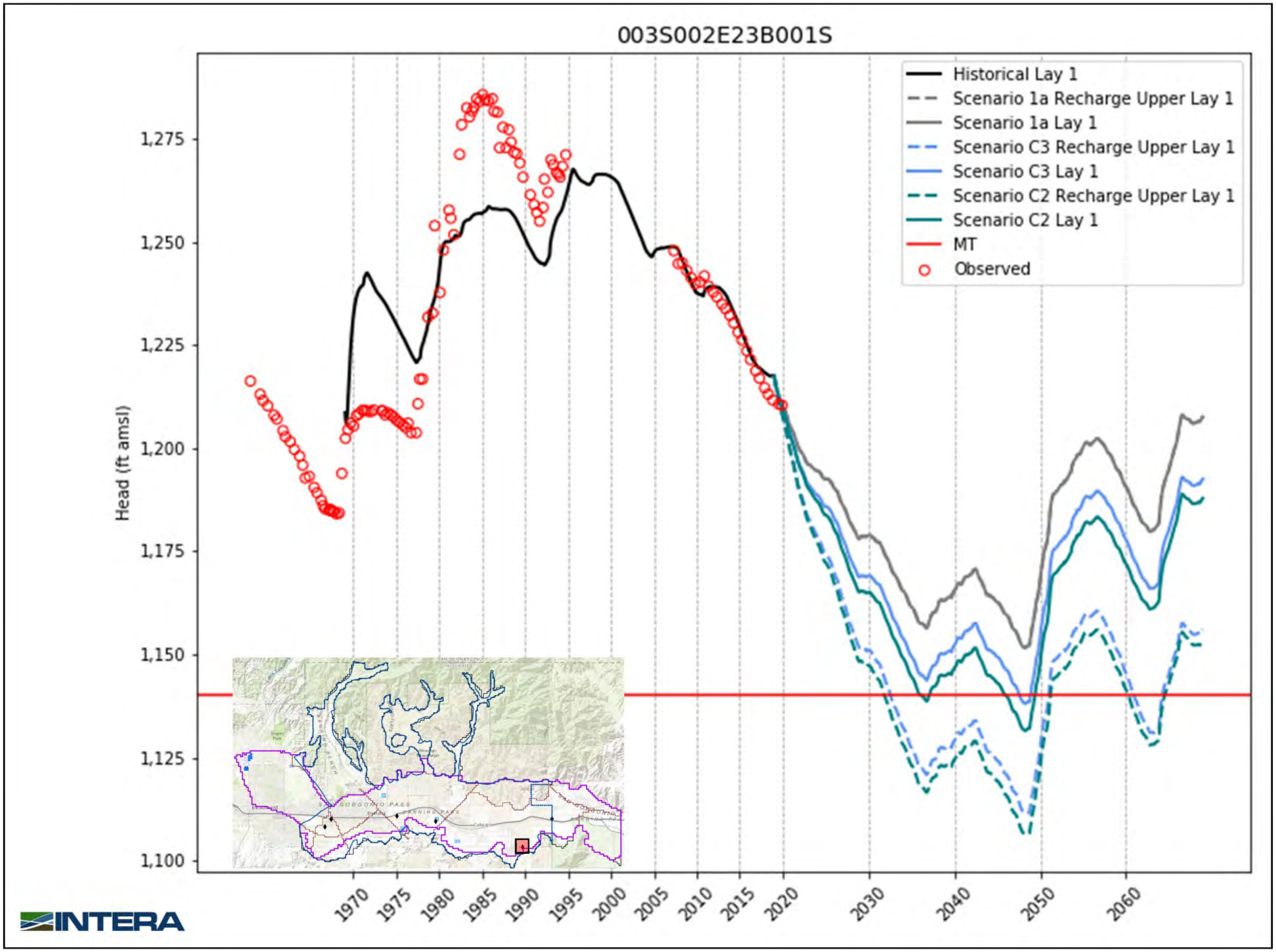


Figure A3e Hydrographs for 23B1 - Scenarios 1a, C2, and C3 (Recharge in Upper Model).

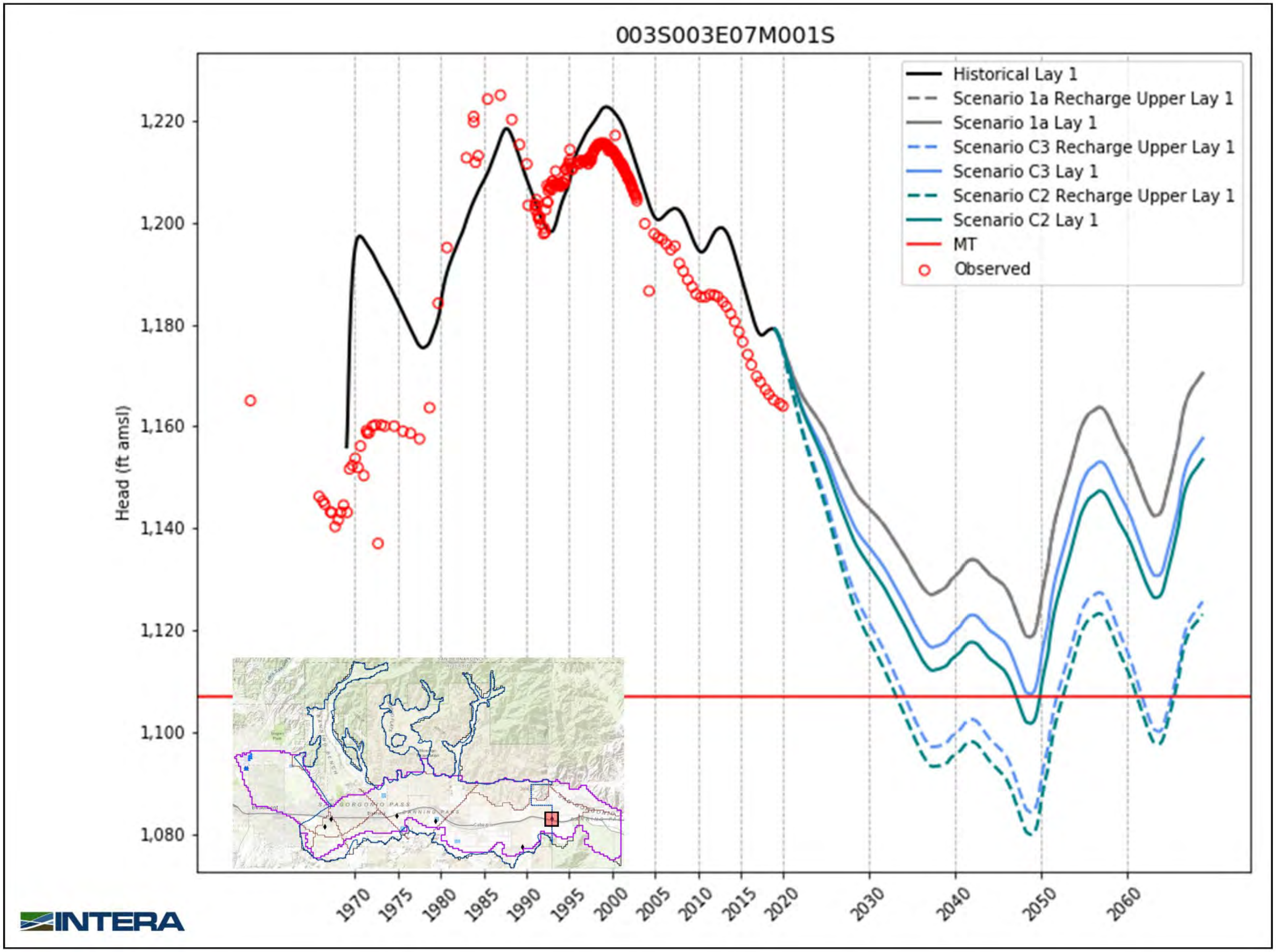


Figure A3f Hydrographs for 7M1 - Scenarios 1a, C2, and C3 (Recharge in Upper Model).

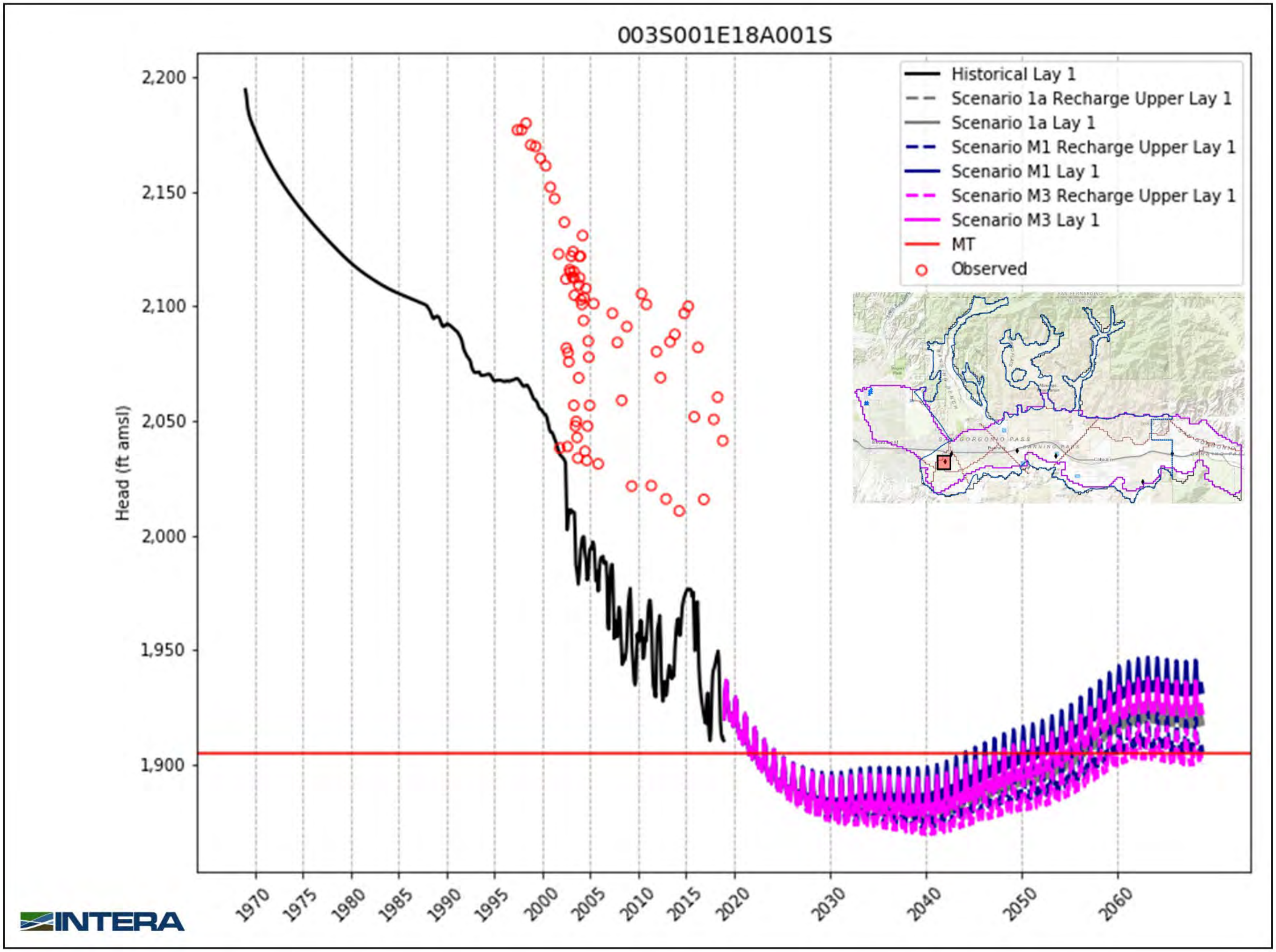


Figure A4a Hydrographs for 18A1 - Scenarios 1a, M1, and M3 (Recharge in Upper Model).

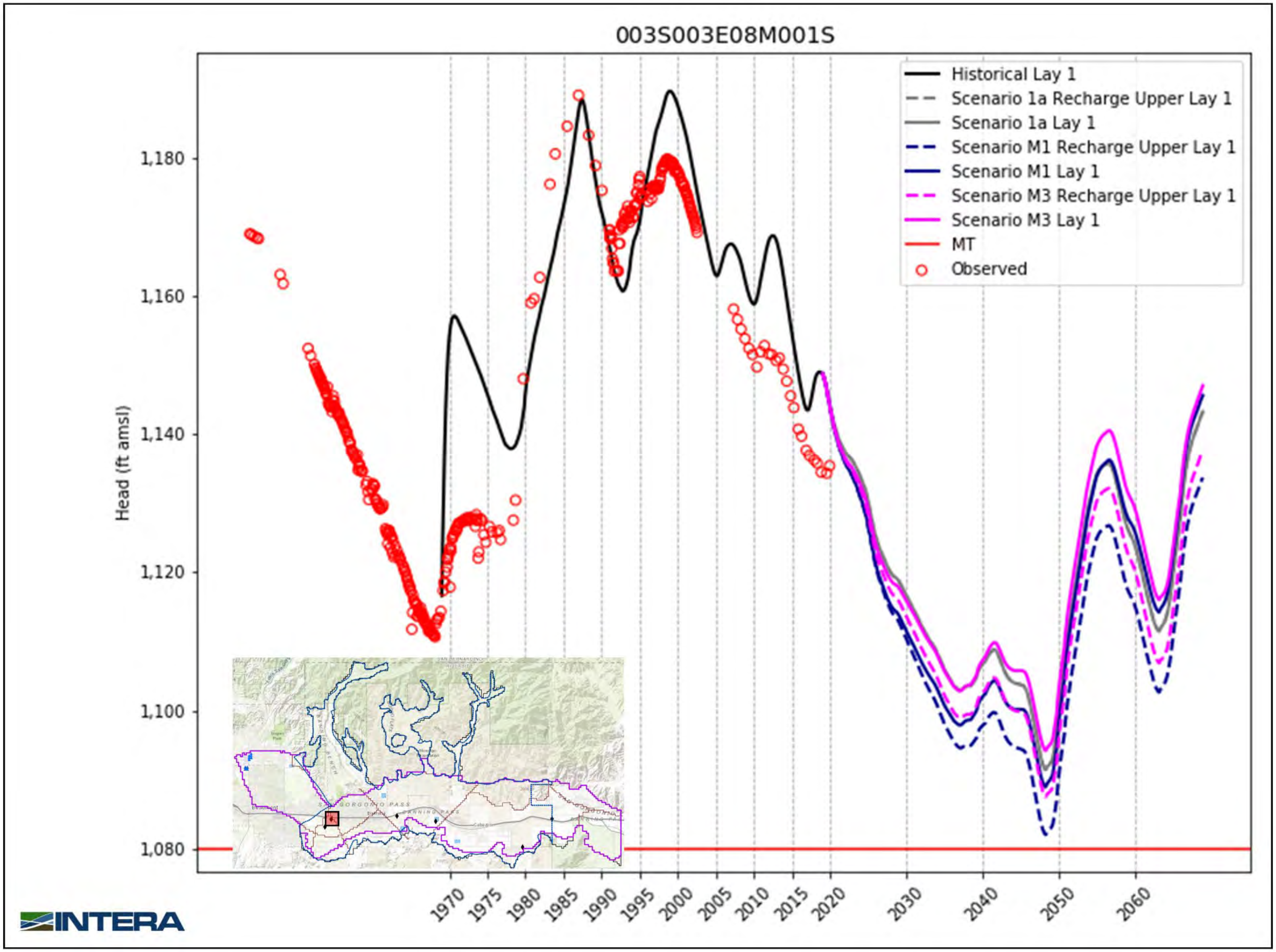


Figure A4b Hydrographs for 8M1 - Scenarios 1a, M1, and M3 (Recharge in Upper Model).

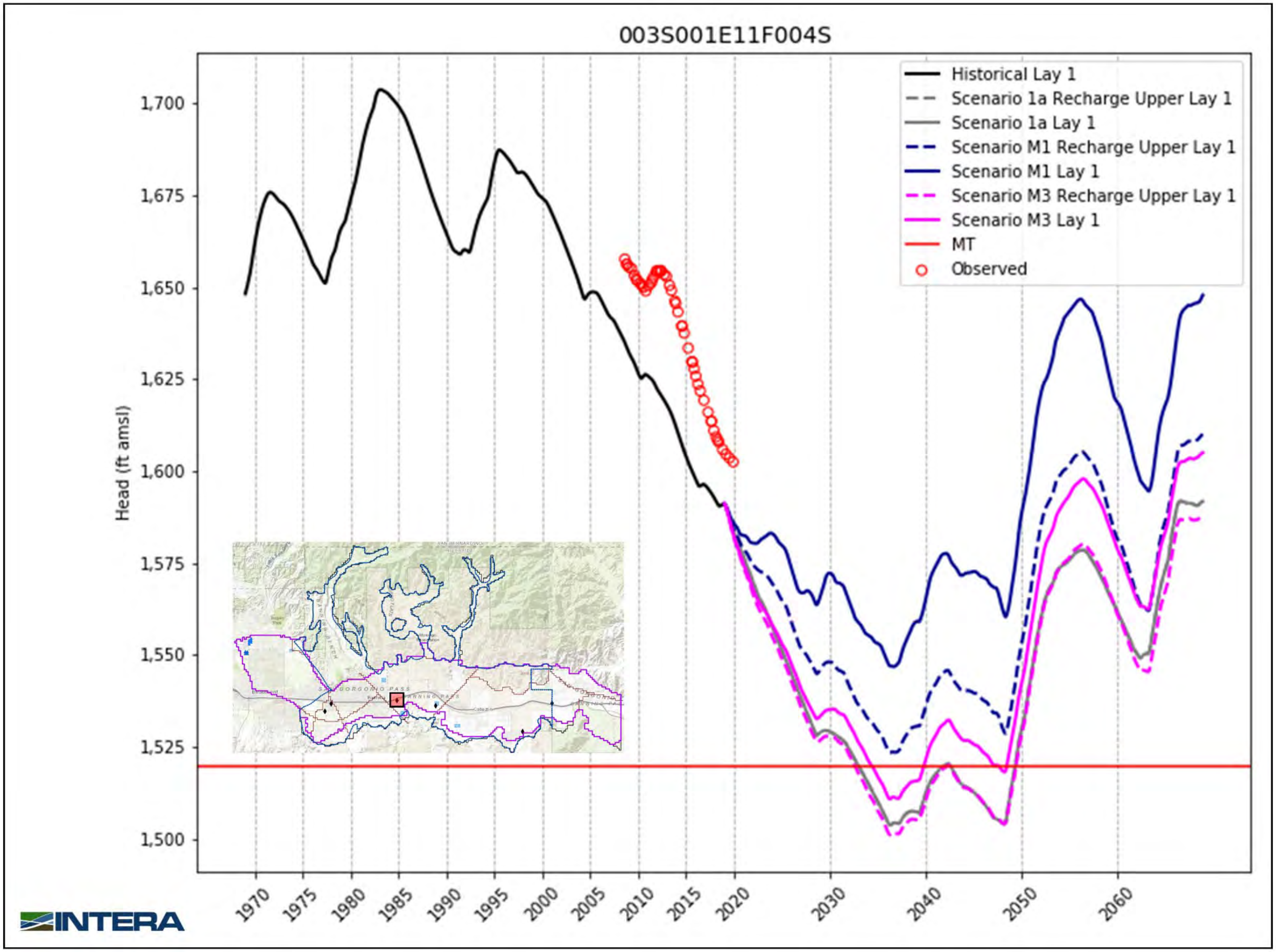


Figure A4c Hydrographs for 11F4 - Scenarios 1a, M1, and M3 (Recharge in Upper Model).

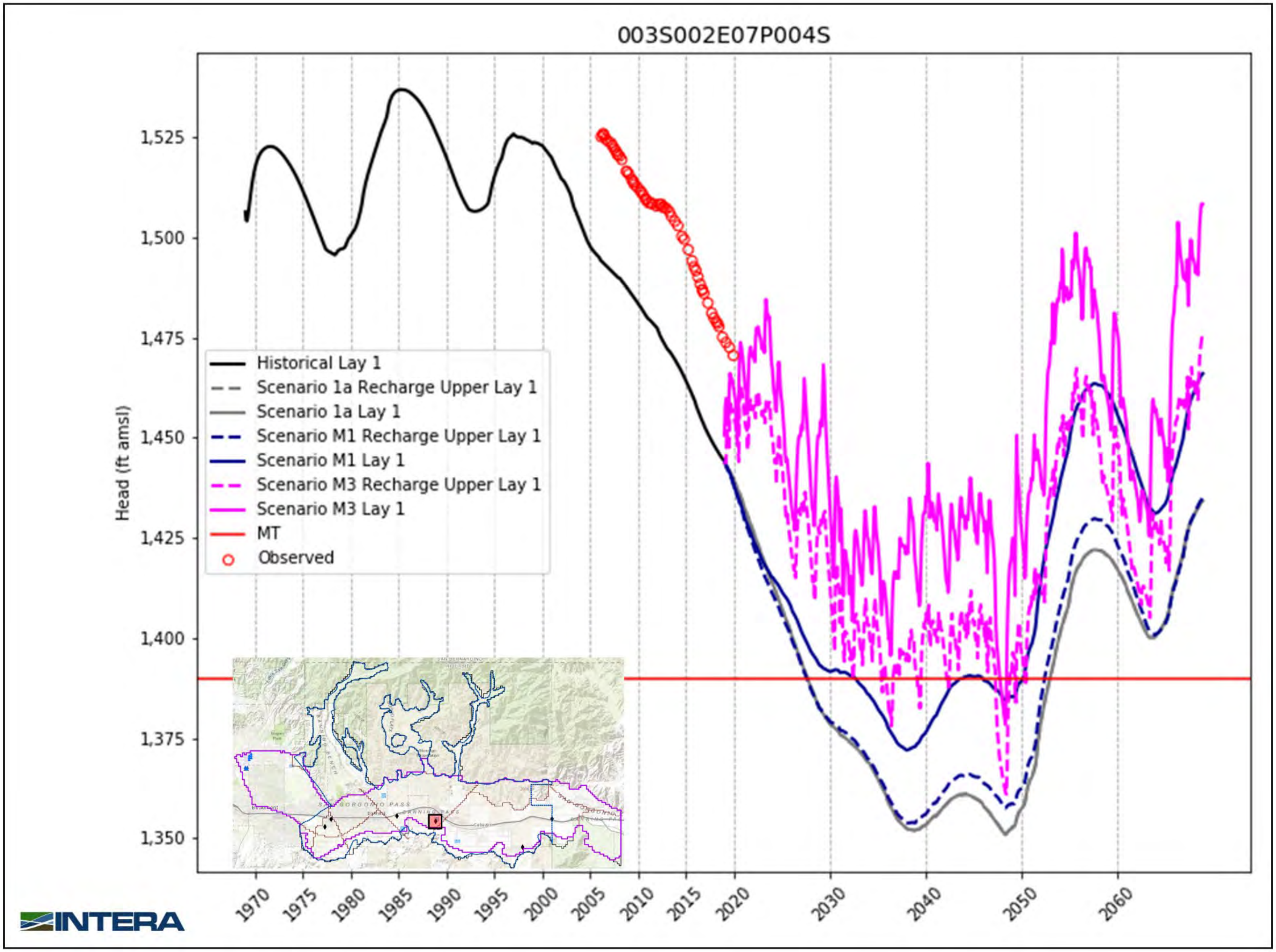


Figure A4d Hydrographs for 7P4 - Scenarios 1a, M1, and M3 (Recharge in Upper Model).

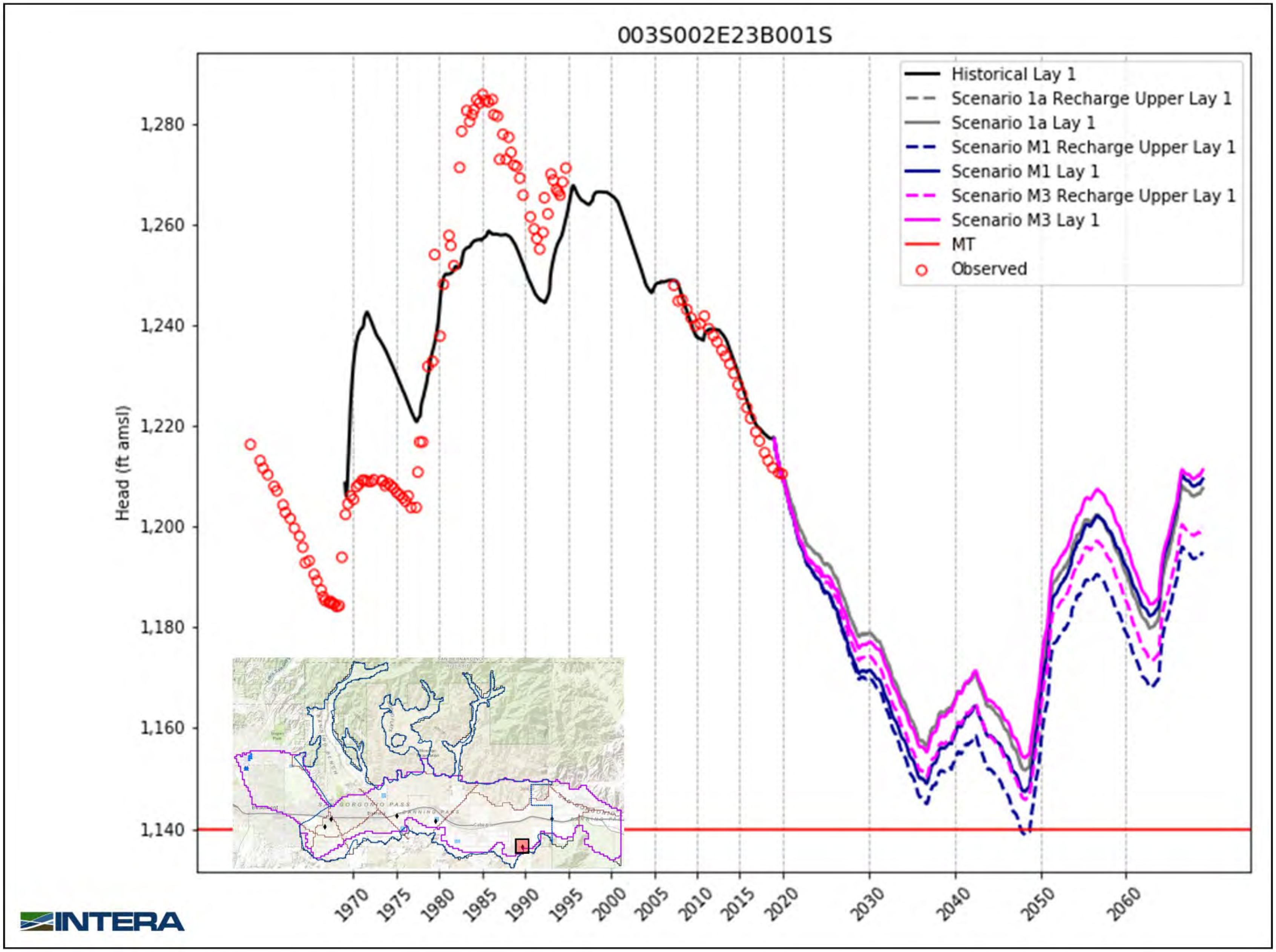


Figure A4e Hydrographs for 23B1 - Scenarios 1a, M1, and M3 (Recharge in Upper Model).

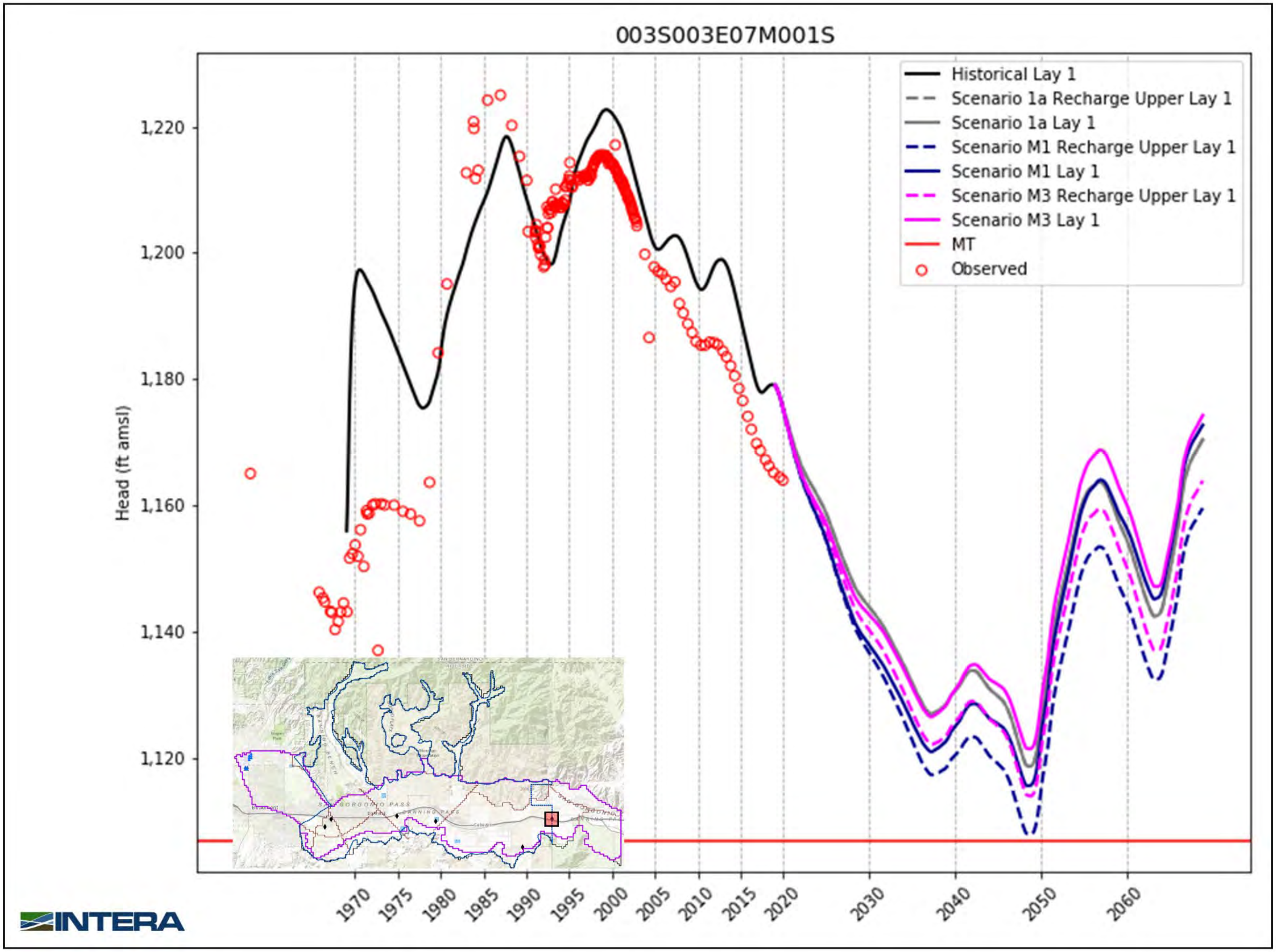


Figure A4f Hydrographs for 7M1 - Scenarios 1a, M1, and M3 (Recharge in Upper Model).

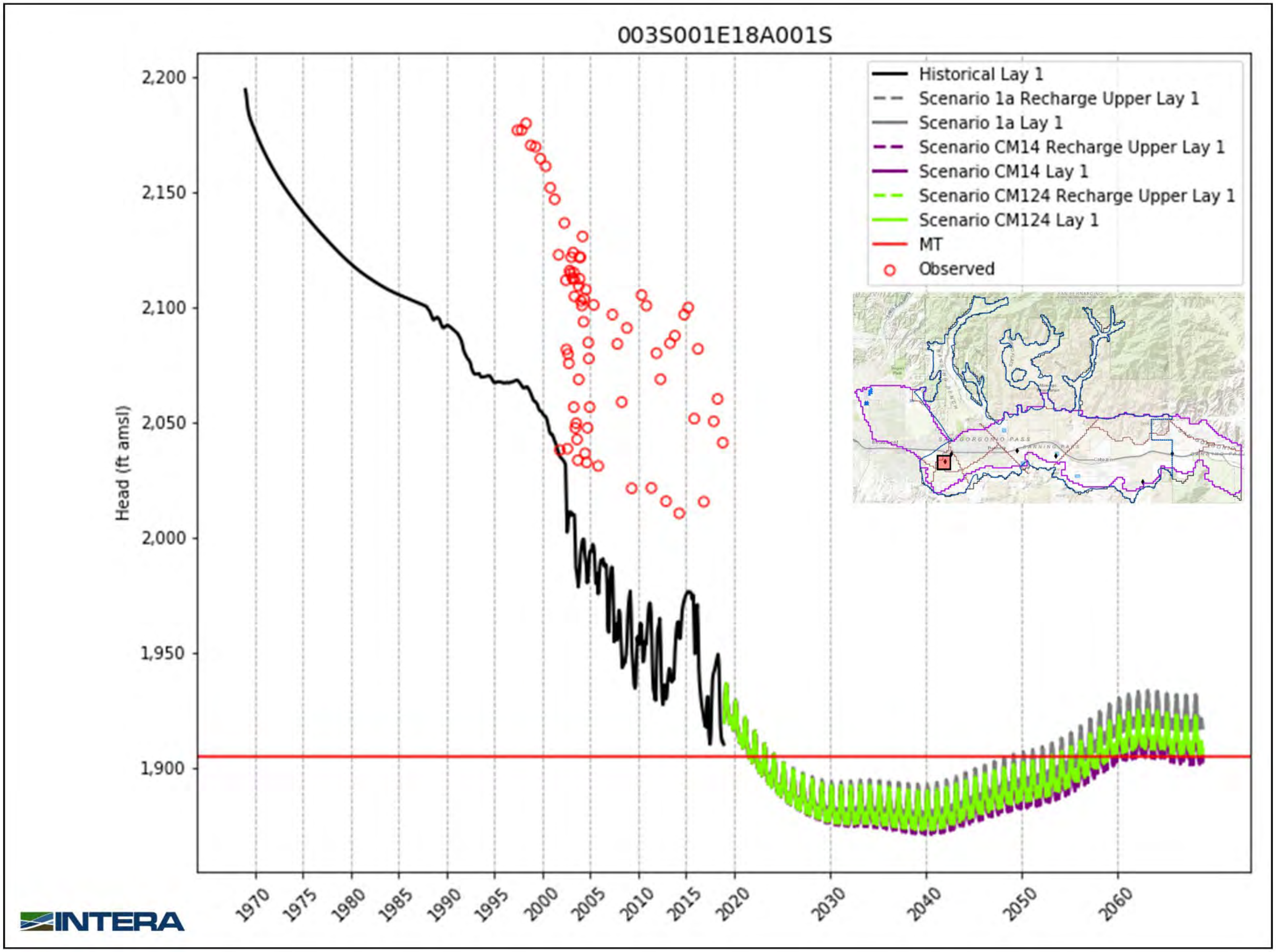


Figure A5a Hydrographs for 18A1 - Scenarios 1a, CM14, and CM124 (Recharge in Upper Model).

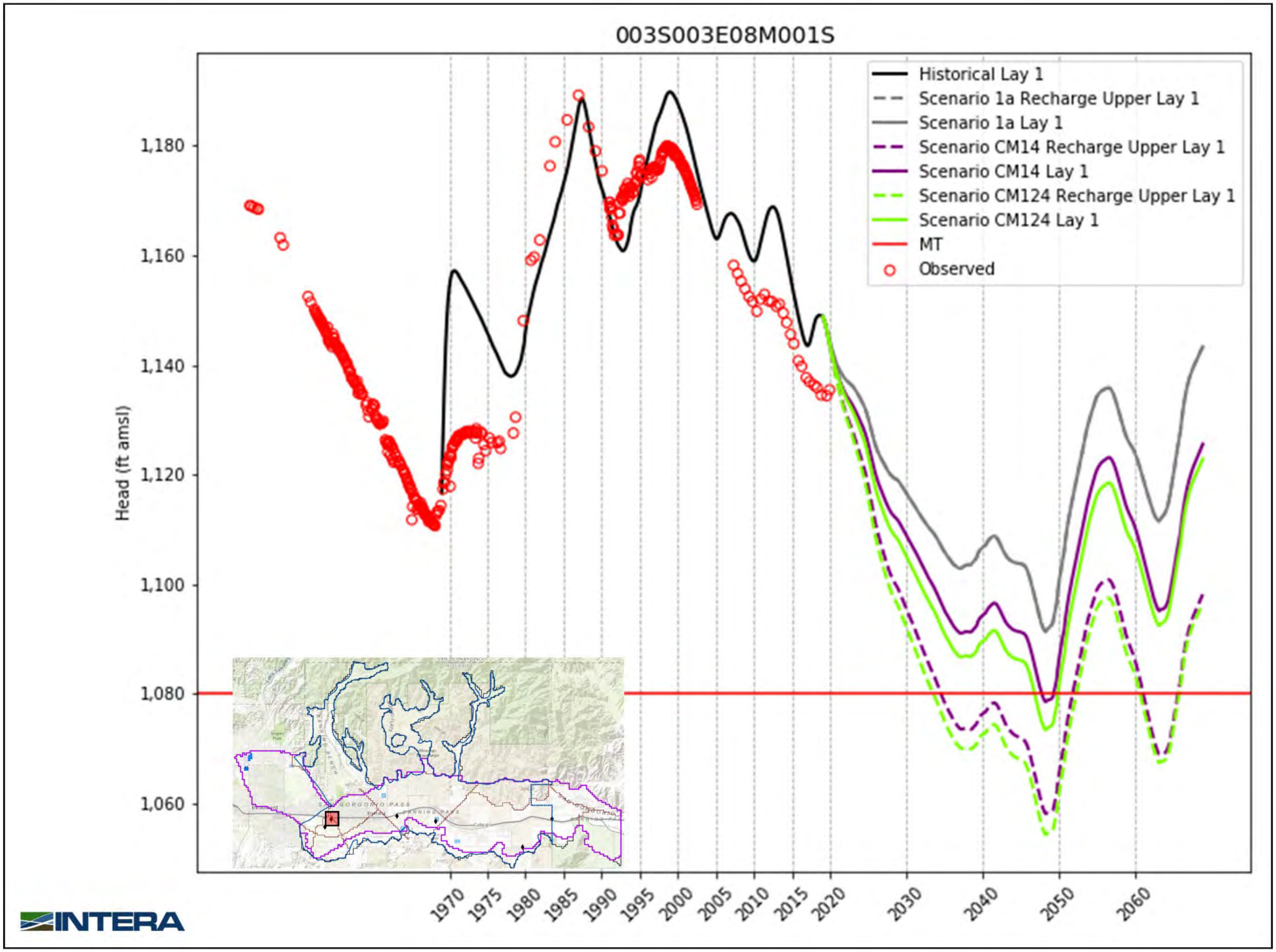


Figure A5b Hydrographs for 8M1 - Scenarios 1a, CM14, and CM124 (Recharge in Upper Model).

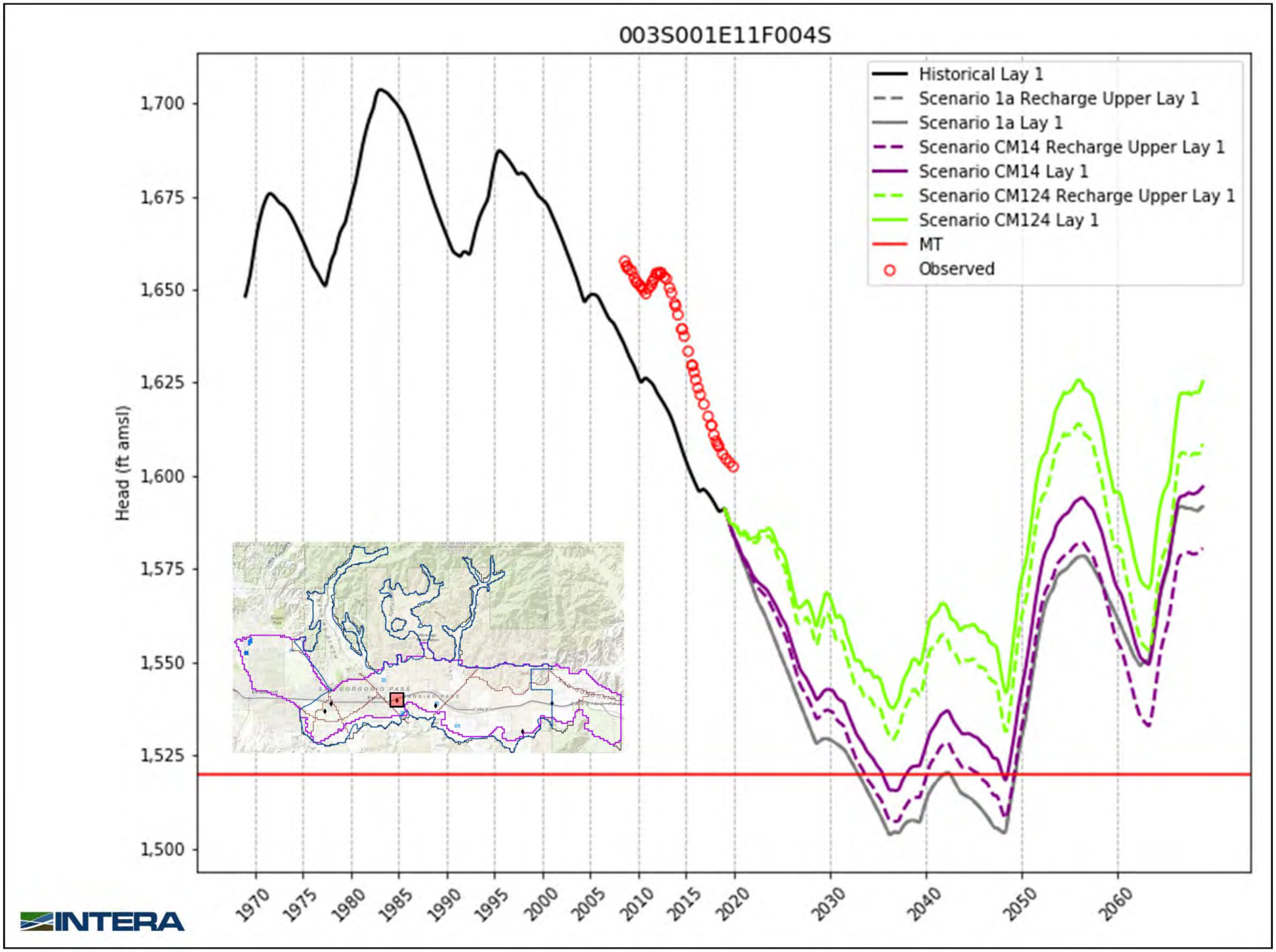


Figure A5c Hydrographs for 11F4 - Scenarios 1a, CM14, and CM124 (Recharge in Upper Model).

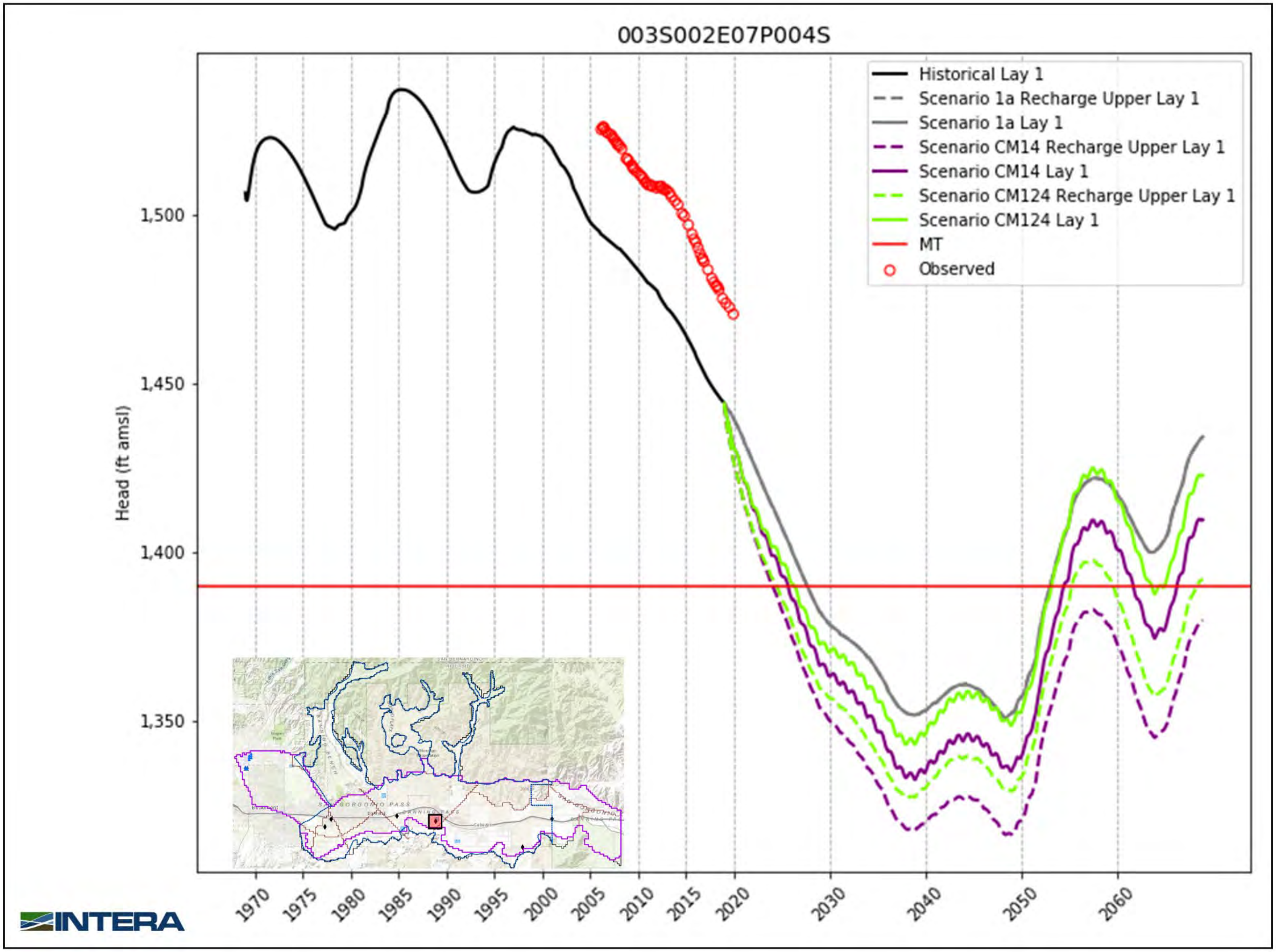


Figure A5d Hydrographs for 7P4 - Scenarios 1a, CM14, and CM124 (Recharge in Upper Model).

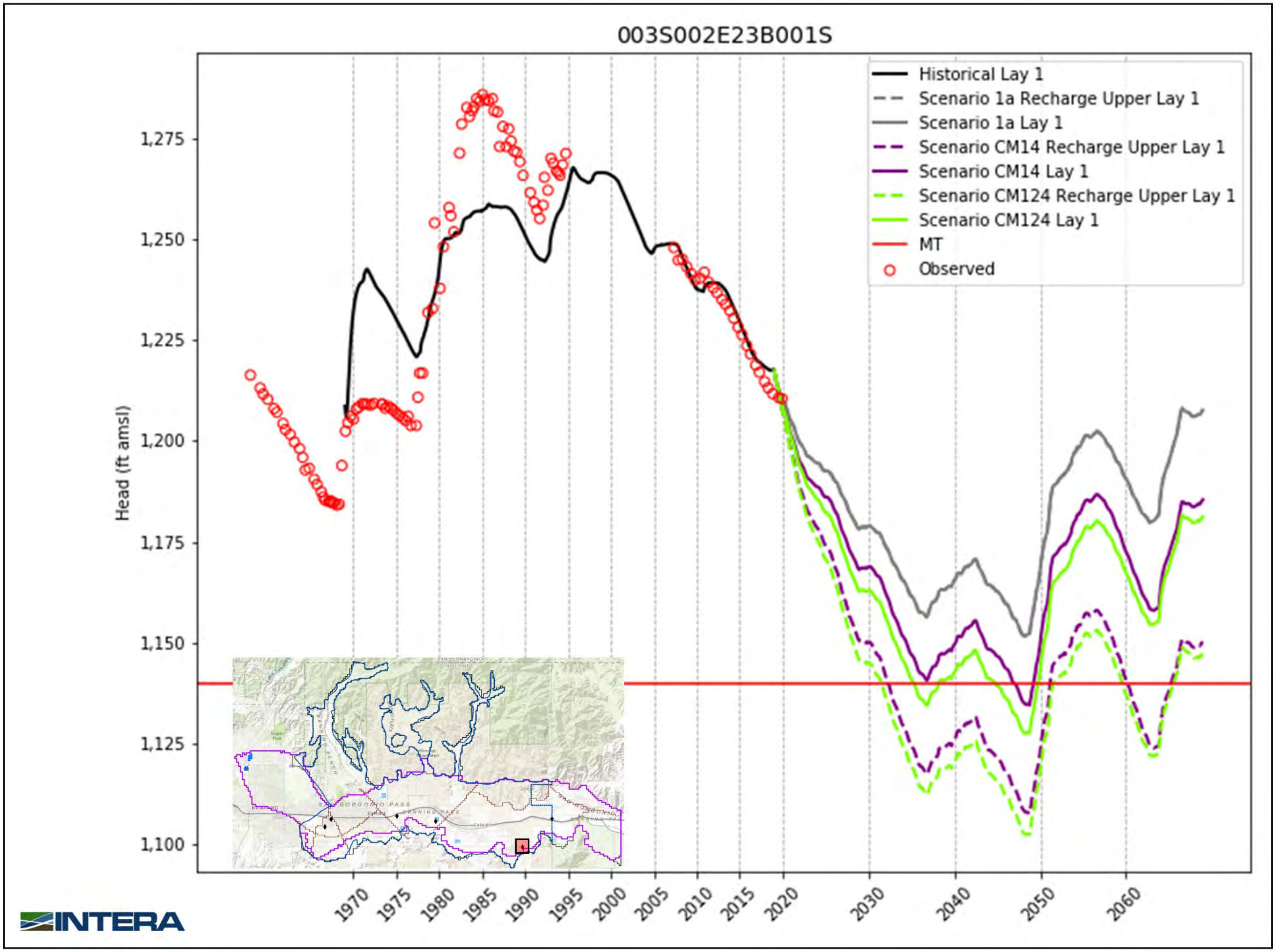


Figure A5e Hydrographs for 23B1 - Scenarios 1a, CM14, and CM124 (Recharge in Upper Model).

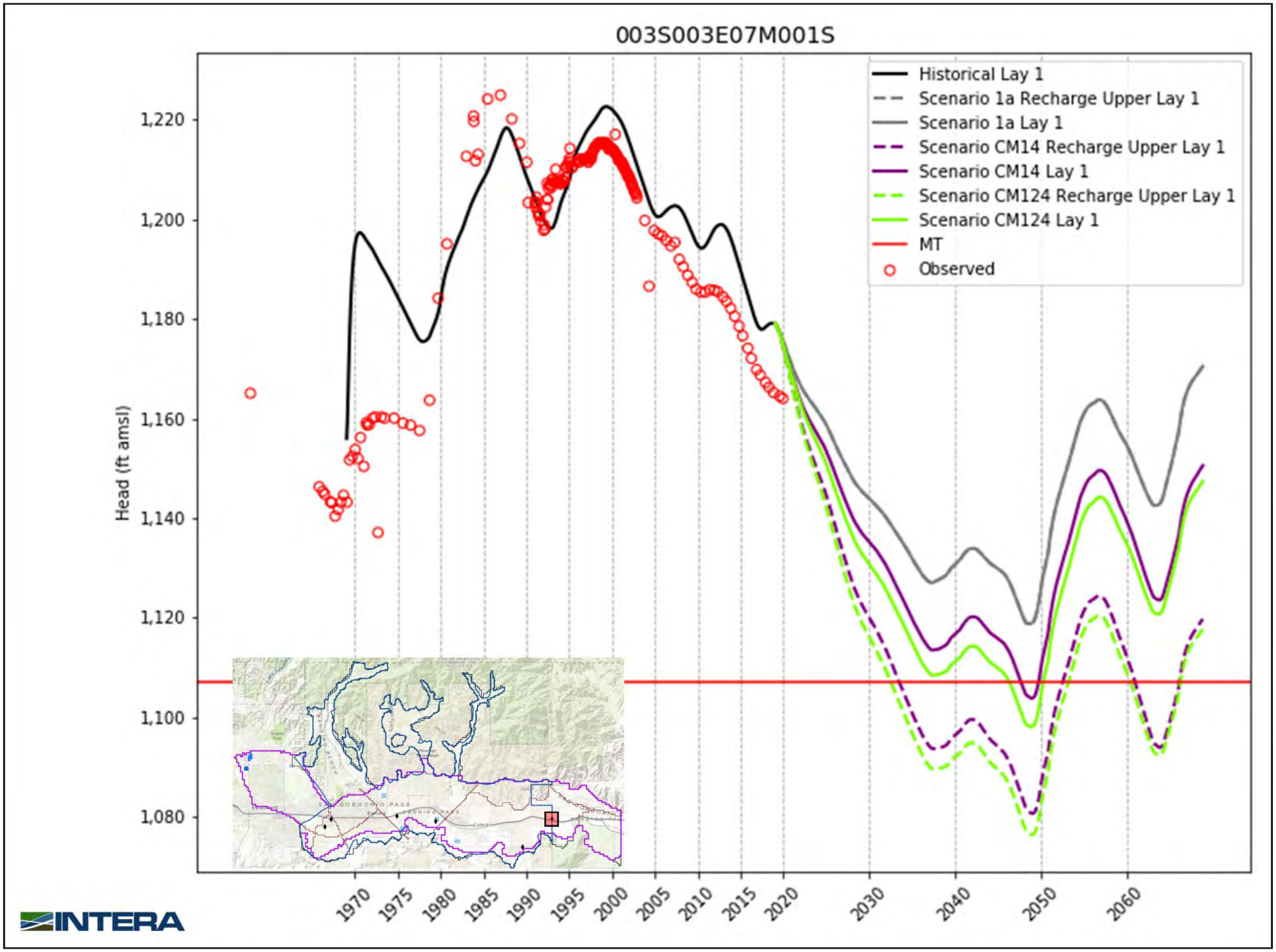


Figure A5f Hydrographs for 7M1 - Scenarios 1a, CM14, and CM124 (Recharge in Upper Model).

TABLES

Table A1 Comparison of Recharge Rates Applied to Model with Vertical Conductivity

	Noble Creek	Atwell Project	Location 1	Location 2	Location 3	Location 4	Total New Recharge Rate* (m/d)	Model Saturated Vertical Hydraulic Conductivity (m/d)
	Recharge Rate Applied to Model (m/d)							
No. Model Cells Applied	12	6	4	9	6	6		
Area Applied (acres)	0.54	0.27	0.18	0.41	0.27	0.27		
Scenario 1a	0.23	-	-	-	-	-	-	0.14
Scenario 2	0.20	0.06	-	-	-	-	0.06	
Scenario C2	0.20	0.06	-	0.07	-	-	0.13	
Scenario C3	0.20	0.06	-	-	0.11	-	0.17	
Scenario M1	0.20	0.06	0.17	-	-	-	0.23	
Scenario M3	0.20	0.06	-	-	0.11	0.06	0.17	
Scenario CM14	0.20	0.06	0.17	-	-	-	0.34	
Scenario CM124	0.20	0.06	0.17	0.03	-	0.11	0.32	

*Noble Creek is excluded from the Total New Recharge Rate term as it is an existing facility

Table A2 GSA Key Groundwater Budget Terms Comparison

	Average over 50-year Projected Period within GSA (AFY)						
	Recharge from Upper Model	Applied Recharge	Groundwater Pumping*	Flow to Indio Subbasin	Change in Storage	Flow to Indio Compared to Recharge in Lower Model	Change in Storage Compared to Recharge in Lower Model
	Recharge Applied in Lower Model						
Scenario 1a	21,637	8,202	-6,028	-18,984	-608	-	-
Scenario 1b	21,102	8,202	-13,712	-15,173	-5,010	-	-
Scenario 2	21,647	8,202	-6,032	-18,985	-554	-	-
Scenario C2	21,748	12,738	-10,442	-18,273	342	-	-
Scenario C3	21,717	12,738	-10,372	-18,708	-21	-	-
Scenario M1	21,806	12,949	-9,909	-18,792	627	-	-
Scenario M3	21,731	12,738	-9,844	-19,178	58	-	-
Scenario CM14	21,804	17,485	-14,214	-19,090	558	-	-
Scenario CM124	21,854	17,485	-14,261	-18,627	1,015	-	-
	Recharge Applied in Upper Model						
Scenario 1a	21,637	8,202	-6,028	-18,984	-608	-	-
Scenario 1b	21,102	8,202	-13,712	-15,173	-5,010	-	-
Scenario 2	22,341	8,202	-6,005	-18,979	-747	-6	-193
Scenario C2	25,247	12,738	-10,376	-17,742	-993	-531	-1,335
Scenario C3	25,535	12,738	-10,331	-18,135	-1,041	-573	-1,020
Scenario M1	25,261	12,949	-9,840	-18,186	-877	-606	-1,505
Scenario M3	25,549	12,738	-9,802	-18,606	-963	-572	-828
Scenario CM14	28,515	17,485	-14,142	-17,806	-1,543	-1,284	-2,101
Scenario CM124	28,329	17,485	-14,188	-17,439	-1,424	-1,188	-2,440

*Simulated pumping may not exactly match the model input due to the groundwater model adjusting the pumping rates for periods of lower water levels.

Table A3 Minimum Threshold Exceedance Summary

	Minimum Threshold Exceeded?						
	18A1 (COB #M11)	8M1 (MSWD #26)	11F4	7P4	23B1 (Jensen #2)	7M1 (MSWD #25)	Total
Scenario 1a	✓✓		✓✓	✓✓			3 / 3
Scenario 1b	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	6 / 6
Scenario 2	✓✓		✓✓	✓✓			3 / 3
Scenario C2	✓✓	✓		✓✓	✓	✓	2 / 5
Scenario C3	✓✓	✓	✓	✓	✓	✓	1 / 6
Scenario M1	✓✓			✓✓			2 / 2
Scenario M3	✓✓		✓				1 / 2
Scenario CM14	✓✓	✓		✓✓	✓	✓	2 / 5
Scenario CM124	✓✓	✓	✓	✓✓	✓✓	✓✓	4 / 6

✓: MT exceeded for simulation with recharge placed in Lower Model

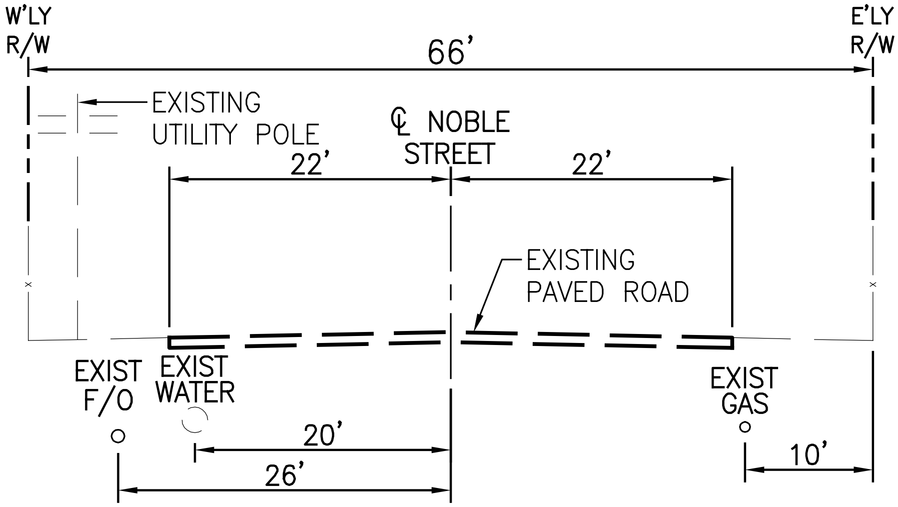
✓: MT exceeded for simulation with recharge placed in Upper Model

Table A4 Recharge Site Ranking Matrix

	Ranking (Recharge in Lower / Recharge in Upper)		
	Relative Flow to Indio	Impact on Water Levels / MT Exceedance	Cumulative
Location 1 (Robertson's Banning)	2 /2	4 / 4	4 / 4
Location 2 (Banning WWTP)	1 / 1	3 / 3	2 / 2
Location 3 (Robertson's Cabazon)	3 / 3	1 / 2	1 / 1
Location 4 (New Cabazon)	4 / 4	2 / 1	3 / 3

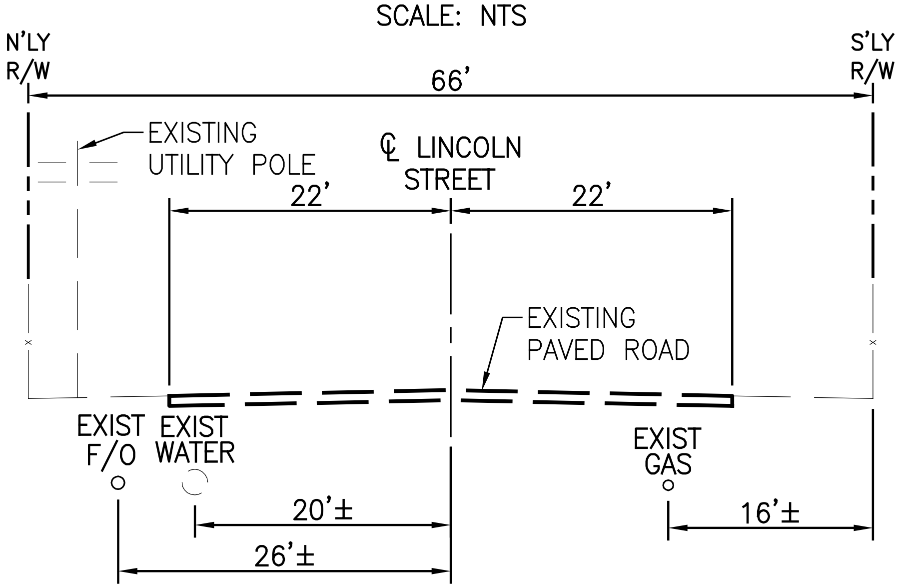
Appendix C

Backbone Pipeline Alignment Cross Section



SECTION 1-1: NOBLE ST (REACH 1)

SCALE: NTS



SECTION 2-2: LINCOLN ST (REACH 1)

SCALE: NTS

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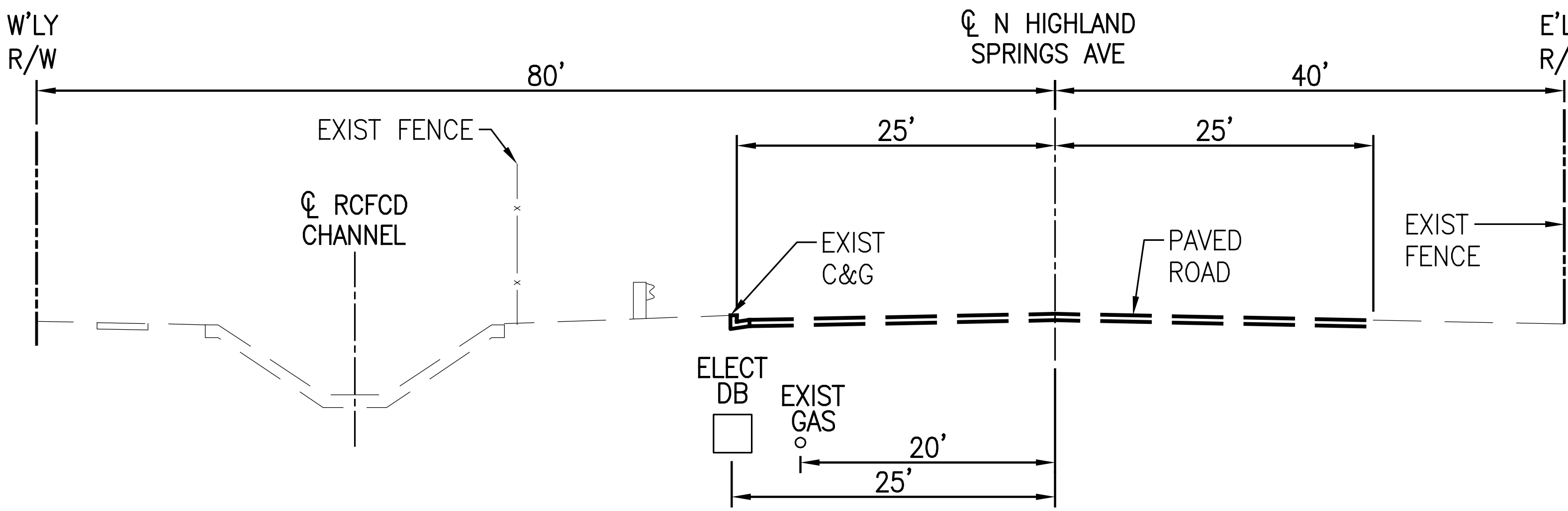
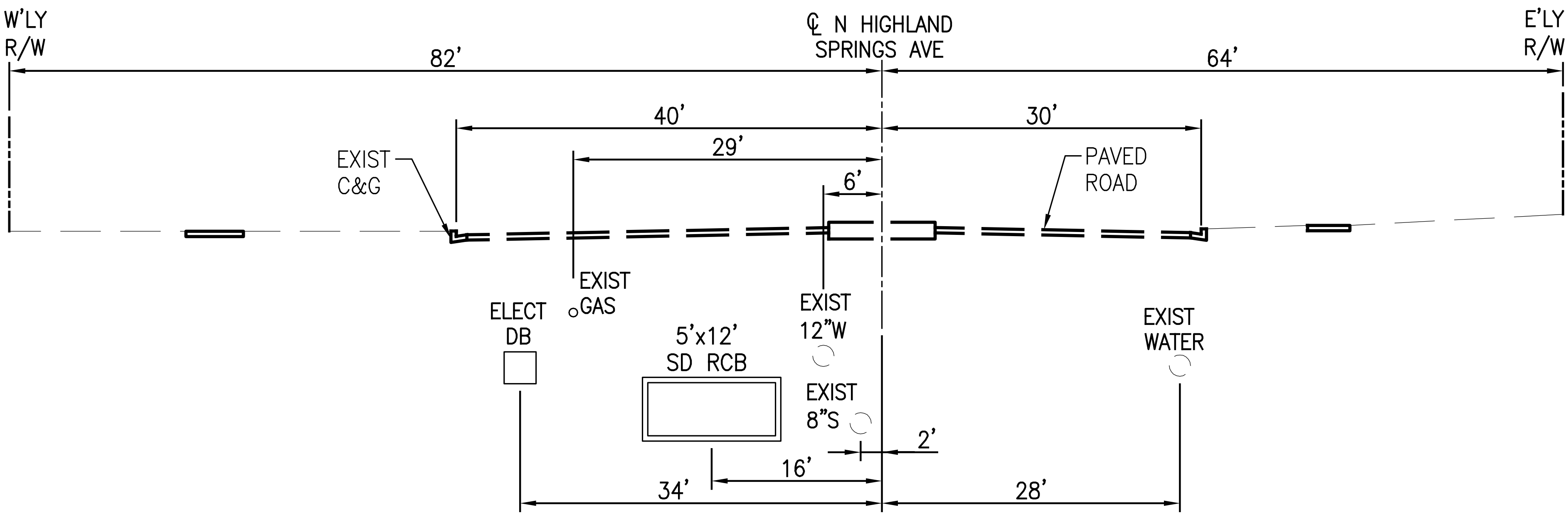
SCALE: 1" = 15'	LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

FIGURE C-2



SECTION 3-3 - HIGHLAND SPRINGS AVE (REACH 2)

SCALE: NTS



SECTION 4-4 - HIGHLAND SPRINGS AVE (REACH 2)

SCALE: NTS

SCALE: 1" = 15'	LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

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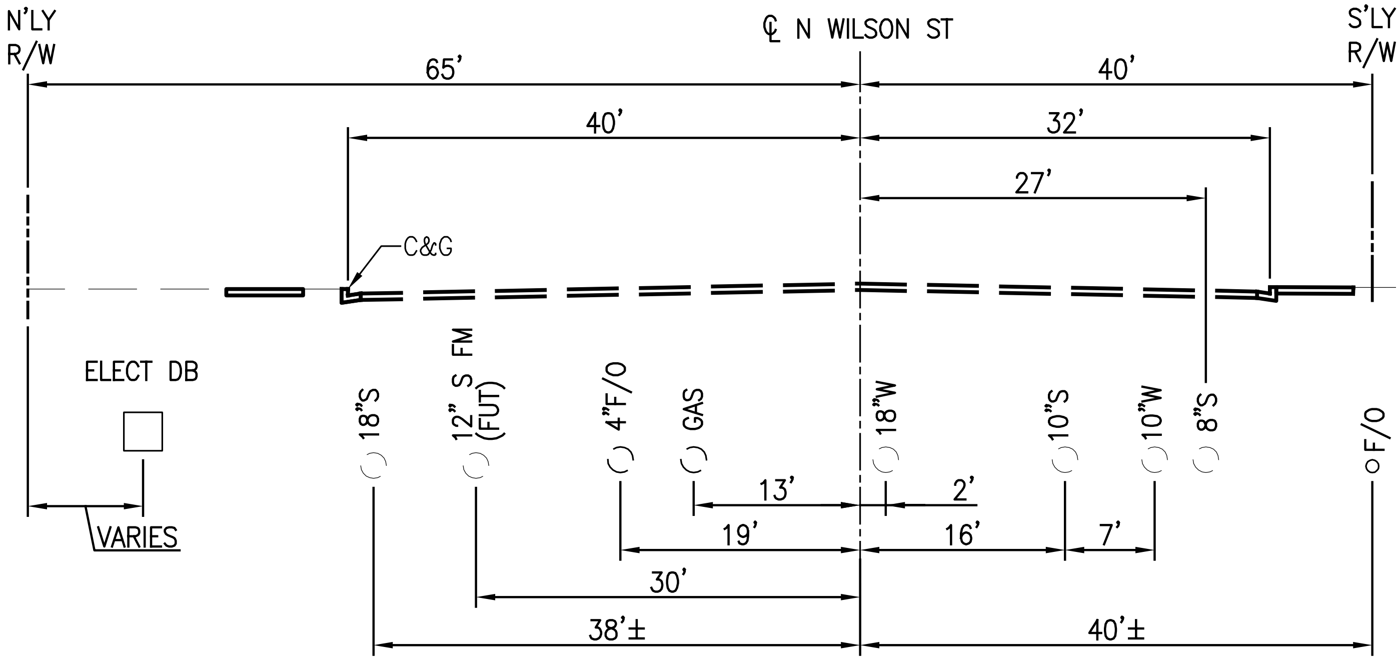
FIGURE C–3



SECTION 5-5 - WILSON ST (REACH 2)
SCALE: NTS

SCALE: 1" = 15'	LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

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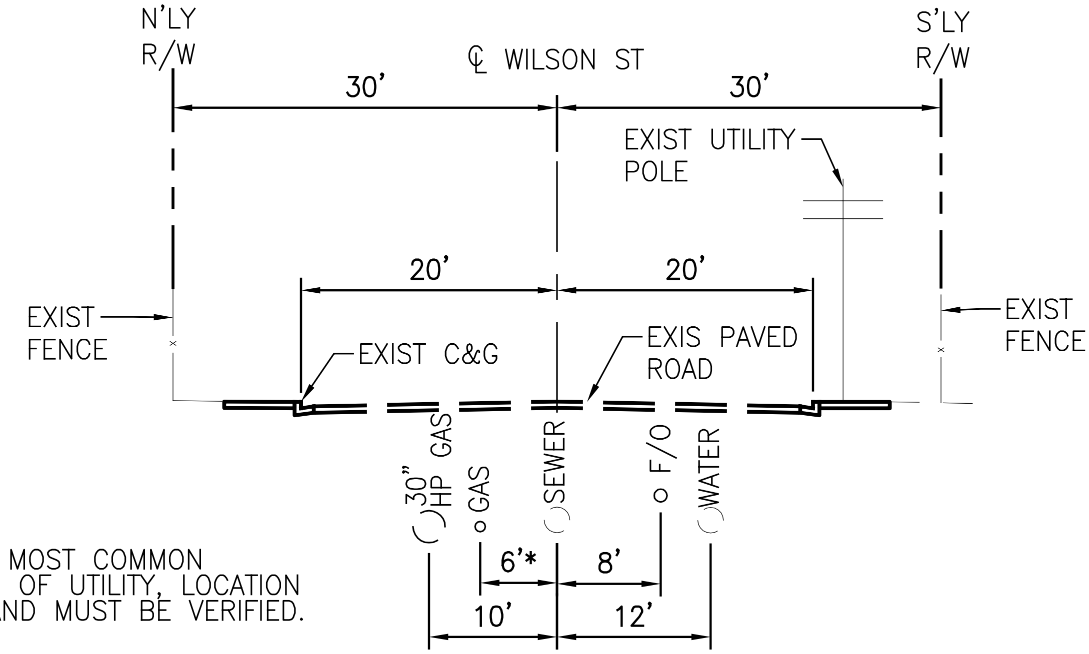
FIGURE C-4



*NOTE:
INDICATE MOST COMMON LOCATION OF UTILITY, LOCATION VARIES AND MUST BE VERIFIED.

SECTION 6-6 - WILSON ST (REACH 3)

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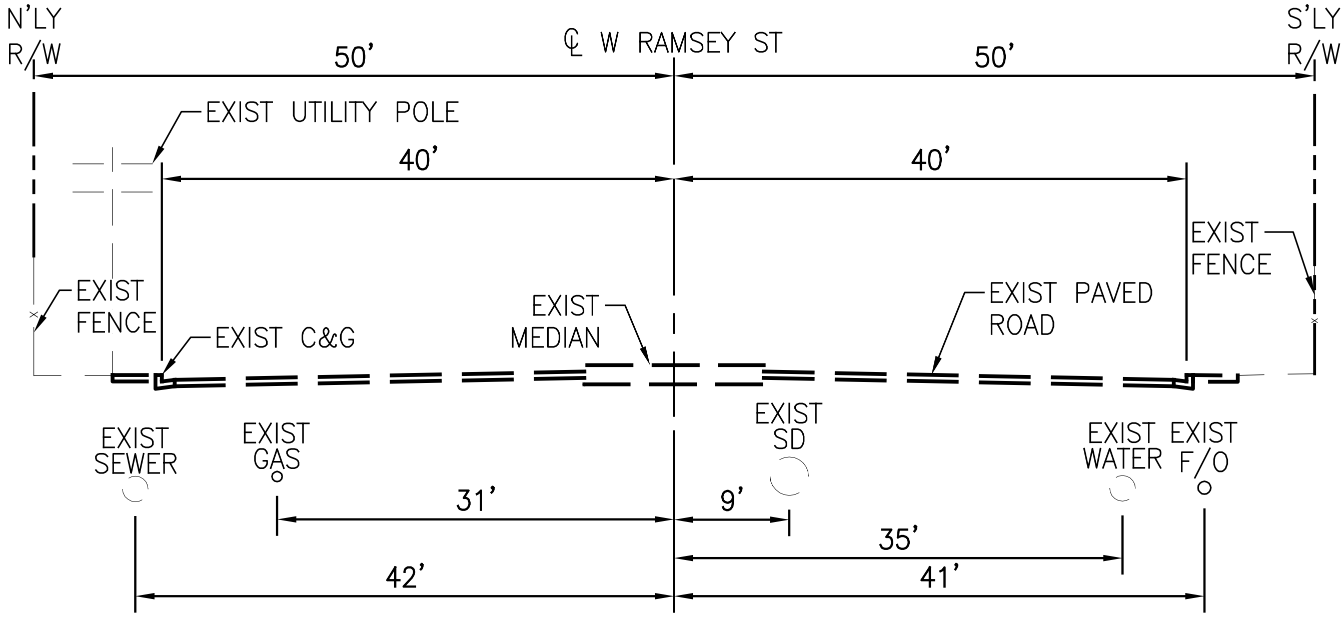
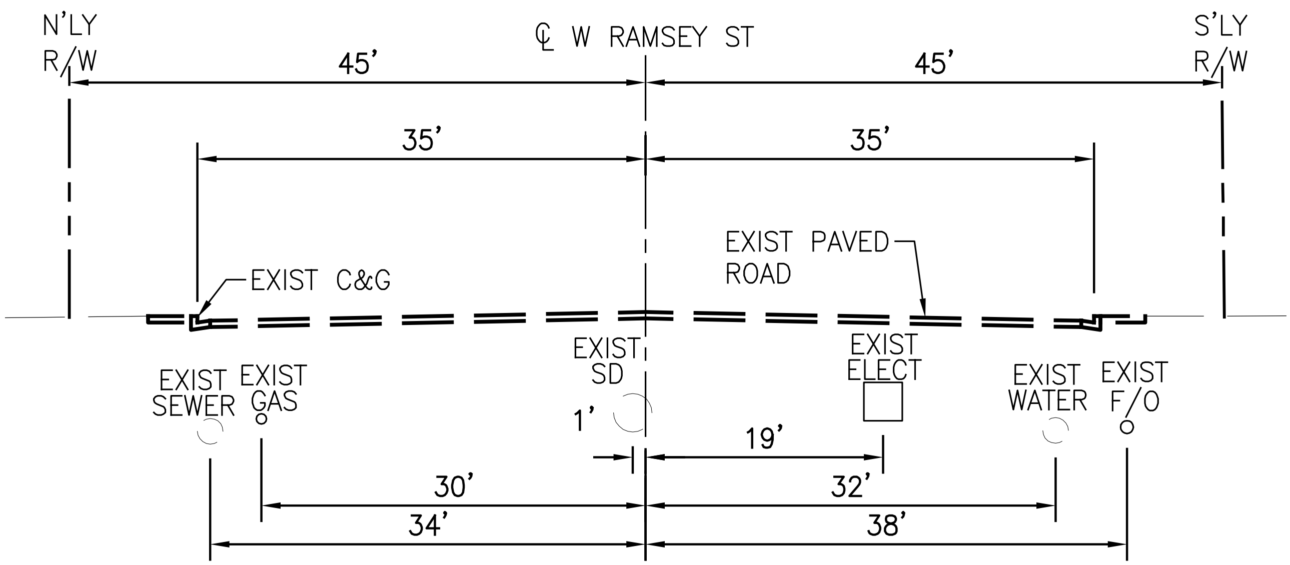
SCALE: 1" = 15'	LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

FIGURE C–5



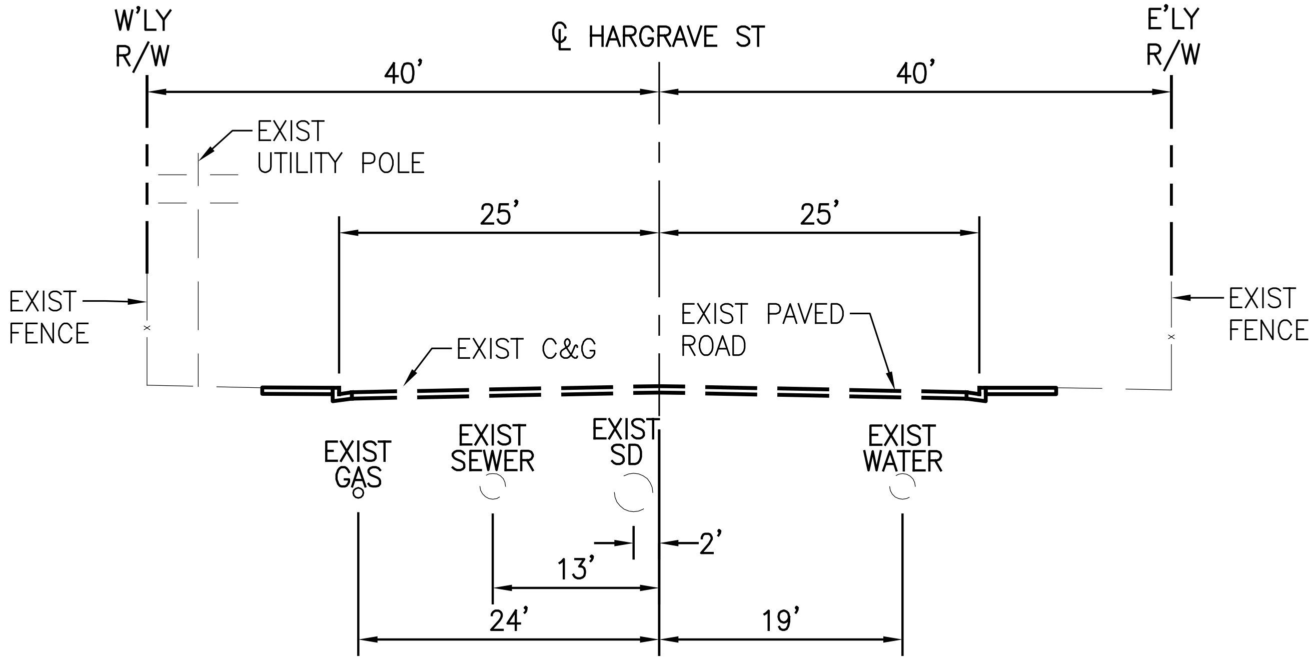
SECTION 7-7 - W. RAMSEY ST (REACH 2B)



SECTION 8-8 - W, RAMSEY ST (REACH 3B)

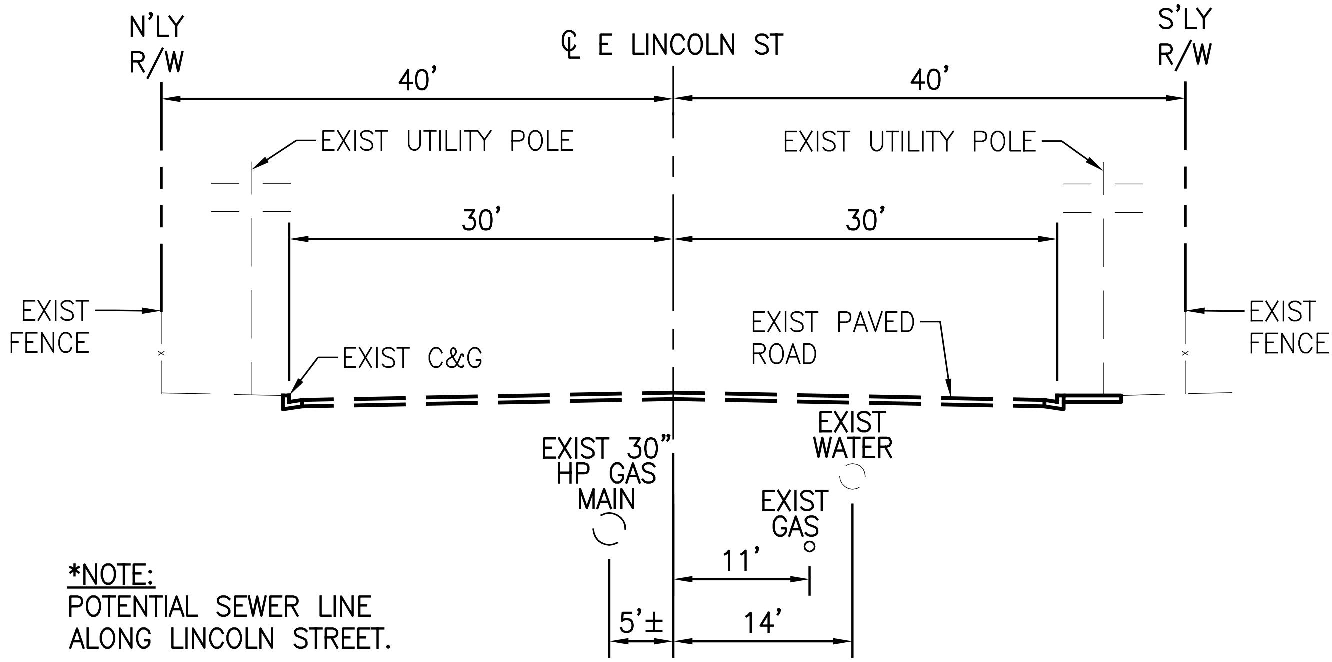
SCALE: 1" = 15' | LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

FIGURE C-6



SECTION 9-9 - HARGRAVE ST (REACH 3A)

SCALE: NTS



*NOTE:
POTENTIAL SEWER LINE ALONG LINCOLN STREET.

SECTION 10-10 E. LINCOLN ST. (REACH 4)

SCALE: NTS

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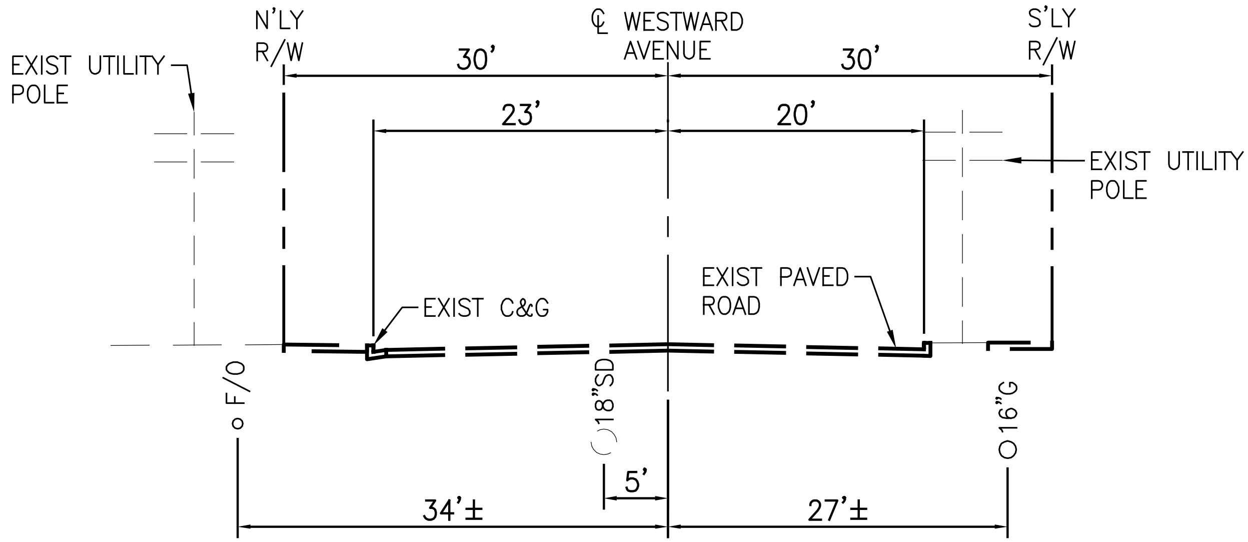
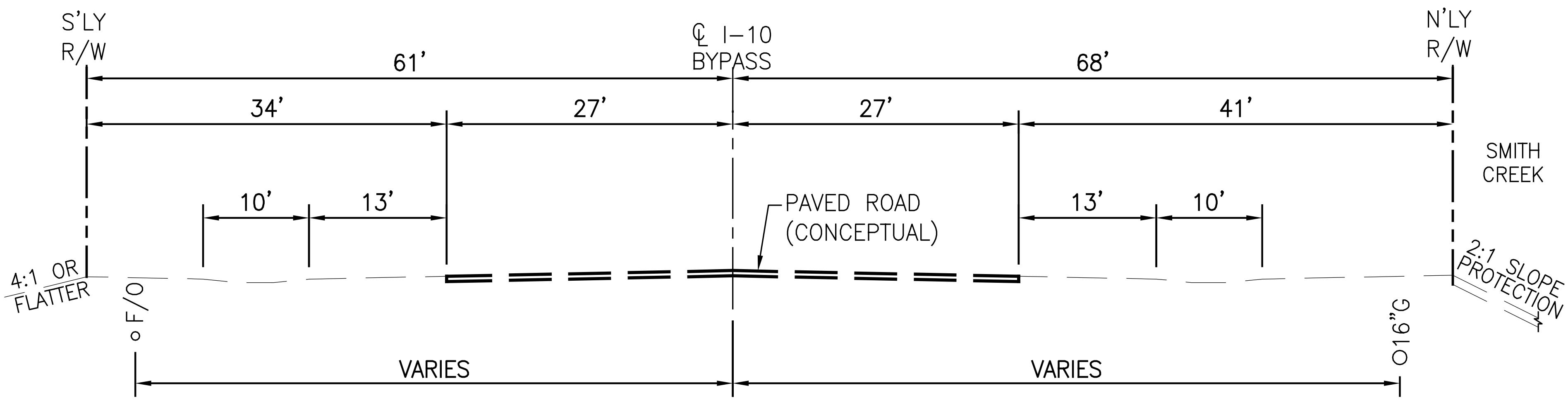
SCALE: 1" = 15'	LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

FIGURE C–7



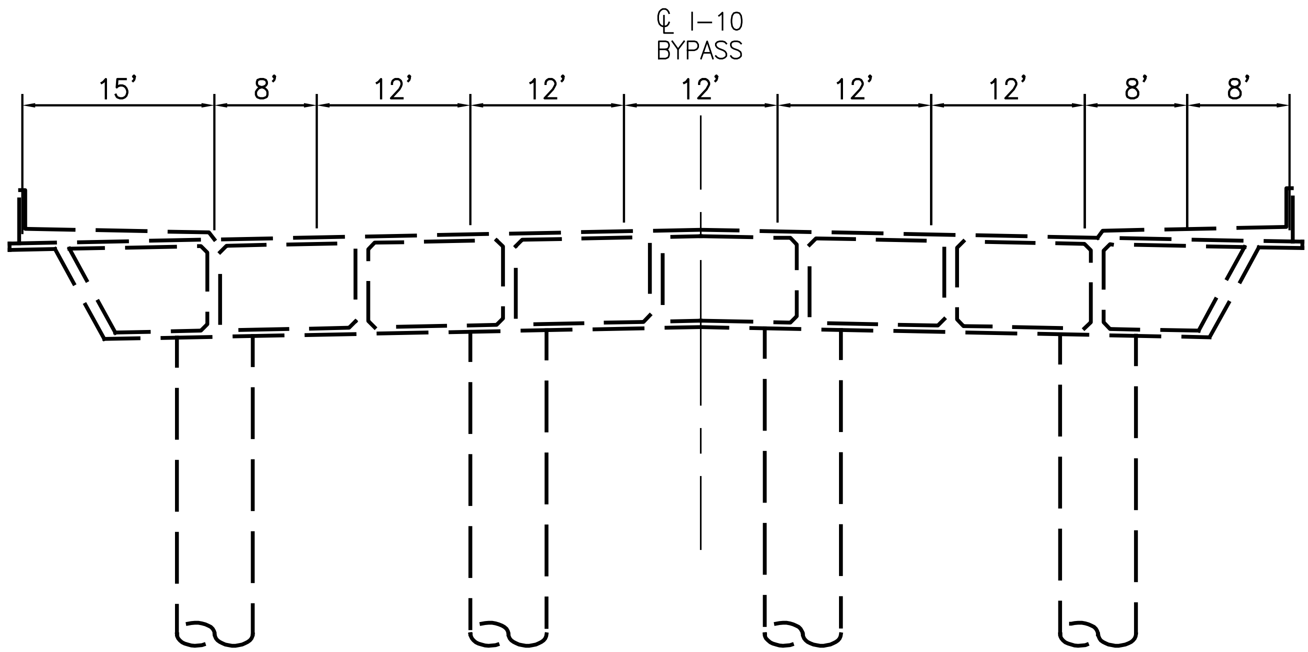
SECTION 11-11 - I-10 BYPASS ALONG WESTWARD ST (REACH 4)



SECTION 12-12 - I-10 BYPASS (REACH 4)

SCALE: 1" = 15'	LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

FIGURE C-8



SECTION 13-13 - I-10 BYPASS TYPICAL BRIDGE DECK (REACH 4)

SCALE: 1" = 15'

LOCATION: SAN GORGONIO PASS WATER AGENCY BACKBONE WATER SYSTEM

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Appendix D

Alternative Alignment through Beaumont Cherry Valley Service Area

Sinnaro Yos

From: Sinnaro Yos
Sent: Tuesday, September 05, 2023 9:44 AM
To: Emmett Campbell
Cc: Lance Eckhart; Siming Zhang
Subject: RE: SGPWA Backbone Facilities Feasibility Study - Final Draft Submittal
Attachments: Figure 1 Alt Align.pdf

Emmett: We reviewed the information provided by BCVWD in reference to Reach 1 of SGPWA's Backbone project. The information included record drawings, water and recycled water master plans, and facilities atlas maps. Per BCVWD's master plans, there are future planned facilities however the locations of these facilities are preliminary and final locations are uncertain. Regarding our review of existing facilities, there are some challenges (Noble St and Grand Ave intersection) of constructing the proposed Backbone Pipeline, though not impossible. Other routes may be considered such as along Dutton St or High St and can be evaluated in preliminary design. Additionally, in review of available assessor's parcel maps, another potential alignment (Figure 1) my be considered. The portion of Cherry Valley Blvd between Noble St and Bellflower Ave is considered public right of way however there may be improvements by private property owners within the public right of way. Further refinement of the proposed Backbone Pipeline can be fully reviewed and evaluated in preliminary design phase.

Thank you

Sinnaro Yos , PE
Senior Engineer
T (951)320-6033 | **C** (951)830-2943
E sinnaro.yos@webbassociates.com
3788 McCray St | Riverside, CA | 92506


FIGURE 1
ORCHARD ST
DUTTON ST
HIGH ST
CHERRY VALLEY BLVD
(RIGHT OF WAY)
CHERRY VALLEY BLVD
GRAND AVE
NOBLE ST
CHERRY AVE
JONATHAN AVE
WINESAP AVE
BELLFLOWER AVE
LINCOLN ST
BROOKSIDE AVE

Appendix E

Backbone Water System Environmental Constraints Overview

ALBERT A. WEBB ASSOCIATES

WO: 2022-0025

Technical Memorandum

To: Sinnaro Yos, PE, Project Manager
Sam I. Gershon, RCE, Principal-In-Charge

From: Autumn DeWoody, Senior Environmental Analyst
Marshall Paymard, Senior Biologist

Copy: Stephanie Standerfer, Vice President

Date: March 28, 2023

Subject: Backbone Water System Environmental Constraints Overview

1 Purpose

This technical memorandum is prepared pursuant to WEBB's proposal to San Gorgonio Pass Water Agency (the Agency) dated October 2021 to provide an overview summary of the environmental constraints that can inform the location and design of the Agency's proposed "Backbone Water System" ("Project").

2 Proposed Project

The proposed Project footprint for this overview is shown on **Figure 1** (all figures are located at the end of this document). The Project consists of the following conceptual components some of which are alternative alignments:

- A pipeline bypassing the Cherry Valley Pump Station (CVPS)
- Reach 1, 2, and 3 Pipelines
- Reach 2, Alternates A and B Pipelines
- Reach 3, Alternates A and B Pipelines
- Reach 4, Alternates A and B Pipelines
- Atwell Detention Basin
- Cabazon Recharge Basin Locations 1, 2, 3, and 4

The proposed Atwell Basin and Reach 2 Alternate A Pipeline are located fully within the Atwell development, which is in various phases of development including completed residences, areas under construction, and areas where development has not started and fenced off being used for cattle grazing during our site visit. Coordination with the City of Banning should commence to include the Project components that might intersect with the Atwell project. Project components that are in the Atwell project were not evaluated herein.

Furthermore, the Reach 4 Alternates A and B Pipelines are partially located within the I-10 Bypass Project being undertaken by Riverside County Transportation Department. [1] The segments that are not within the I-10 Bypass Project are shown on **Figure 2**. The Reach 4 Pipeline Alternates A and B were not accessible during our site visit. Project components that are in the I-10 Bypass Project were not evaluated herein.

3 Field Investigation

Senior Environmental Analyst Autumn DeWoody and Senior Biologist Marshall Paymard conducted a field investigation on February 16, 2023 between 8:00 a.m. and 11:00 a.m. The proposed pipeline alignments that are on public streets were surveyed. Alignments on future streets that are currently open fields were not surveyed because they are part of future development projects by others (i.e., Atwell Project and I-10 Bypass). The proposed recharge basin locations could not be accessed because they appeared to be on private property with razor wire fencing, electric gates, and posted “No Trespassing” signs. Property access will need to be secured in order for site surveys to be conducted.

4 Relevant Regulations/Plans

Banning Airport Influence Area

Part of the Project area is located within the Airport Influence Area of the Banning Municipal Airport (see enclosed **Figure 3**). The Riverside County Airport Land Use Commission (ALUC), consistent with the Federal Aviation Administration (Advisory Circular No. 150/5200-33B), requires new stormwater basins to be designed to provide for a maximum 48-hour detention period following the conclusion of the storm event for the design storm (may be less, but not more), and to remain totally dry between rainfalls. In addition, if the project includes landscaping within the Banning Airport Influence Area, then the selected plantings should not conflict with airport landscaping requirements.

Caltrans I-10 Bypass Project

The project components that are identified on Figure 1 as “24” Dia. SGPWA Pipeline Reach 4 Alternate A (Conceptual)” and “ 24” Dia. SGPWA Pipeline Reach 4 Alternate B (Conceptual)” are partially located within the future I-10 Bypass Project being undertaken by Riverside County Transportation Department. If any of the Agency’s

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[1] From https://rcprojects.org/i10bypass , *Figure 1.4-4 Alternative 12 Alignment Overview.*

Backbone Water Project falls within the footprint of the I-10 Bypass Project, the Agency's Project would be part of the analysis and permitting conducted for I-10 Bypass Road project. The segments of Reach 4 Alternates A and B pipelines that are outside of the I-10 Bypass Road project are shown on Figure 2 and we have considered the environmental constraints associated with those segments herein.

City & County Municipal Codes – Construction Noise

The noise ordinances related to construction from the City of Banning, City of Beaumont, and Riverside County are provided below. Construction noise is allowed between 7:00 am and 6:00 pm in the Cities of Banning and Beaumont, unless needed outside those hours in the case of urgent necessity for health and safety purposes. Construction noise from capital improvement projects by governmental agencies is exempted in unincorporated Riverside County.

City of Banning

Municipal Code Section 8.44.090 – Noises prohibited – Unnecessary noise standard.

E. Construction, landscape maintenance or repair.

1.It shall be unlawful for any person to engage in or permit the generation of noise *related to landscape maintenance, construction including erection, excavation, demolition, alteration or repair of any structure or improvement, at such sound levels, as measured at the property line of the nearest adjacent occupied property, as to be in excess of the sound levels permitted under this chapter, at other times than between the hours of* ***7:00 A.M. and 6:00 P.M.*** *The person engaged in such activity is hereby permitted to exceed sound levels otherwise set forth in this chapter for the duration of the activity during the above described hours for purposes of construction. However, nothing contained herein shall permit any person to cause sound levels to at any time exceed fifty-five dB(A) for intervals of more than fifteen minutes per hour as measured in the interior of the nearest occupied residence or school.*

2.Construction related noise *as defined in subsection (E)(1) immediately above, may take place outside the time period set forth in subsection (E)(1) and above the relative sound levels in case of urgent necessity in the interest of public health and safety, and then only with the prior permission of the building inspector. Such permit may be granted for a period not to exceed three days or until the emergency ends, whichever is less. The permit may be renewed for periods of three days while the emergency continues.*

Unless exempted by this chapter, if the building official should determine that the public health and safety will not be impaired by the construction related noise*, the building inspector may issue a permit for construction within the hours of 6:00 P.M. and 7:00 A.M., upon application being made at the time the permit for the work is awarded or during the progress of the work. The building official may place such conditions on the issuance of the permit as to him or her shall seem appropriate to maintain the public health and safety.*

City of Beaumont

Municipal Code section 9.02.110 (F) – Construction, Landscape, Maintenance, or Repair.

F. Construction, Landscape, Maintenance or Repair.

1.It shall be unlawful for any person to engage in or permit the generation of noise related to landscape maintenance, construction including erection, excavation, demolition, alteration or repair of any structure or improvement, at such sound levels, as measured at the property line of the nearest adjacent occupied property, as to be in excess of the sound levels permitted under this Chapter, at other times than between the hours of ***7:00 a.m. and 6:00 p.m.*** *The person engaged in such activity is hereby permitted to exceed sound levels otherwise set forth in this Chapter for the duration of the activity during the above described hours for purposes of construction. However, nothing contained herein shall permit any person to cause sound levels to at any time exceed 55 dB(A) for intervals of more than 15 minutes per hour as measured in the interior of the nearest occupied residence or school.*

2. ***Whenever a construction site is within one-quarter of a mile of an occupied residence or residences, no construction activities shall be undertaken between the hours of 6:00 p.m. and 6:00 a.m. during the months of June through September and between the hours of 6:00 p.m. and 7:00 a.m. during the months of October through May.*** *Exceptions to these standards shall be allowed only with the written consent of the building official.*

3.Construction related noise as defined in subsection (F)(1) and (2) above may take place outside the time period set forth therein and above the relative sound levels in case of urgent necessity in the interest of public health and safety, and then only with the prior permission of the building inspector. Such permit may be granted for a period not to exceed three days or until the emergency ends, whichever is less. The permit may be renewed for periods of three days while the emergency continues.

4.Unless exempted by this Chapter, if the building official should determine that the public health and safety will not be impaired by the construction related noise, the building inspector may issue a permit for construction within the hours of 6:00 p.m. and 7:00 a.m., upon application being made at the time the permit for the work is awarded or during the progress of the work. The building official may place such conditions on the issuance of the permit that are appropriate to maintain the public health and safety, as determined by the building official.

County of Riverside

Riverside County Code of Ordinances section 9.52.020-Exemptions

Sound emanating from the following sources is exempt from the provisions of this chapter:

A. Facilities owned or operated by or for a governmental agency;

B. Capital improvement projects of a governmental agency;

County of Riverside – Ordinance No. 655, Mt. Palomar Observatory Lighting Zone

The entire project is located within Zone B of the Mt. Palomar Observatory Lighting Zone boundary as identified by Riverside County Ordinance No. 655. Zone B is defined as the 45-mile radius from the observatory minus Zone A, which is the inner 15-mile radius. Therefore, if the Project includes any temporary or permanent outdoor lighting, then the local outdoor lighting policies should be implemented to minimize light pollution.

5 Environmental Constraints Assessment

Biological Resources

Any part of the Project footprint that is outside of paved or developed areas should be made clearly known to the project biologist as road rights-of-way do not always align with the location of road pavement. Depending on the alignment or locations of the Project components, future biological surveys may be required. Biological resource surveys typically not only include the areas where direct impacts are proposed, but also areas adjacent to the impact footprint. This is to assess for indirect impacts (e.g., noise, lighting, dust, water run-off, increased human presence, etc.) that may affect special-status species or species that are afforded special protections under the Federal and State Endangered Species Act, or local regional habitat conservation plans. As such, any opportunity to avoid unpaved areas or areas containing habitat for special-status species should be taken. If those areas cannot be avoided, then impacts to those areas should be minimized to maximum extent feasible to avoid costly mitigation and restoration costs associated with impacts to special-status species and their habitats.

General vegetation communities and land cover types located in the Project footprint, including a 100-feet survey buffer, were mapped utilizing aerial satellite imagery and field checked if access could be obtained. See **Figures 4a – 4n**. If access could not be obtained during WEBB's field visit, vegetation communities were estimated using aerial satellite imagery, soils type, topography, hydrology, and CNDDB species occurrence data (CNDDB 2023). The vegetation communities were generally delineated using Holland (1986) classifications. The following vegetation communities and land cover types were delineated in the Project footprint: non-native grassland (NNG), Riversidean alluvial fan sage scrub (RAFSS), disturbed habitat (DH), riparian (RIP), ornamental plantings (ORN), eucalyptus woodland (EUC), ornamental/developed (ORN/DEV), developed (DEV), and open water (OW) (see **Figures 3a-3o**).

Table 1 provided below lists the Project components and the special-status species that may be impacted, either directly, or indirectly, by Project component construction. Hence, the need for future detailed biological studies once specific locations and alignments are known.

If it is determined that special-status plants or animal species may be impacted by Project implementation, focused surveys and mitigation may be required. It should be noted that Table 1 is approximate and should not be used as a definitive guide for project compliance with the applicable federal, state, and local biological resource protection laws.

Table 1

Project Component[(a)]	Potential Special-Status Species Surveys
Pipeline bypassing CVPS	Burrowing owl
Reach 1 Pipeline	Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, rare plants
Reach 2 Pipeline	burrowing owl, Crotch bumble bee
Reach 3 Pipeline	burrowing owl, Crotch bumble bee
Reach 2 Alternate A Pipeline*	Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, rare plants
Reach 3 Alternate A Pipeline	burrowing owl, Crotch bumble bee
Reach 2 Alternate B Pipeline	none
Reach 3 Alternate B Pipeline	none
Reach 4 Alternates A and B Pipelines* (segments outside of I-10 Bypass Project)	coastal California gnatcatcher, Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, rare plants
Atwell Detention Basin*	Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, rare plants
Cabazon Recharge Basin (Location 1)*	coastal California gnatcatcher, Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, least Bell's vireo, rare plants
Cabazon Recharge Basin (Location 2)*	coastal California gnatcatcher, Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, rare plants
Cabazon Recharge Basin (Location 3)*	coastal California gnatcatcher, Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, least Bell's vireo, rare plants
Cabazon Recharge Basin (Location 4)*	coastal California gnatcatcher, Los Angeles Pocket Mouse, northwestern San Diego pocket mouse, Crotch bumble bee, least Bell's vireo, rare plants, Coachella Valley Milk-vetch USFWS Critical Habitat

Source: CNDDB. 2023. California Natural Diversity Data Base RareFind 5. https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx [accessed February 2023].
[(a)] I-10 Bypass Road component is omitted here since it will be analyzed by others.
* Project components marked with an asterisk (*) were not accessible during site visit.

Moreover, most Project components have suitable habitat for nesting birds. Therefore, constraints related to construction periods would apply to any of the components.

Examples of measures that should be taken to avoid take of nesting birds includes:

> If construction occurs during the general nesting season for passerines (i.e., February 1 through August 31), or raptors (i.e., January 15 through July 31) and where any mature tree, shrub, or structure capable of supporting bird nests within 300-feet (passerines), and 500-feet (raptors), of proposed project construction, a qualified biologist should perform a nesting bird survey. All surveys will be conducted within 72 hours prior to the start of construction. Surveys should be conducted on-foot with the aid of binoculars and all areas containing suitable nesting habitat should be surveyed utilizing passive survey strategies. If nesting birds are present or within 300-feet (passerines), or 500-feet (raptors), of the construction area, the project biologists should flag and demarcate nesting buffers of 300-feet for passerines and 500-feet for raptors.

Bats often roost under the dried palm fronds on a palm tree as well as the undersides of bridges. If pipelines are proposed to the underside of any bridge infrastructure, then mitigation may be required by CDFW for impacts to roosting bats, such as focused bat surveys and use of exclusionary devices to deter the presence of bats.

Drainage Features

Many drainages/streams bisect the proposed alignments and some of the basin locations (see **Figure 5**). There is a high likelihood that these drainages throughout the Project area would be considered jurisdictional resources pursuant to the California Department of Fish and Wildlife, Regional Water Quality Control Board and/or Army Corps of Engineers and require permits in order to impact such features. Care should be taken to have jurisdictional delineations conducted by qualified individuals once specific locations of facilities have been identified. To avoid costs and delays associated with regulatory permitting, the project should be designed to avoid all types of drainage features and associated riparian habitat, including concrete-lined ditches. If hydraulic directional drilling (HDD) is used to cross underneath a creek, then California Department of Fish and Wildlife (CDFW) should be noticed pursuant to Section 1600 et al of the Fish and Game Code and the contractor will need to prepare a Frac-Out Contingency Plan. If the crossing is within Riverside County Flood Control District rights-of-way, then they may require for their encroachment permit some form of documentation from the other agencies in addition to CDFW (i.e., U.S. Army Corps of Engineers and Regional Water Quality Control Board) saying whether or not permits are required.

Agricultural Resources

Under CEQA, projects have to be evaluated for having potential impacts to agricultural lands that may be protected by the State. Per CEQA, only Prime Farmland ("P"), Unique Farmland ("U"), and Farmland of Statewide Importance ("S") are considered significant under CEQA. As shown in **Figure 6**, there is one location in the Project Area with either a "U", "P", or "S" identifier:

- "U" Farmland adjacent to and south of Cherry Valley Blvd., which is associated with Project component Pipeline By-pass to CVPS;

Staging areas should be selected to avoid designated farmland properties.

Other CEQA issues related to agricultural lands is when lands are subject to Williamson Act Contracts which prevents any other use of the site other than agriculture. There are a few Williamson Act Contracted parcels in the Project area, as shown in **Figure 7,** which appears to be in the same area as the property identified as "U" Farmland.

Therefore, one Project component (i.e., Pipeline By-Pass of CVPS) is in an area where agricultural lands are supposed to be protected. The exact impacts and any mitigation would need to be evaluated at the time specific facilities are proposed and level of impacts can be quantified.

Cultural Resources

CEQA requires projects to be evaluated for any ground disturbing activities which can have the potential to impact cultural resources. Specifically, cultural resources are any of the following: historical resources such as buildings and irrigation features, archaeological resources such has pre-historic habitation sites and paleontological resources such as fossils. Because there is always a potential to find these resources when excavation, trenching, grading activities occur, a cultural resources investigation should be prepared for any Project component. The report should include an assessment of the likelihood of uncovering archaeological and paleontological resources, and if that likelihood warrants the need for monitoring by a Tribe, archaeologist, or paleontologist.

Because the Project may have a federal nexus, such as a grant funded by federal monies (e.g., State Revolving Fund) or requiring a federal permit (e.g., Section 408 or 404 permits) future cultural resources studies should include a Section 106 analysis consistent with the National Historic Preservation Act (NHPA).

In addition to studying the potential for cultural resources, such studies will also need to include consultation with local Native American Tribes. Local Tribes will have the opportunity to provide input and/or request future government-to-government consultation pursuant to AB52 which is triggered with CEQA reviews (excluding Notice of Exemptions and Addenda). If a Tribe requests Tribal monitoring, then it is typically paid for by the project applicant; therefore, given project proximity to a Tribe reservation, SGPWA should consider setting aside budget for tribal monitors at a rate of approximately $100 per hour per monitor per Tribe.

Erosion Control

The project, including staging areas, extends over more than one acre. Even if constructed in phases that are individually less than one acre, because they are part of a larger plan of development, each would trigger a Storm Water Pollution Prevention Plan (SWPPP) and permit coverage under the statewide Construction General Stormwater Permit (https://waterboards.ca.gov/water_issues/programs/stormwater/construction.html). Including space in the staging areas for erosion control materials (e.g., sand bags, fiber rolls, etc.) and planning for the placement of erosion control materials in areas known to flood will be beneficial to the project design.

Federal Public Works Facilities

If the project will modify, alter, or occupy any existing U.S. Army Corps of Engineers federal public works project, such as dams, basins, levees, channels, and any other local flood protection works constructed (or funded) by the USACE, then approval is needed through the USACE's Section 408 program. Riverside County Flood Control District can help identify any such facilities that are in the project footprint in concert with obtaining an encroachment permit from the District. The process of obtaining a 408 permit should start as soon as the project footprint is firmly established because it can take more than one year for the permit to be issued. There is no fee. Biological and cultural studies should be no more than 5 years old and address how federal laws and regulations apply to the project (e.g., "CEQA-Plus," federal Endangered Species Act, and National Historic Preservation Act). (https://www.spl.usace.army.mil/Missions/Section-408-Permits/). If a 408 permit is needed, then a 404 permit application must be submitted, too regardless of whether a Water of the U.S. will be impacted.

Flood Hazard Zones

The project intersects with areas that are identified as 100-Year and 500-Year flood hazard zones by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). Specifically, Cabazon Recharge Basin Locations 1, 3, and 4 are located within 100-Year flood hazard zones (see **Figure 8**). Specific project designs would need to take these flood hazard zones into consideration. Underground facilities may be allowed, however above ground facilities like the basins may need to be designed with special considerations.

Geotechnical Analysis

The Project is located in areas identified in the City and County General Plans that are susceptible to liquefaction and/or within or adjacent to fault zones; therefore, a site-specific geotechnical analysis should be performed by a qualified geotechnical engineer and the recommendations included in the design. As shown in **Figure 9**, the project does not bisect an Alquist-Priolo Fault Zone; however, the proposed CVPS bypass pipeline appears to cross the Beaumont Plain Fault Zone.

Hazardous Materials/Waste: EnviroStor Database

"EnviroStor" is the California Department of Toxic Substances Control's data management system for tracking its cleanup, permitting, enforcement, and investigation efforts at hazardous waste facilities and site with known contamination or sites where there may be reasons to investigate further (https://www.envirostor.dtsc.ca.gov/public/).

WEBB ran an EnviroStor search for the Project area on March 2, 2023. EnviroStor data shows there are three cases near the Project:

Table 2

ENVIROSTOR ID	PROJECT NAME	STATUS	PROJECT TYPE	ADDRESS	CITY
33650004	ATHLETIC FACILITIES	No Action Required	School Investigatio	Beaumont Avenue/Brookside Avenue	Beaumont
80000140	BANNING RIFLE RANGE	Inactive - Needs Evaluation	Military Evaluation	Sections 13 and 14 of Township South, Range 1 East,	Banning
60002152	TYCO ELECTRONICS CORPORATION	Certified O&M - Land Use Restrictions Only	Voluntary Cleanup	700 SOUTH HATHAWAY STREET	BANNING

The project components that might be affected by this include:

- Reach 1 pipeline;
- Cabazon Recharge Basin Location 2; and
- Reach 4 Alternates A and B pipelines.

Hazardous Materials/Waste: GeoTracker Database

"GeoTracker" is the California State Water Resource Control Board's data management system for sites that impact, or have the potential to impact, water quality with emphasis on groundwater. GeoTracker contains records for sites that require cleanup, such as Leaking Underground Storage Tank (LUST) Sites, Department of Defense Sites, and Cleanup Program Sites. GeoTracker also contains records for various unregulated projects as well as permitted facilities including, Irrigated Lands, Oil and Gas production, operating Permitted USTs, and Land Disposal Sites. The following list from GeoTracker are facilities along the proposed project alignments and basin locations (search conducted March 6, 2023):

Table 3

SITE NAME	GLOBAL ID	SITE_TYPE	STATUS	ADDRESS	CITY	LATITUDE	LONGITUDE
ARCO #5463	T0606500368	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	1696 SIXTH ST	BEAUMONT	33.92979495	-116.9474784
ARCO STATION #1953	T0606500720	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	813 E RAMSEY STREET	BANNING	33.9256025	-116.8676249
AZ MINIMART & GAS	T0606592921	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	813 E RAMSEY ST	BANNING	33.92563466	-116.8674367
BEAUMONT-CHERRY VALLEY WA	T0606599138	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	11083 CHERRY AVE	BEAUMONT	33.96033887	-116.9653679
BUD'S LAWNMOWER	T0606500722	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	355 EAST RAMSEY STREET	BANNING	33.92571557	-116.8731907
CAL D FUEL	T0606500724	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	5861 W 5TH STREET	BANNING	33.928972	-116.9374934
CAL TRANS BANNING YARD	T0606500715	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	2033 EAST RAMSEY STREET	BANNING	33.92800502	-116.8539063
CHEVRON STATION #9-0255	T0606500732	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	3251 WEST RAMSEY STREET	BANNING	33.92603767	-116.9120643
CITY OF BANNING	T0606500725	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	161 WEST RAMSEY STREET	BANNING	33.92550024	-116.8780256
FORMER USA GAS	T0606537906	LUST CLEANUP SITE	OPEN - INACTIVE	1979 W RAMSEY STREET	BANNING	33.92576972	-116.8985015
G & M OIL CO INC #20	T0606500733	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	827 RAMSEY STREET W	BANNING	33.92567031	-116.8856836
G & M OIL STATION #25	T0606500735	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	3230 RAMSEY STREET W	BANNING	33.92555696	-116.9122083
MATICH CORPORATION	T0606500721	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	1990 NORTH HARGRAVE STREET	BANNING	33.94281482	-116.8655032
MOBIL #18-HNY	T0606500734	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	2192 W RAMSEY ST	BANNING	33.92516898	-116.9006758
MOBIL STATION #18-HNY	T0606500723	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	2192 WEST RAMSEY STREET	BANNING	33.92529646	-116.9006183
PHIL MESSRAH	T0606500190	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	38766 CHERRY VALLEY BLVD	CHERRY VALLEY	33.96868832	-116.9810166
RAMANA ENTERPRISES	T0606500728	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	775 EAST RAMSEY STREET	BANNING	33.92567015	-116.8681403
ROBERTSON'S READY MIX	T0606500904	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	13990 APACHE TRAIL	CABAZON	33.91960104	-116.8082872
SHELL BANNING	T0606599284	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	780 E E RAMSEY ST	BANNING	33.9250819	-116.8682118
SHELL STATION	T0606500717	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	780 E RAMSEY STREET	BANNING	33.92490249	-116.8683047
SOUTHLAND #19299	T0606500726	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	2217 RAMSEY STREET	BANNING	33.925998	-116.901125
SUNSET CHEVROLET	T0606500718	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	4545 RAMSEY STREET	BANNING	33.9256799	-116.9117093
TEXACO MIKE'S	T0606500730	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	1601 WEST RAMSEY STREET	BANNING	33.92565204	-116.8948137
TEXACO NINO'S	T0606500624	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	10501 BEAUMONT AVE	CHERRY VALLEY	33.96917708	-116.977614
UNOCAL STATION 4118	T0606500727	LUST CLEANUP SITE	COMPLETED - CASE CLOSED	437 WEST RAMSEY STREET	BANNING	33.92558251	-116.8814968

Although a site can be listed on GeoTracker with a status of "Completed-Case Closed," there can still exist a potential for impacts in soil, soil vapor, and groundwater below the SWRCB Low Threat Closure Policy[2] to remain onsite. Therefore, an environmental firm should be consulted to look into each case to determine if any additional assessments need to be performed prior to or during construction activities (e.g., trenching through former tank areas, dispensers, islands, etc.)

The Project components that might be affected by this include:

- Pipeline by-pass to CVPS;
- Reach 2 Alternate B pipeline;
- Reach 3 Alternate B pipeline;
- Reach 4 Alternates A and B pipelines;
- Cabazon Recharge Basin Location 1; and
- Cabazon Recharge Basin Location 3.

Sensitive Receptors and Traffic Control

In addition to lying adjacent to homes, the pipeline alignment crosses in front of school entrances (e.g., "Pipeline Bypass of CVPS" and Beaumont High School and "Reach 3 Pipeline" and Hoffer Elementary), hospital entrances (e.g., "Reach 2 Pipeline"/"Reach 2 Alternate B" and San Gorgonio Memorial Hospital), and churches (e.g., along Wilson Street and Ramsey Street). The Project will therefore pose temporary traffic and noise issues for these sensitive land uses.

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[2] SWRCB Low-Threat UST Case Closure Policy (effective August 17, 2012) at https://www.waterboards.ca.gov/ust/lt_cls_plcy.html#policy081712.

Hoffer Street along the entrance of Hoffer Elementary School ("Reach 3 Pipeline") in particular offers very limited space for construction and would make accessing the school entrance challenging during student drop off and pick up times in our opinion. We suggest looking into an alignment of Reach 3 Pipeline that avoids the area in front of Hoffer Elementary.

A traffic control plan (TCP) will be required for each jurisdiction (i.e., Riverside County, City of Banning, City of Beaumont) and should take into consideration sensitive land uses such as schools, churches, and hospitals so that access is maintained within the allowable construction hours. Any weekend work should take into consideration church schedules and allow ongoing access.

6 Specific Constraint Observations

Atwell Project, City of Banning

All of Reach 2 Alternative A pipeline is located within the Atwell development project located in the City of Banning at the northeast corner of Highland Springs Avenue and Wilson Street (Figure 1). The entire Atwell property is fenced in and partially under construction and could not be accessed during our site investigation. It would be advantageous to coordinate the location of the proposed Reach 2 Alternative A pipeline with the City of Banning as early on as possible. Coordination with the City should include discussing how the proposed Atwell Basin that is currently planned for stormwater detention purposes per the Banning Master Drainage Plan can be changed to dual-purpose as flood control/recharge basin.

Danny Thomas Ranch

A substantial unnamed drainage feature bisects the area identified as the future Danny Thomas Ranch property on Cherry Valley Blvd. in unincorporated Riverside County; therefore, we strongly recommend the design of the north/south segment of the "Pipeline Bypass of the CVPS" to be located within the existing dirt roads to the maximum extent possible. If the drainage feature cannot be avoided, then regulatory permits and mitigation would be required in order to cross the property outside of the existing dirt road along the east side of the parcel (Figure 1).

Proposed Recharge Basins

The proposed basin locations could not be reached during the field investigation because they are on private property that was fenced off.

For the purpose of ensuring safe recharge at Cabazon Recharge Basin Locations 1 and 3, first we recommend obtaining from Robertson's Ready Mix information on the activities and chemicals used within and around their excavation pits. This could be done by an environmental firm as part of a Phase 1 Environmental Site Assessment. Second, based on the information from Robertson's, to then confirm with the California

Regional Water Quality Control Board – Colorado River Basin (Region 7) who is the regulatory authority on surface and ground water quality whether there are regulations on reusing former gravel pits for groundwater recharge, such as sampling or reporting before or after recharge starts. Likewise, if Cabazon Basin Location 2 adjacent to the Banning Wastewater Treatment Plant will reuse former wastewater treatment ponds as recharge basins, then confirming the approach with Region 7 is recommended.

Cabazon Basin Location 1 and Location 3 (i.e., Robertson's Ready Mix mines) could not be accessed during the field investigation; however, according to recent aerial imagery (August 29, 2022), there appears to be wetland habitat growing where water pools in the older pits. Therefore, a jurisdictional delineation should be conducted to determine whether they are potentially jurisdictional under Sections 404/401 of the Clean Water Act and Section 1600 of the State Fish and Game Code. The delineation should include all of the pipeline alignments, basins, and staging areas.

Aerial imagery of Cabazon Basin Location 3 from Sept. 18, 2019 to August 29, 2022 shows a pool of water present in all images; therefore, a hydrogeologist should evaluate the infiltration ability of this basin and whether this pool indicates an aquitard.

The proposed location of Cabazon Basin Location 4 is especially challenging since it spans an undisturbed section of Smith Creek. Smith Creek is known to have occupied Los Angeles Pocket Mouse (LAPM) habitat, California Species of Special Concern. Also, part of the Cabazon Basin Location 4 intersects with designated US Fish and Wildlife Service Critical Habitat for the endangered Coachella Valley milk-vetch. Regulatory permitting to excavate and modify the creek would be very difficult if these resources are found in the Basin footprint and mitigation may be so expensive as to make it infeasible. We strongly recommend considering a different location to avoid Smith Creek.

If the pipeline alignments of Reach 3 Alternate A / Reach 4 Alternates A and B cross under the I-10 freeway (e.g., at Hargrave Street), then an encroachment permit from Caltrans will be required. Our experience with similar projects suggests Caltrans does not prefer open trench to occur under a freeway overpass (Figure 1).

If the pipeline alignment of Reach 3 Alternate A / Reach 4 Alternates A and B cross under the Union Pacific Railroad (UPRR), then a permit from the UPRR is required. Our experience with similar projects suggests a permit fee of approx. $90,000 and a lengthy process with the railroad to obtain an encroachment permit (Figure 1).

7 Summary

Our findings and recommendations are summarized by Project reach/component, below and should be considered preliminary for planning purposes only and do not include the results of a cultural resources investigation nor detailed biological surveys.

Refer to Table 1 for potential species surveys by reach and Tables 2 and 3 for sites listed on hazardous facilities databases.

- **Pipeline By-Pass of CVPS:** At the Danny Thomas Ranch property, it is recommended for the future pipeline from Cherry Valley Blvd. to the EBX pipeline to stay within an existing road alignment to avoid the on-site drainage feature. Because Cherry Valley Blvd. abuts agricultural lands and has soft (dirt) shoulders, biological surveys should be done (Table 1 and Figure 3)) as well as avoidance of designated Farmland of Unique importance and parcels under Williamson Act Contracts (Figures 5 and 6). Cherry Valley Blvd. crosses several drainage features that the Project should avoid by staying within the limits of pavement and using jack-and-bore methods. It also bisects a 100-Year Flood Hazard Zone related to Noble Creek that is identified by a FEMA FIRM map (Figure 7). The Project should consult with Riverside County Flood Control District on whether any of the drainage features are Army Corps of Engineers Civil Works Projects and require a 408 permit. Lastly, the proposed pipeline will cross in front of Beaumont High School on Cherry Valley Blvd. and coordination with the school district may be required for the traffic control plan. Cherry Valley Blvd. bisects the Beaumont Plan Fault Zone and the Cherry Valley Fault is in the general area of where the proposed pipeline would connect to the EBX pipeline; therefore, a geotechnical engineer should be consulted to account for these features (Figure 8).

- **Reach 1 Pipeline:** This pipeline reach crosses at least two low flow drainage crossings that should be avoided by staying within pavement area and tunneling underneath the drainage feature.

- **Atwell Basin and Reach 2 Alternate A Pipeline**: Because these are within the Atwell development project, we were unable to access them during the site visit and development impacts to the area is analyzed by others. However, the Project may consider coordinating with the City on making the Atwell basin a dual-purpose feature where it is currently slated to be a stormwater detention basin for the Banning Master Drainage Plan.

- **Reach 2 Pipeline:** Many churches and medical facilities including a hospital (at corner of Highland Springs Ave and Wilson Street) exist along Wilson Street. Special construction considerations may be needed in the traffic control plan and/or work hours upon consultation with the City of Banning. The portion of Reach 2 that is along Wilson Street crosses several 100-Year and 500-Year FEMA flood hazard zones (Figure 7).

- **Reach 3 Pipeline:** Many churches and medical facilities including a hospital (at the corner of Highland Springs Ave and Wilson Street) exist along Wilson Street. Special construction considerations may be needed in the traffic control plan and/or work hours upon consultation with the City of Banning related to these land uses. In addition, the Reach 3 pipeline will pass in front of Hoffer Elementary School on Hoffer Street, which has limited space to work around construction equipment; therefore, we recommend looking into an alternative alignment that avoids the entrance to the school on Hoffer Street. The portion of Reach 3 that is along Wilson Street crosses several 100-Year and 500-Year FEMA flood hazard zones (Figure 7). In addition, part of Reach 3 is south of but adjacent to an Alquist-Priolo Fault Zone (Figure 8).

- **Cabazon Recharge Basin Location 1 (Robertson's Ready Mix Plant on Hathaway Street):** The plant is closed to the public and could not be accessed during our site visit. Biological surveys and jurisdictional delineations should be performed in the area proposed for recharge and regulatory permits may be required due to presence of riparian habitat. In addition, since we could not locate regulations for former gravel pits being used for groundwater recharge, consultation with the local Regional Water Board is recommended. We expect they will want to know what processing occurs/has occurred by the owner in the recharge area and whether recharging there will introduce contaminants to groundwater.

- **Reach 2 Alternate B & Reach 3 Alternate B Pipelines:** According to GeoTracker, there are many former UST locations along Ramsey Street; therefore, an environmental firm should be consulted to evaluate whether any contamination remains and what actions should be done prior to and/or during construction to reduce risk to workers and the environment.

- **Reach 3 Alternate A Pipeline:** No recommendations.

- **Reach 4 Alternates A and B Pipelines:** Crossing the I-10 freeway and UPRR railroad lines will require lengthy encroachment permitting with CalTrans, and UPRR, respectively. Because portions of these alignments are within the I-10 ByPass Road project being undertaken by Riverside County Transportation Department, the Project should coordinate with them to include the proposed pipeline. The segments that are not within the RCTC I-10 Bypass Road project will need to be analyzed for environmental impacts separately. Reach 4 Alternate B in particular would cross Smith Creek at least once in a natural area with sensitive species habitat present. Regulatory permitting would be required to cross the creek as well as species surveys and coordination with wildlife agencies should species be found onsite.

- **Cabazon Recharge Basin Location 2 (Banning WWTP):** Since we could not locate regulations for reusing former WWTP ponds for groundwater recharge, consultation with the local Regional Water Board is recommended. We expect they will want to know what occurred in the recharge area and whether recharging there will introduce contaminants to groundwater. Furthermore, because of its proximity to the airport, the Federal Aviation Administration's rules for drawdown times and landscaping to minimize presence of birds may apply to the recharge basin. Biological surveys area required in this area since Smith Creek is suitable for Los Angeles Pocket Mouse.

- **Cabazon Recharge Basin Location 3 (Robertson's Ready Mix on Apache Trail):** The plant is closed to the public and could not be accessed during our site visit. Biological surveys and jurisdictional delineations should be performed in the area proposed for recharge and regulatory permits may be required due to presence of riparian habitat. In addition, since we could not locate regulations for former gravel pits being used for groundwater recharge, consultation with the local Regional Water Board is recommended. We expect they will want to know what processing occurs/has occurred by the owner in the recharge area and whether recharging there will introduce contaminants to groundwater. Notably, aerial imagery shows a constant year-round pool of water in one of the gravel pits; therefore, a hydrogeologist should be consulted to confirm suitability of the site for recharge. Part of the facility is located within a 100-Year FEMA flood hazard zone (Figure 7).

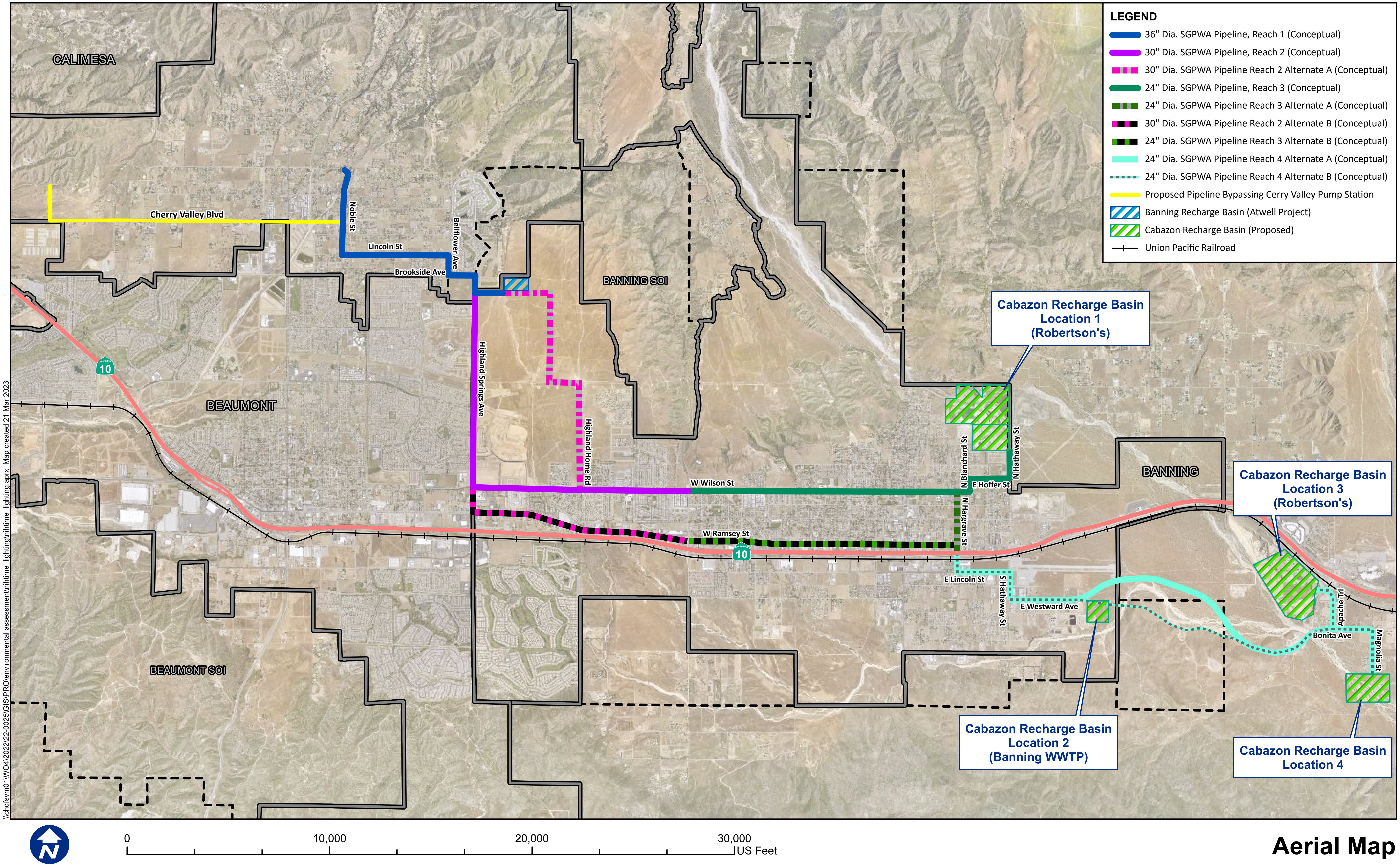
- **Cabazon Recharge Basin Location 4:** This proposed basin is partially within federally designated Critical Habitat for the endangered Coachella Valley milk-vetch plant, and the basin would be fully within the banks of Smith Creek, which is a jurisdictional water feature and home to special-status plant and animal species including Los Angeles Pocket Mouse and Riversidean Alluvial Fan Sage Scrub. The time and expense to obtain regulatory permit approvals and suitable mitigation may be too costly to be feasible. We recommend finding an alternate location.

Enclosures:

Figures 1-9

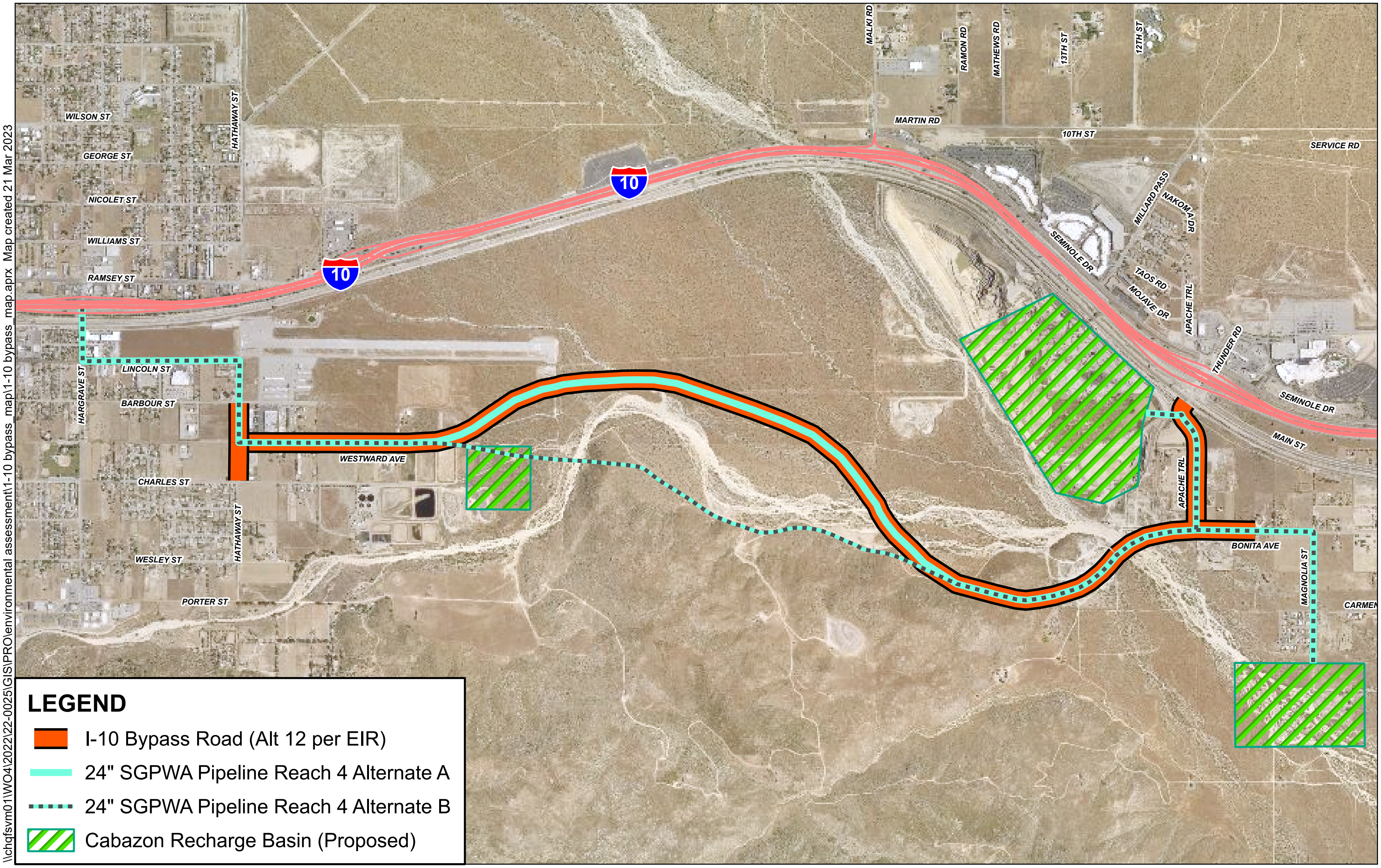
Enclosures

Figure 1



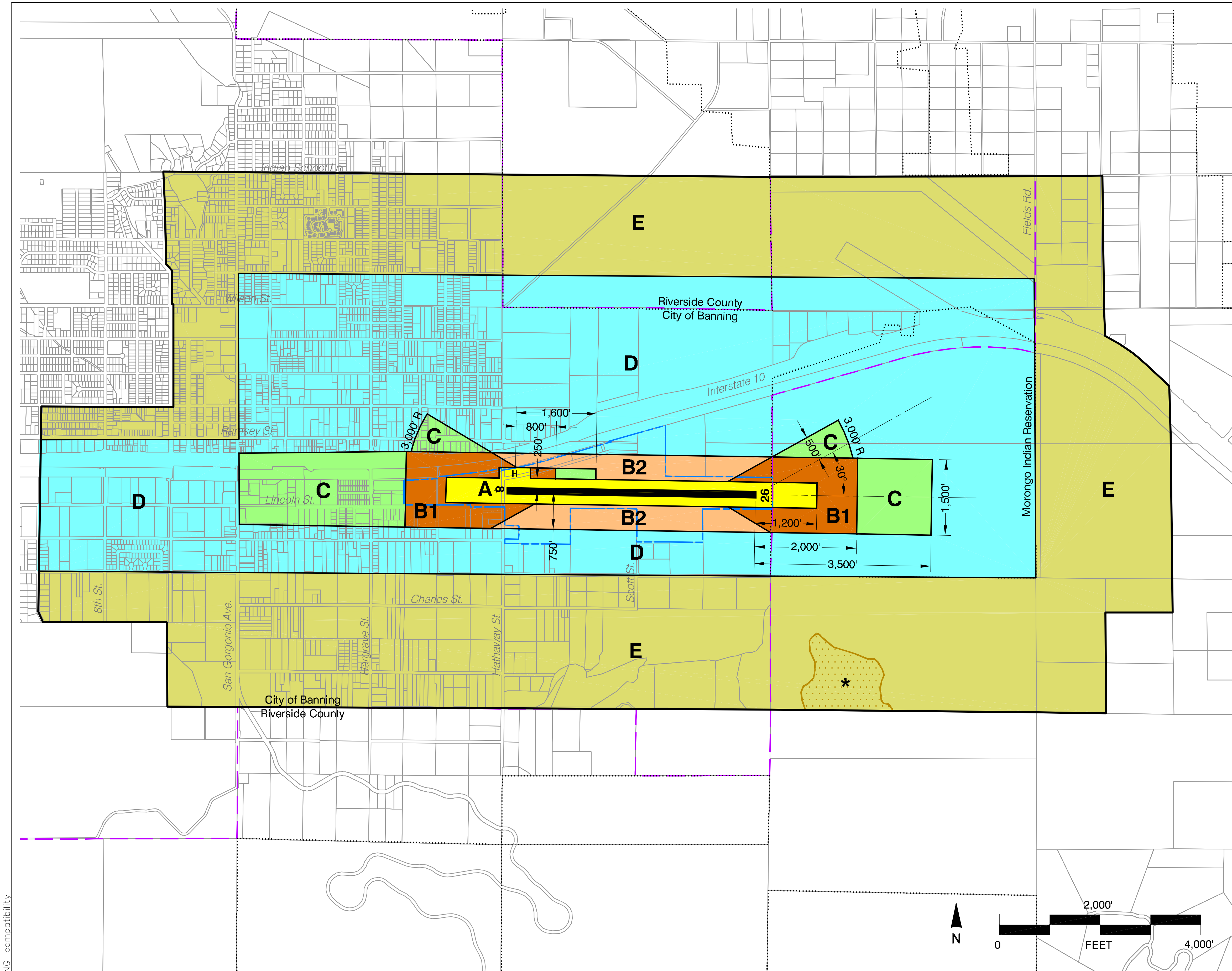
Aerial Map

Figure 2



I-10 Bypass Road Area

0 2,000 4,000 6,000 Feet



Legend

Compatibility Zones

- Airport Influence Area Boundary
- Zone A
- Zone B1
- Zone B2
- Zone C
- Zone D
- Zone E
- Height Review Overlay Zone

Boundary Lines

- Airport Property Line
- City Limits
- Morongo Indian Reservation

Note

Dimensions measured from runway ends and centerlines.

See Chapter 2, Table 2A for compatibility criteria associated with this map.

Riverside County
Airport Land Use Commission

Riverside County
Airport Land Use Compatibility Plan
Policy Document

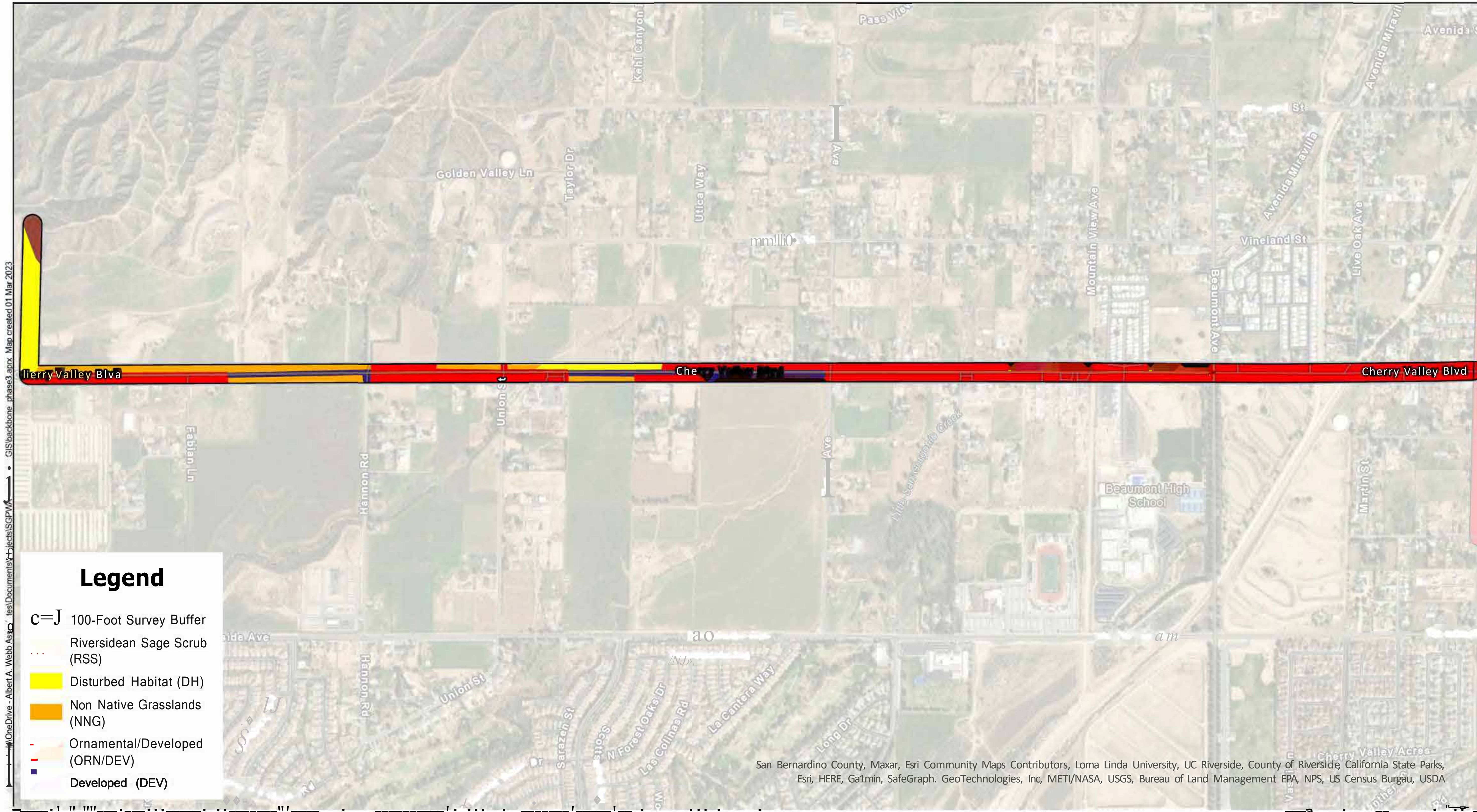
(Adopted October 2004)

Map BN-1

Compatibility Map

Banning Municipal Airport

Figure 4a



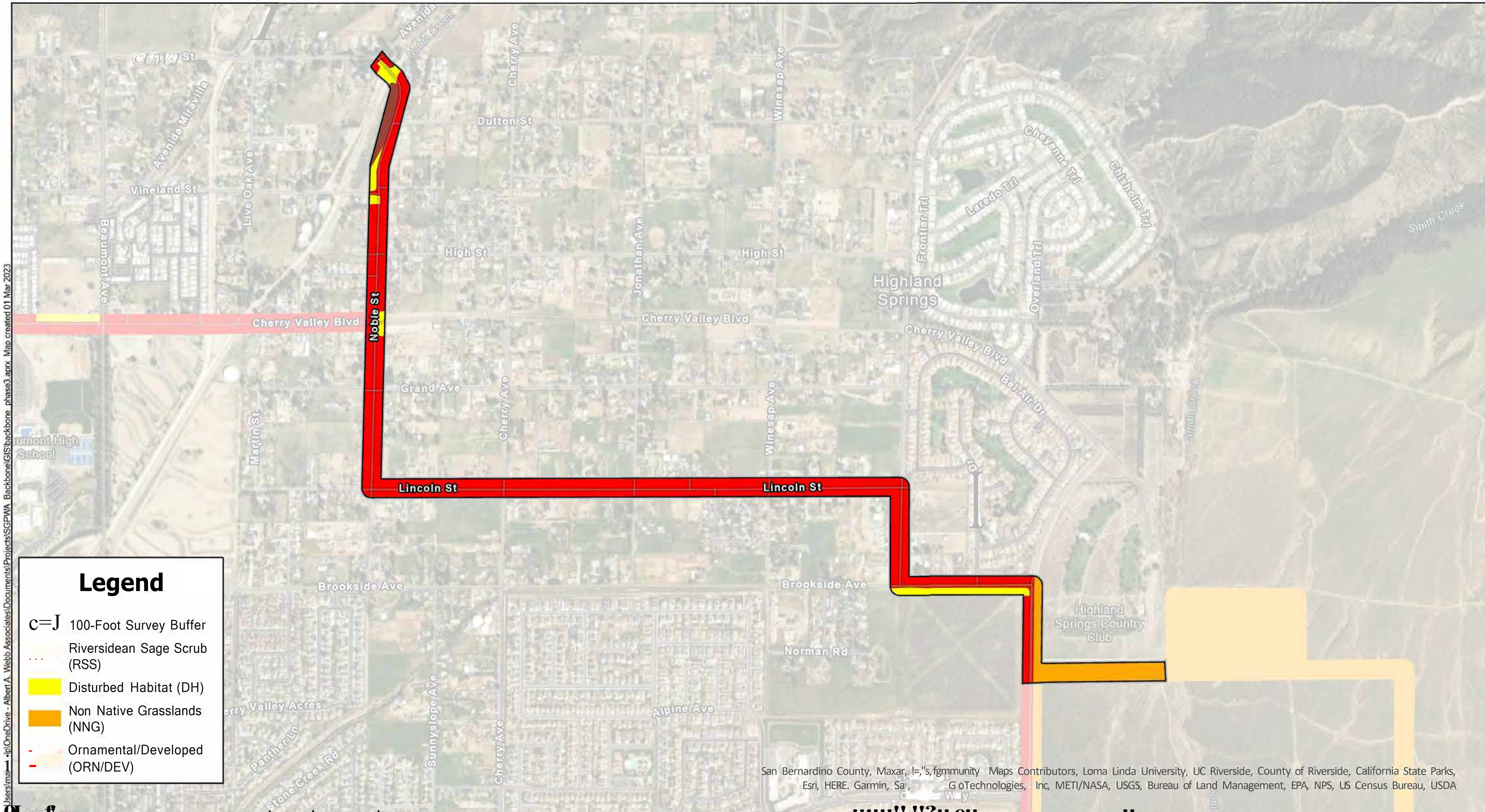
Source: Riverside County 2016

0 1,500 3,000 6,000 Feet

Proposed Pipeline Bypassing Cherry Valley Pump Station

Preliminary Vegetation and Land Cover Types

Figure 4b



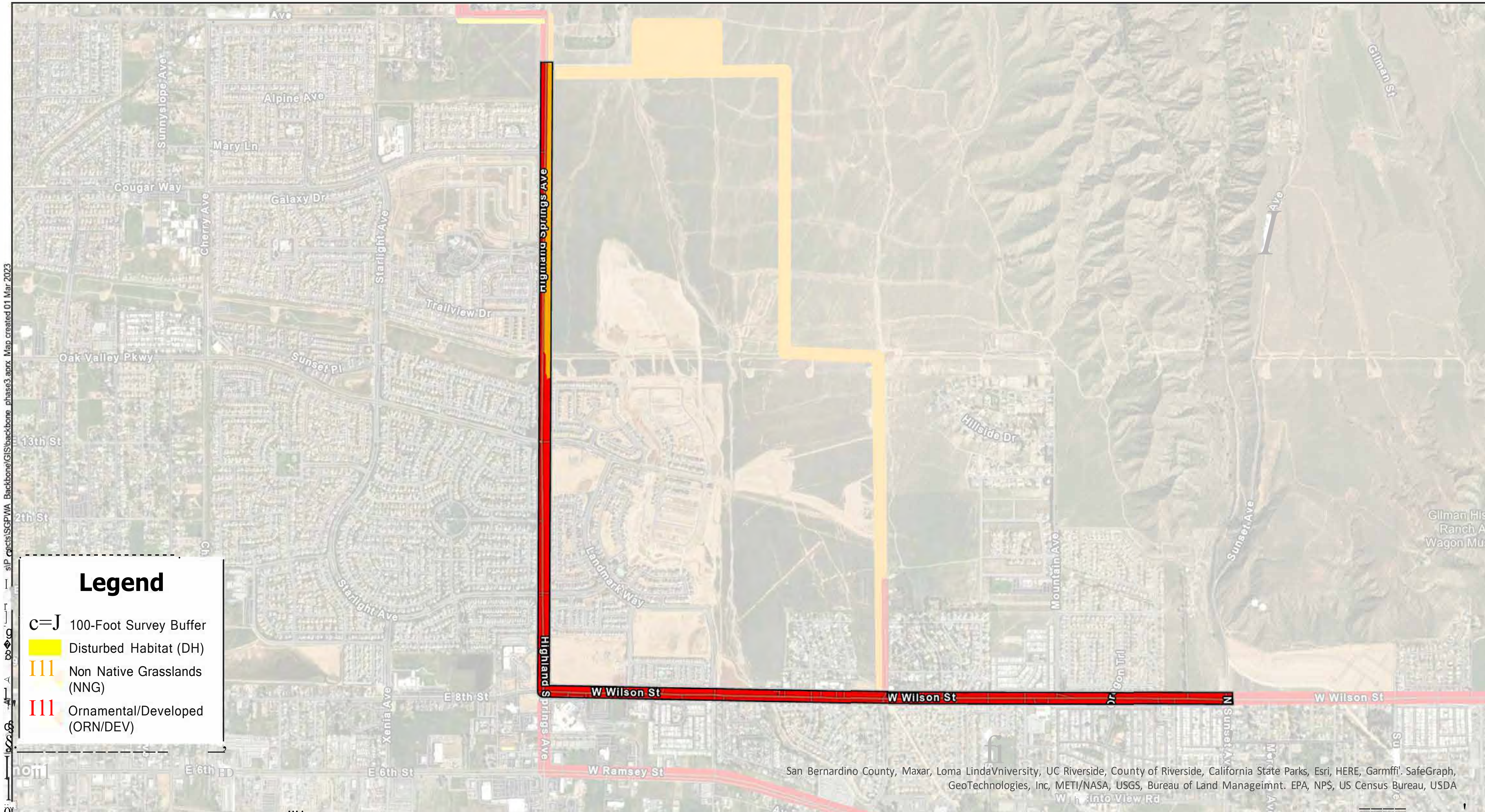
Source: Riverside County 2016

0 1,500 3,000 6,000 Feet

REACH 1

Preliminary Vegetation and Land Cover Types

Figure 4c



Source: Riverside County 2016

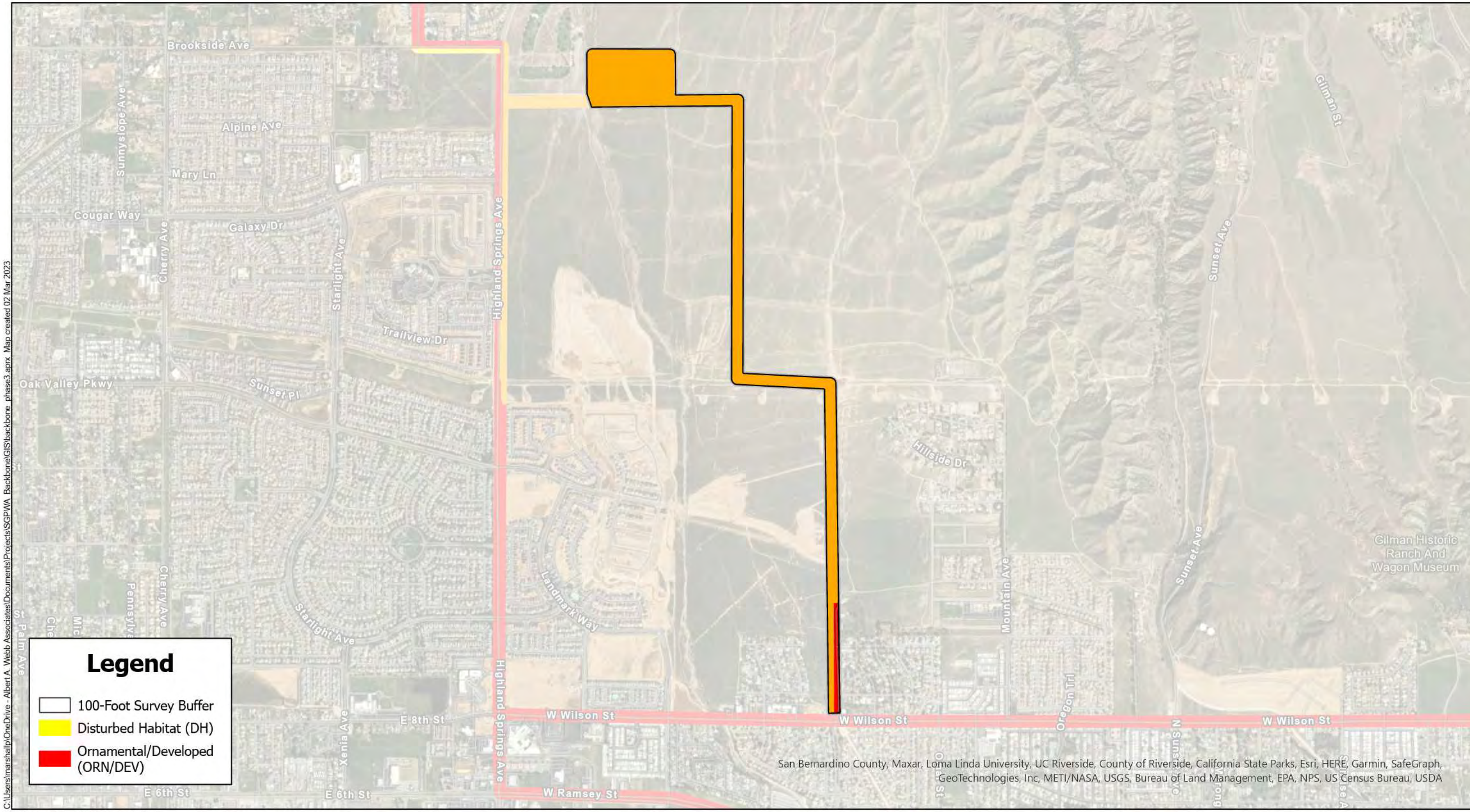
8

0 2,500 5,000 10,000 Feet

REACH 2

Preliminary Vegetation and Land Cover Types

Figure 4d



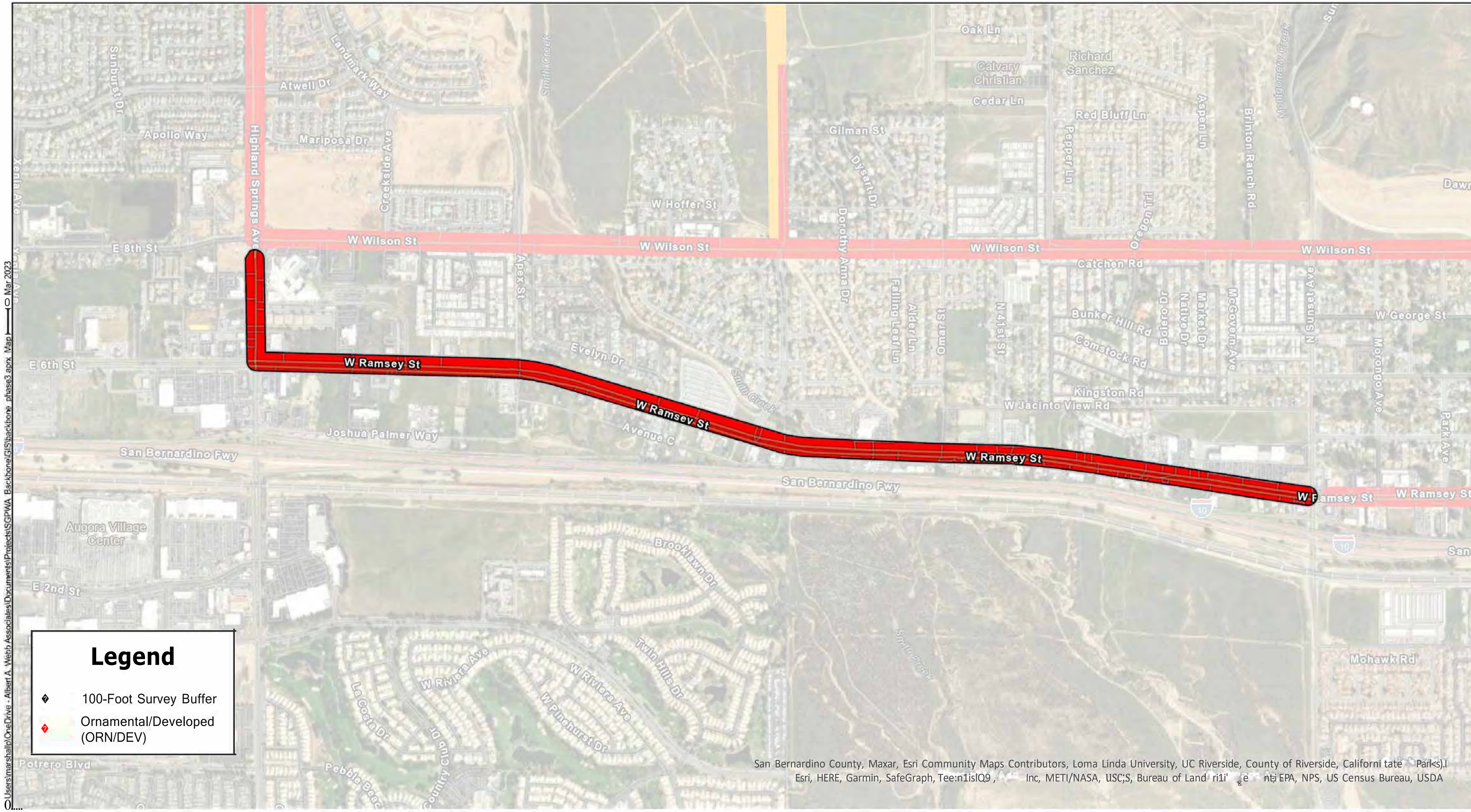
Source: Riverside County 2016

0 2,500 5,000 10,000 Feet

BANNING RECHARGE BASIN (ATWELL PROJECT) and REACH 2-ALTERNATE A

Preliminary Vegetation and Land Cover Types

Figure 4e



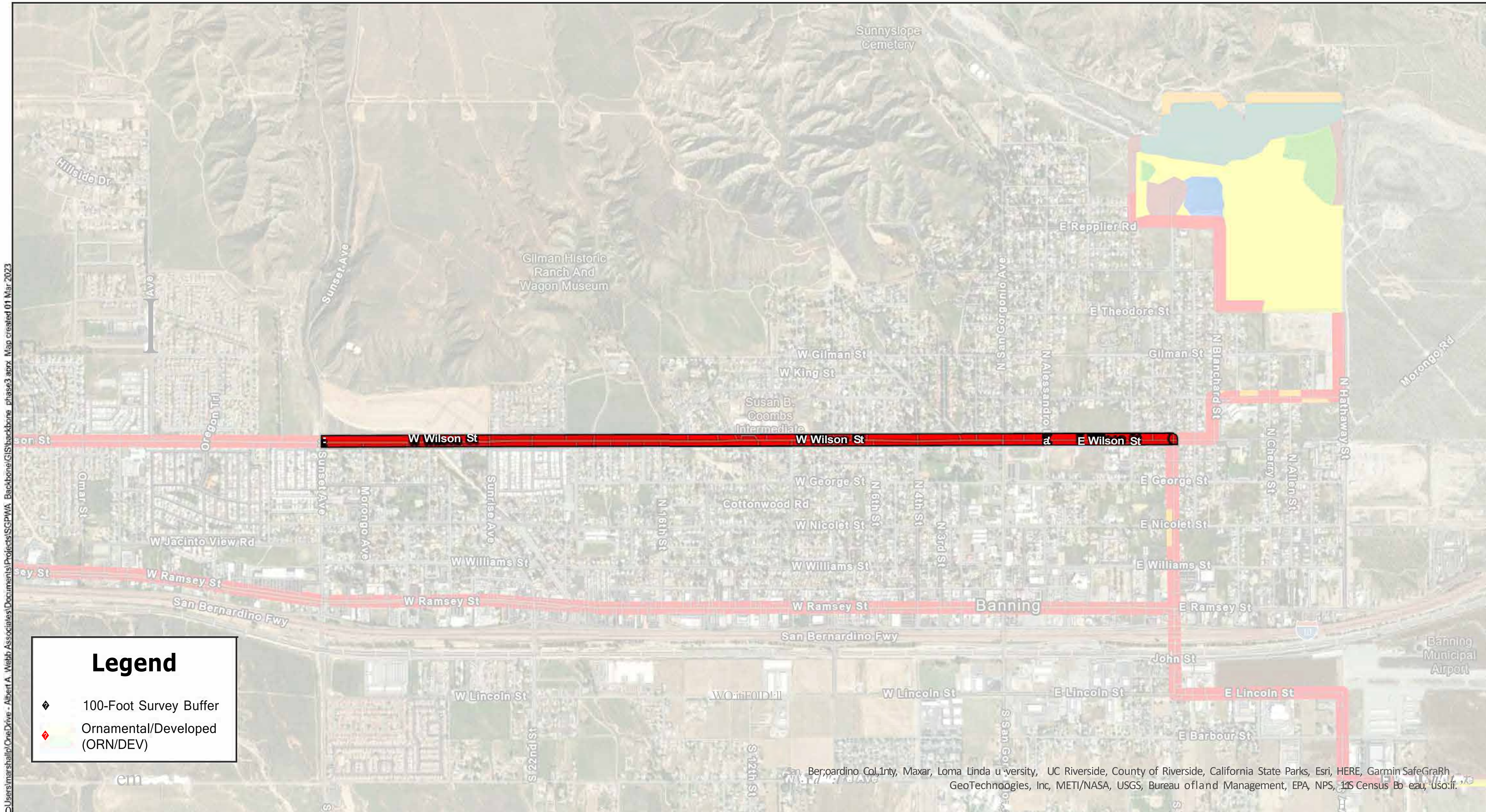
Source: Riverside County 2016

0 1,500 3,000 6,000 Feet

REACH 2-ALTERNATE B

Preliminary Vegetation and Land Cover Types

Figure 4f



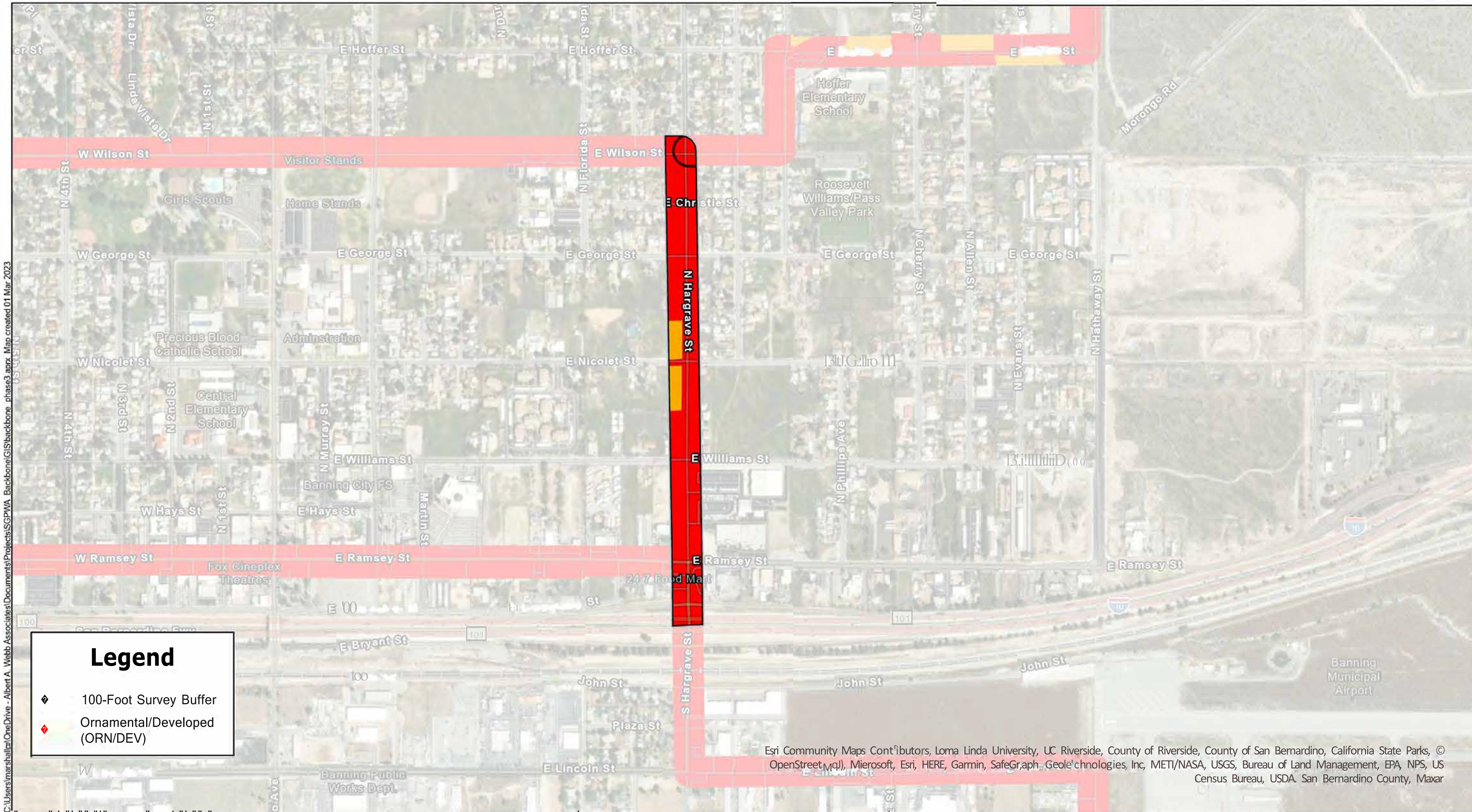
Source: Riverside County 2016

0 2,500 5,000 10,000 Feet

REACH 3

Preliminary Vegetation and Land Cover Types

Figure 4g



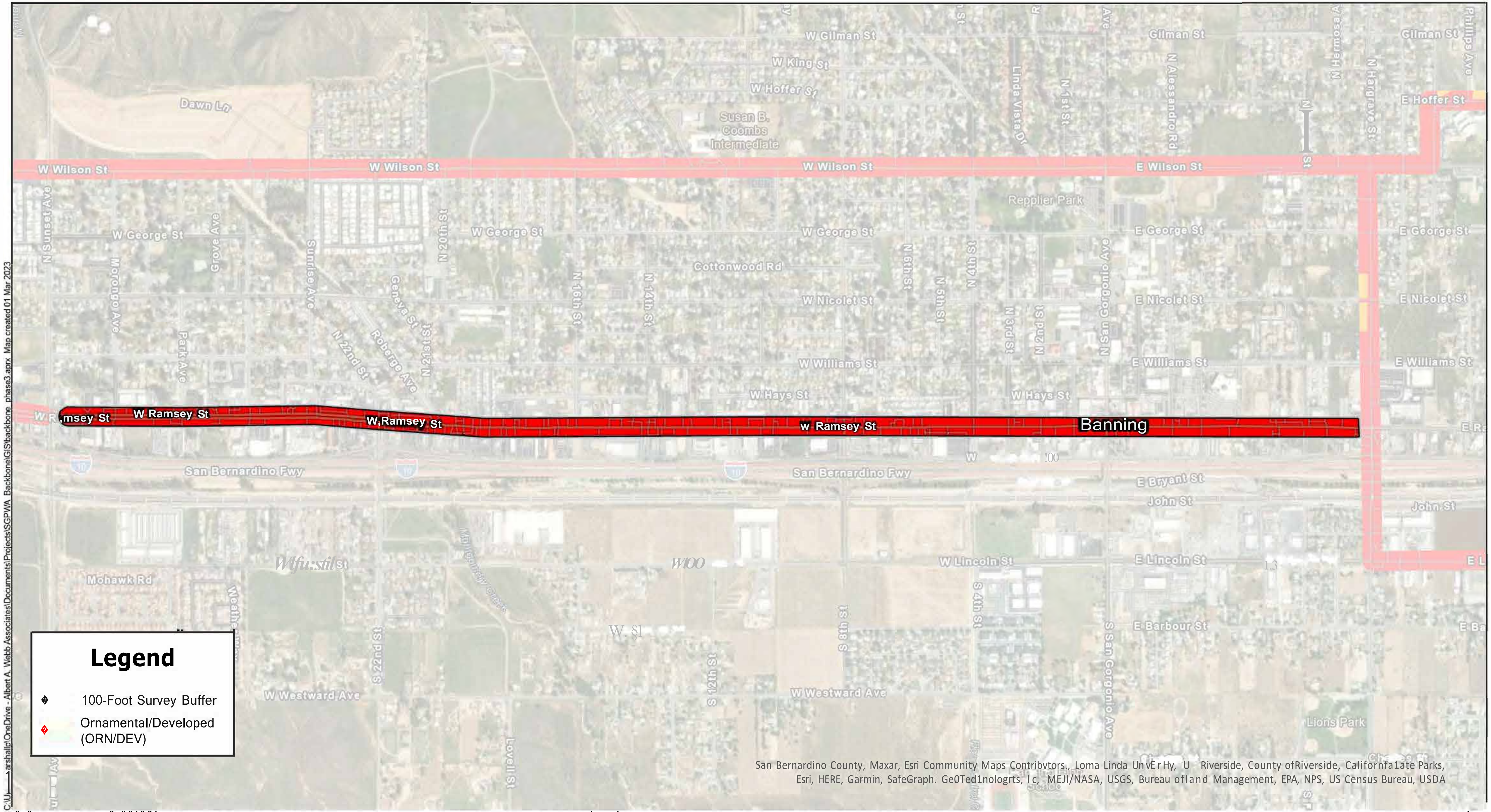
Source: Riverside County 2016

0 1,000 2,000 4,000 Feet

REACH 3-ALTERNATE A

Preliminary Vegetation and Land Cover Types

Figure 4h



Legend

- 100-Foot Survey Buffer
- Ornamental/Developed (ORN/DEV)

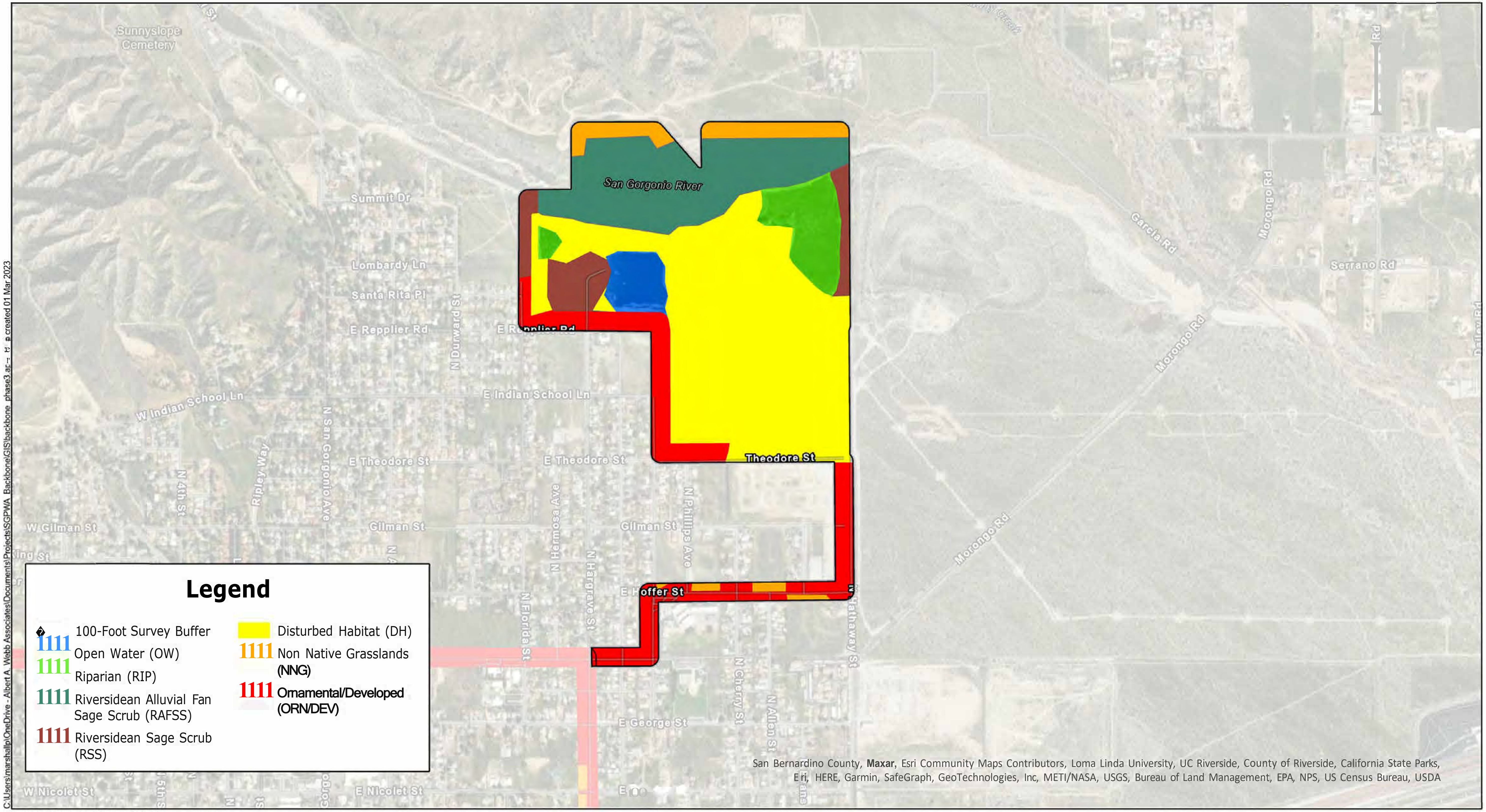
Source: Riverside County 2016

0 1,500 3,000 6,000 Feet

REACH 3-ALTERNATE B

Preliminary Vegetation and Land Cover Types

Figure 4i



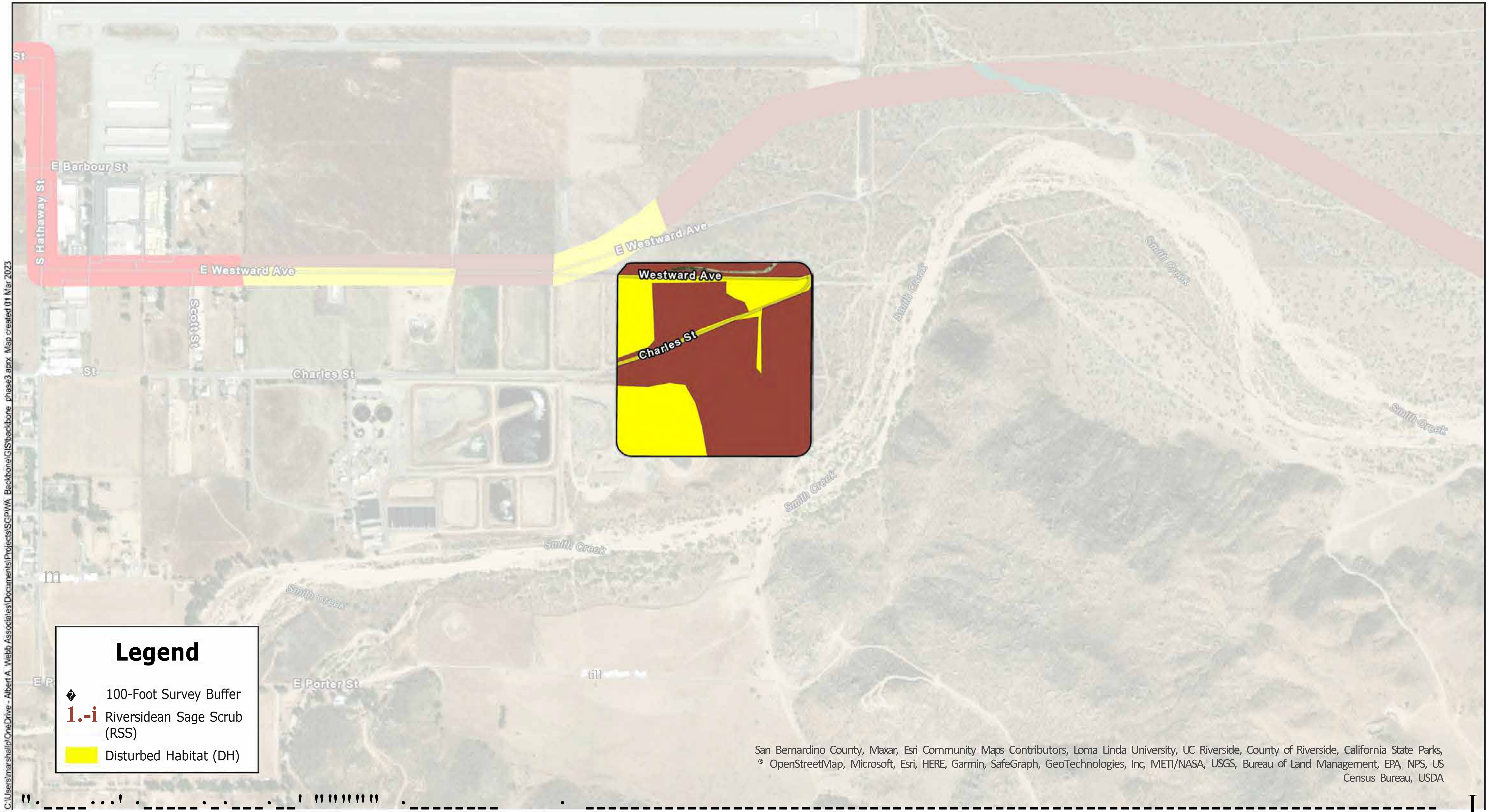
Source: Riverside County 2016

8

0 1,500 3,000 6,000 Feet

CABAZON RECHARGE BASIN LOCATION 1

Preliminary Vegetation and Land Cover Types

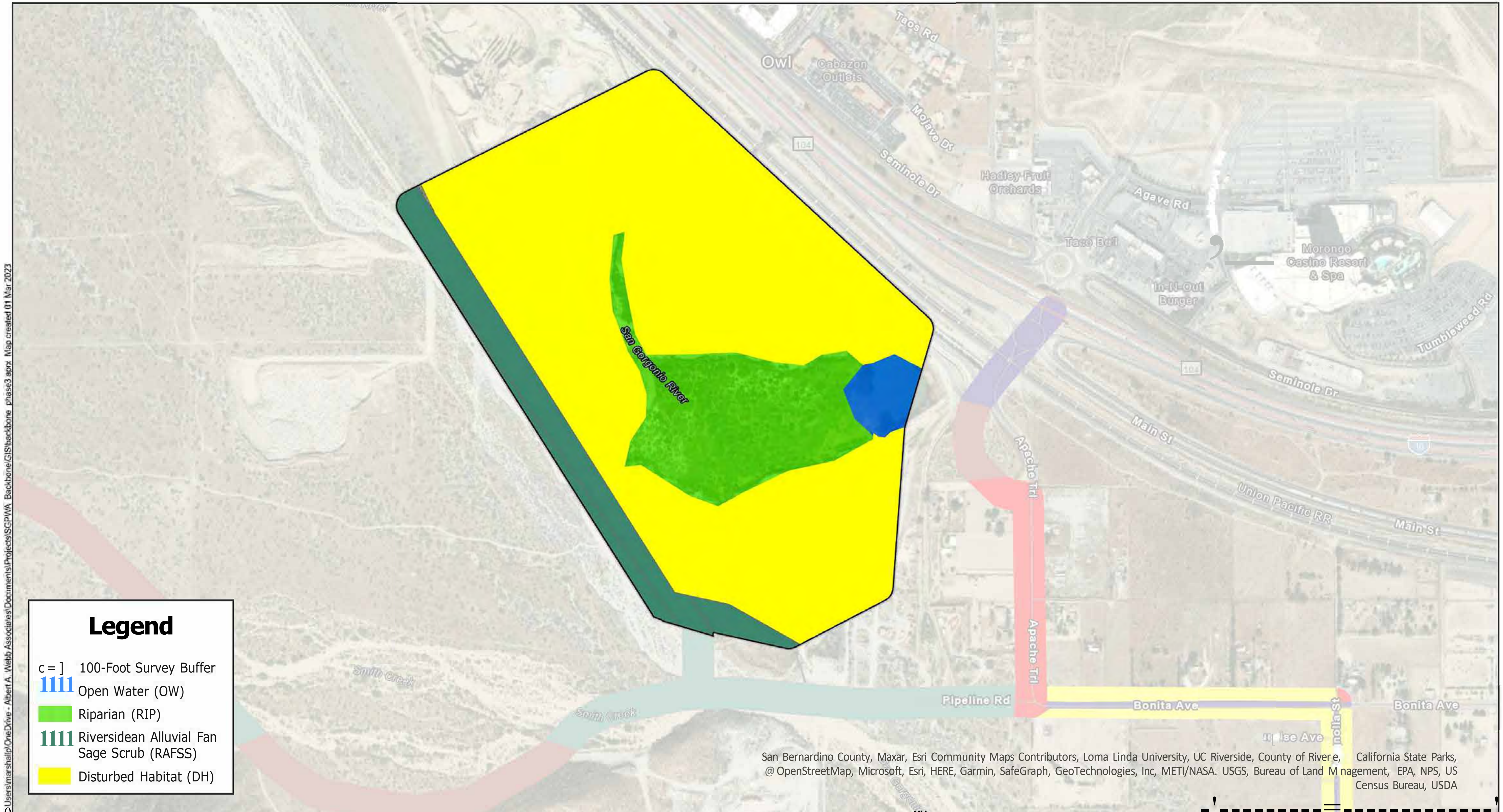


Source: Riverside County 2016

0 1,000 2,000 4,000 Feet

CABAZON RECHARGE BASIN LOCATION 2

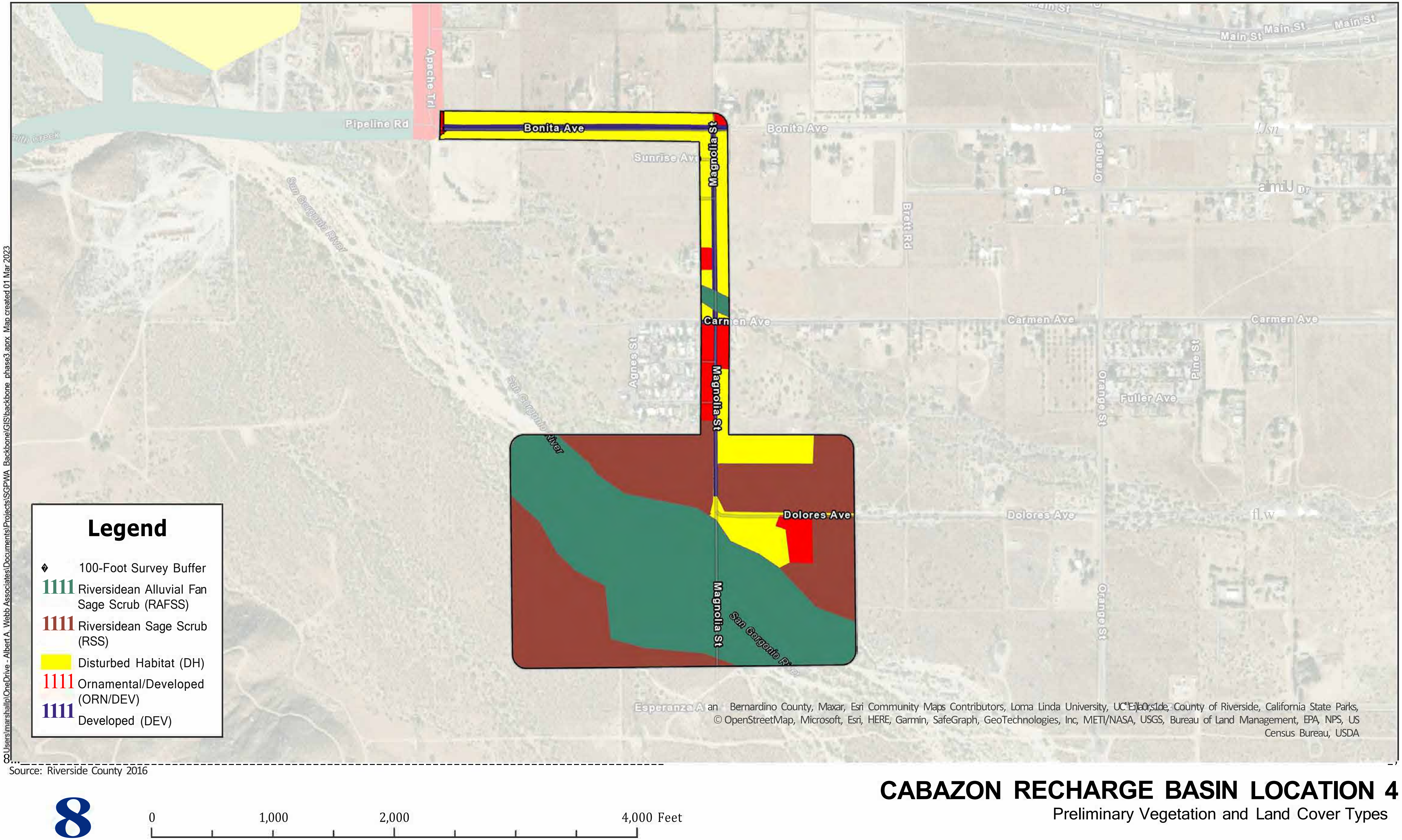
Preliminary Vegetation and Land Cover Types



Source: Riverside County 2016

CABAZON RECHARGE BASIN LOCATION 3

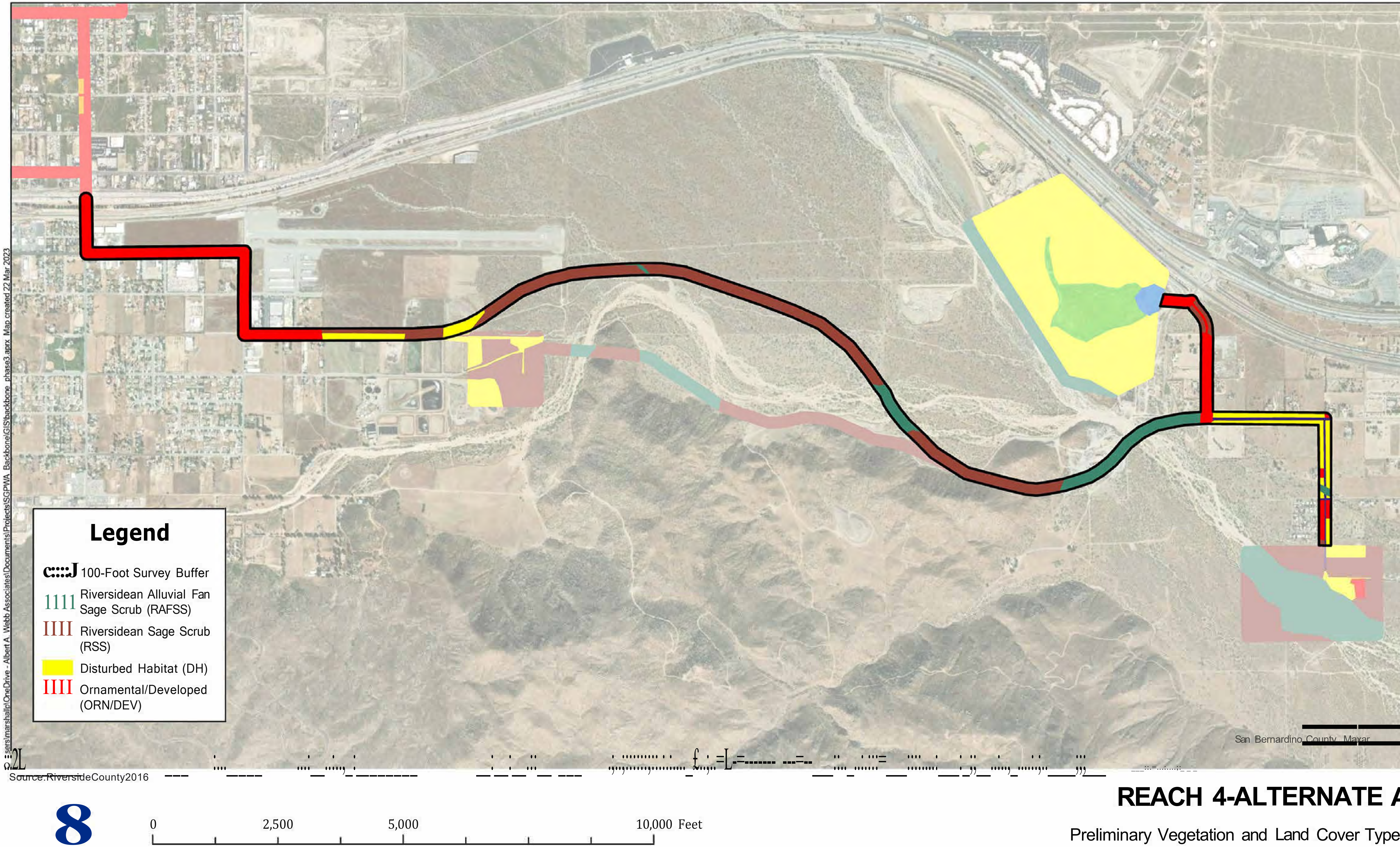
Preliminary Vegetation and Land Cover Types



Source: Riverside County 2016

CABAZON RECHARGE BASIN LOCATION 4

Preliminary Vegetation and Land Cover Types

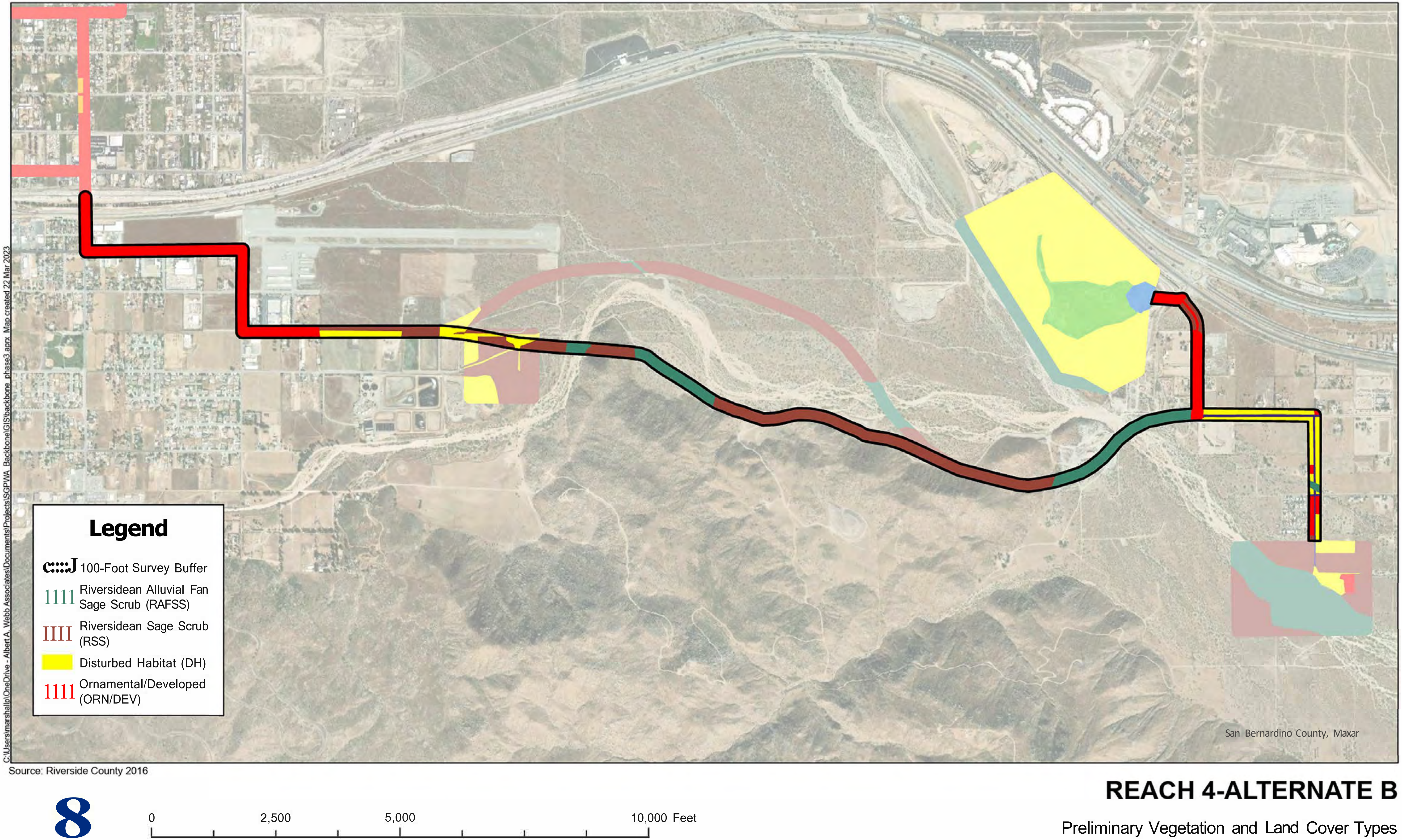


Source: RiversideCounty2016

REACH 4-ALTERNATE A

Preliminary Vegetation and Land Cover Types

Figure 4n

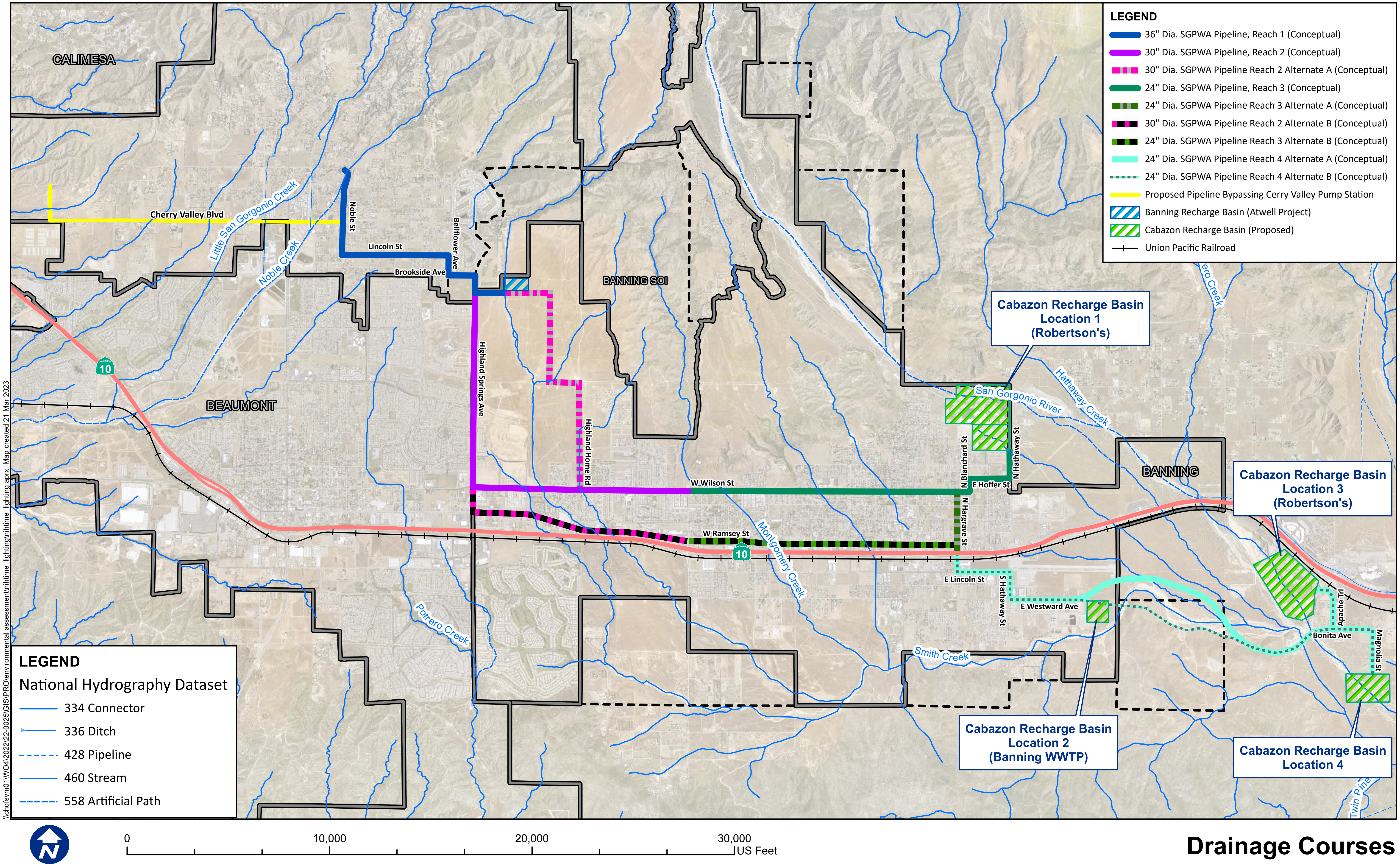


Source: Riverside County 2016

REACH 4-ALTERNATE B

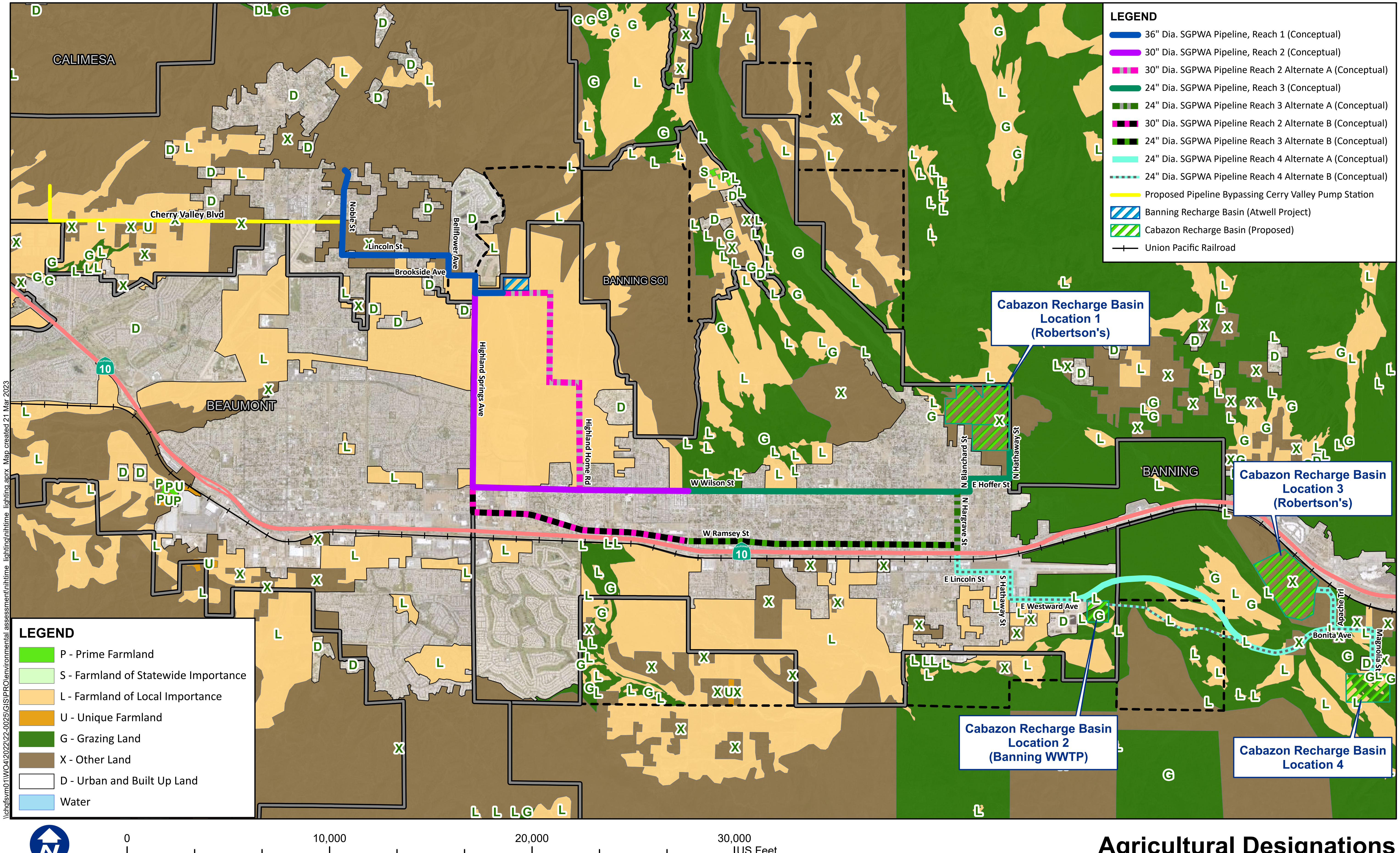
Preliminary Vegetation and Land Cover Types

Figure 5



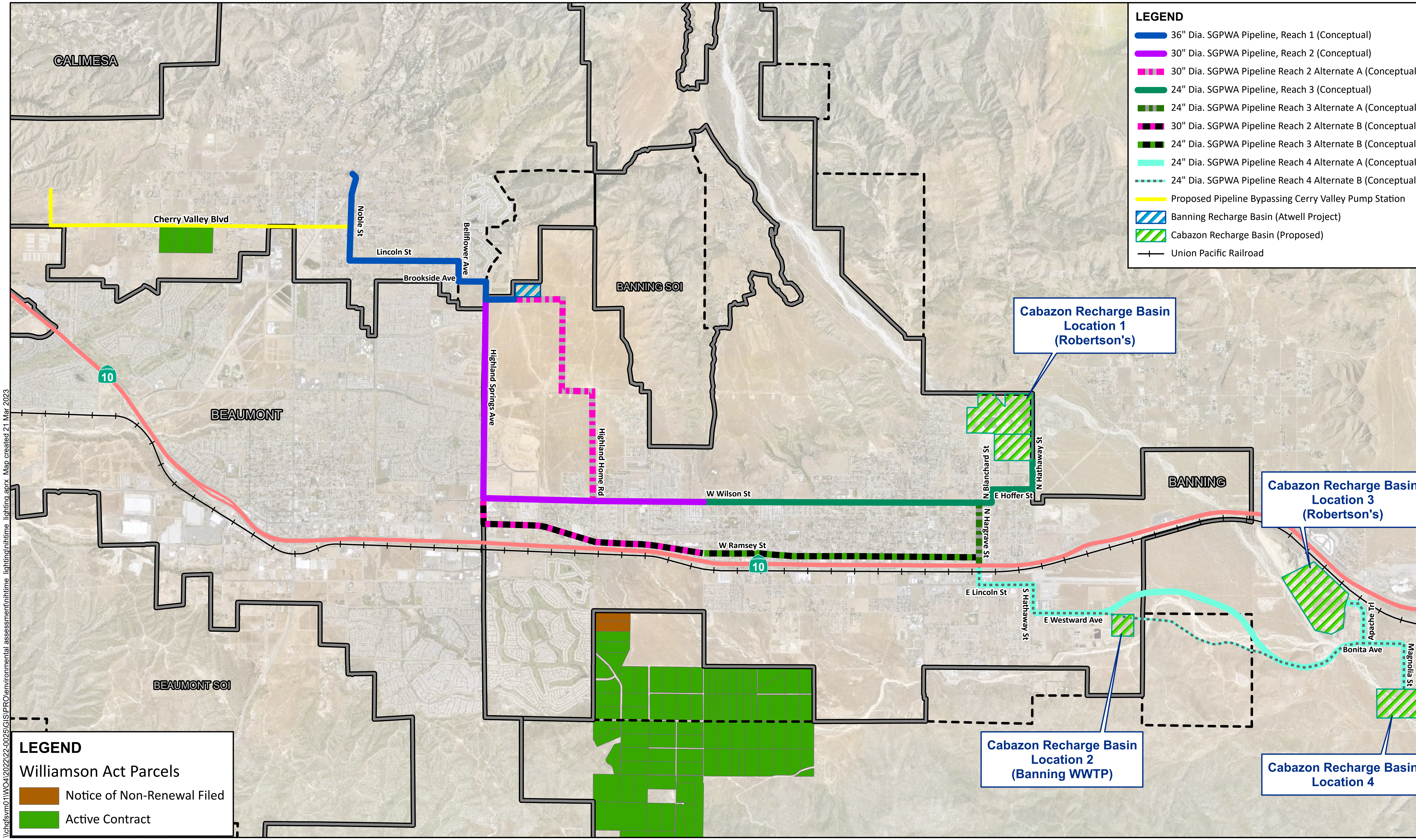
Drainage Courses

Figure 6



Agricultural Designations

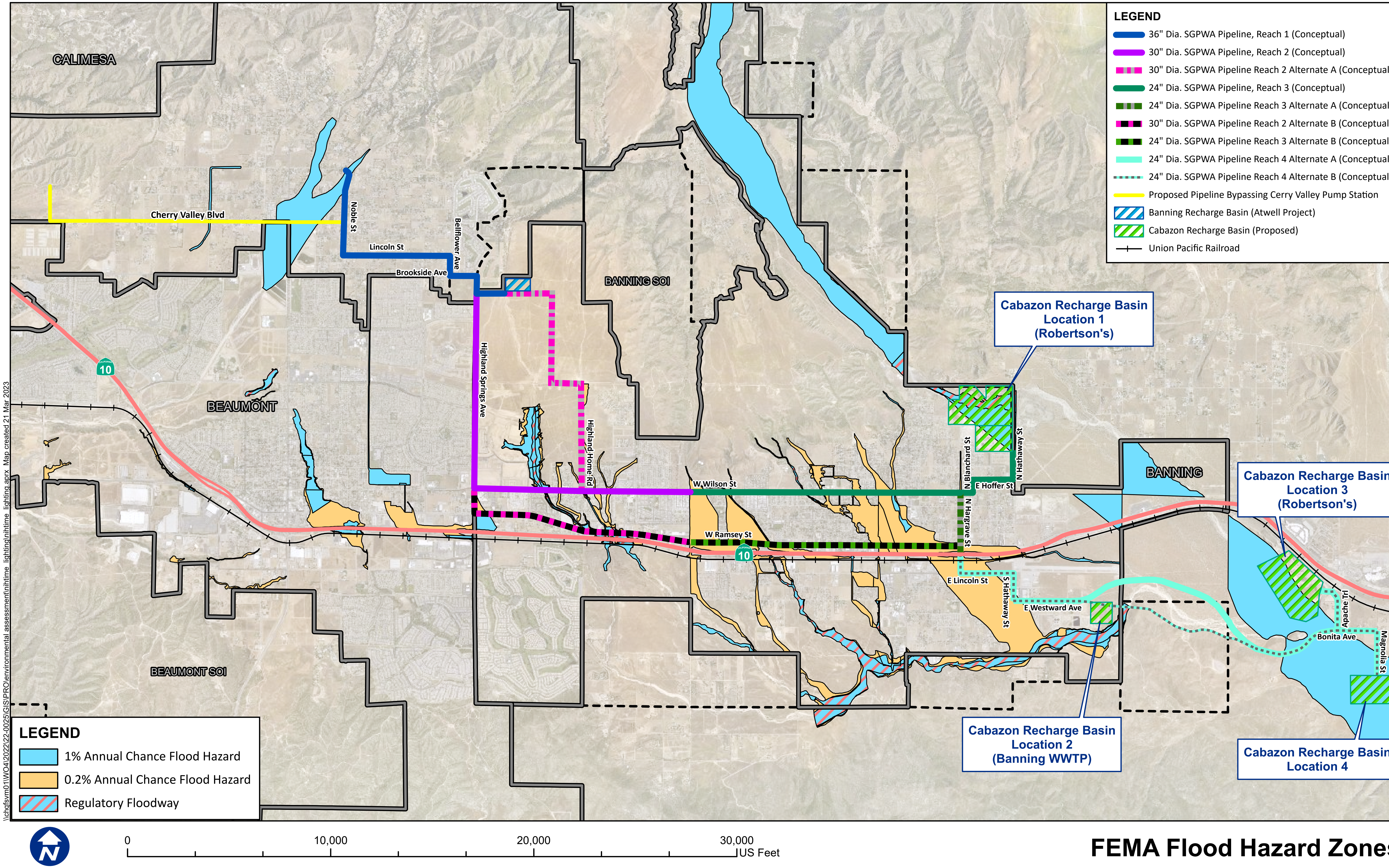
Figure 7



0 10,000 20,000 30,000 US Feet

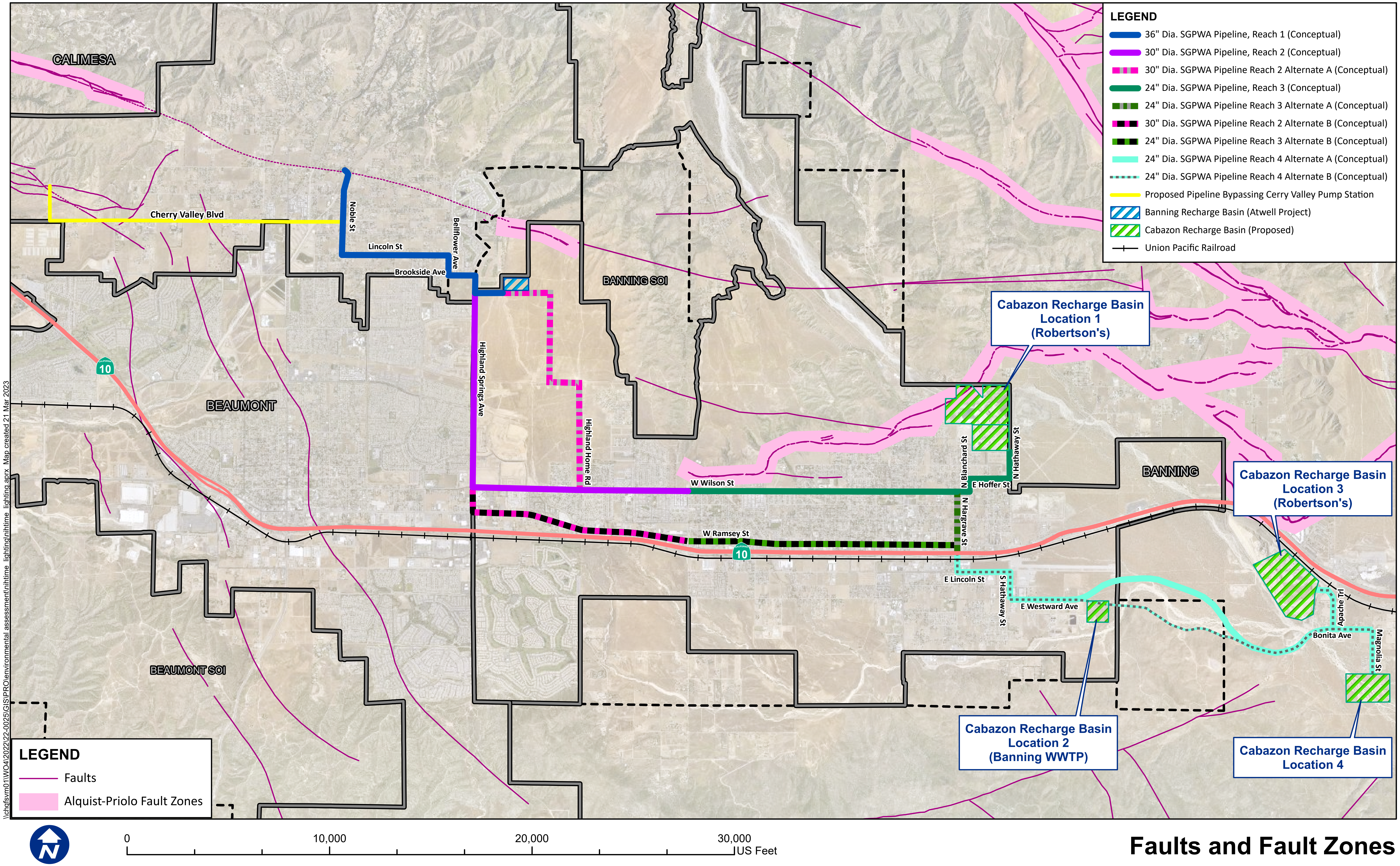
Williamson Act Contracts

Figure 8



FEMA Flood Hazard Zones

Figure 9



Faults and Fault Zones