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F. ASSOCIATED PROPERTY TYPES

Due to the large scale complexity of the project, the disjunct nature of many of its components, and that many CVP engineering features have not reached the 50 year consideration criteria, a multiple property listing (MPL) approach rather than a single district approach is considered most appropriate for assessing significance of the CVP's historic engineering features. This MPL is also designed to be easily amended as more project engineering features become historic.

National Register guidance documents define a property type as a "grouping of individual properties characterized by common physical and /or associative attributes" and consider it to be the key link between historic contexts and individual resources. Property types associated with the CVP consist of structures built for storage, diversion, delivery, and power development of water. They include dams with their attached powerplants, water conveyance and control structures, and pumping plants. In addition, properties may exist that are associated with project construction and ongoing operation and maintenance. Some of these properties are not under Reclamation's jurisdiction. Application of the National Register Criterion excludes certain features that are less than significant to the overall success and/or contribution of the CVP. No intensive survey of the CVP has been conducted; therefore, it is not known to what extent all of the associated property types are not considered under this multiple property listing.

Eligibility

For an engineering component associated with the CVP to be eligible for the National Register, it must be 50 years old or possess exceptional significance and it must meet one or more National Register criteria, and must retain integrity. The engineering component may be an individual feature such as a dam, or a district such as a contiguous series of main canals. A district must possess a significant concentration or linkage of resources united historically by plan, function,

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or physical development. A district should also be a significant, distinguishable entity, although its component parts need not possess individual distinction. The following discussion relates only to individual eligibility considerations.

Properties eligible under Criterion A must illustrate important historical events, themes, or patterns. As stated above, the CVP in its entirety has been pivotal in the history of the area it serves and in Federal Reclamation history. For individual properties associated with the CVP to be eligible under this criterion, they must strongly represent one or both themes. An individual main canal, for example, may qualify for listing if it is key to the whole project. Conversely, properties such as laterals, water control structures, or privately built farm ditches would not meet this criterion because they represent conveyance features that are insignificant to the CVP as a system. Any decision to include or exclude support elements from a major, pivotal feature like a main canal will be made on an individual basis.

To be eligible under Criterion B, a property must be associated with a person who made important contributions to history and must be a property that best illustrates those contributions. For example, a dam or powerplant that best exemplifies important contributions to engineering technology developed by a significant engineer may be eligible under this criterion. Likewise, a historic office building in which a prominent Reclamation engineer prepared his most important designs may be eligible. Irrigation systems and their associated components are not usually eligible under this criterion alone.

Properties eligible under Criterion C must demonstrate significant engineering or design values. Examples of different types, styles, periods or methods of construction; good examples of the work of an important engineer or architect; or properties of high artistic merit may qualify. Such properties include, but are not limited to, dams, canals, water control structures, ditchrider

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housing, or project headquarters. The earliest, best preserved, largest, or sole surviving example of a particular property type, or a property exhibiting an innovative or experimental approach to water engineering may be eligible. Under Criterion C, properties may have unique values or they may be good representative examples of a type of property. In the latter case, properties must possess “distinctive characteristics,” the common features or traits of that type, period, or method of construction. They must also retain a high degree of integrity. It is also important to differentiate those resources significant at the national level for their unique technological and/or engineering aspects, and those significant at the state or local level as good representative examples within the CVP system.

Finally, properties associated with the CVP may be eligible under Criterion D for information they may contain about important scholarly and scientific issues useful in interpreting the past. Some of the key research issues, for example, include historical changes in the CVP landscape, settlement patterns, and water engineering technology. The properties most commonly deemed eligible under Criterion D are archeological sites, but buildings, structures, and objects can also, if infrequently, be found eligible for their information potential. In order for these property types to be eligible under D, the physical properties themselves must be or have been the principal source of information.

For the purposes of this MPL, a CVP property type or “engineering feature” is defined as a dam (with or without a powerplant), a main canal (not laterals or branches), and a pumping plant.

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Shasta Dam, the CVP's "Keystone" Feature (Bureau of Reclamation, Jim Bailey)

I. PROPERTY TYPE: STORAGE STRUCTURES AND POWERPLANTS

Description

A. Dams

Historic CVP dams fall into a single category according to their function: storage-regulation. Storage-regulation dams impound surplus run-off and flood flow waters and store them for future use. In most cases, such dams serve multiple purposes, with flood control, irrigation, and hydropower being the most common. In addition, some smaller storage dams regulate and

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control releases from larger dams located upstream; for example, Keswick Dam, located six miles downstream from Shasta Dam, regulates hydropower releases from Shasta's powerplant. Shasta, Keswick, Folsom, Nimbus, and Friant are the only CVP dams that fit within the period of



Keswick Dam and Powerhouse, Shasta Division (Bureau of Reclamation, Jim Bailey)

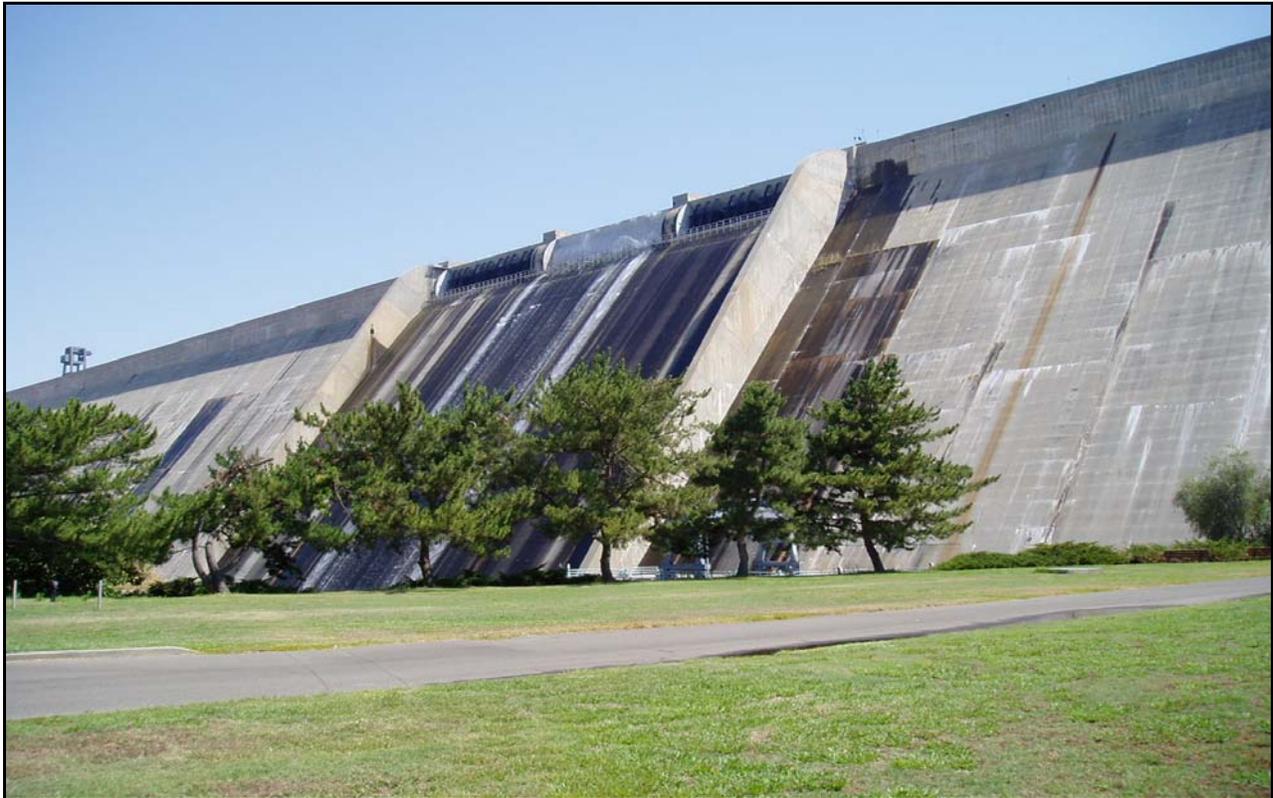
significance, 1938 to 1956, known as the initial wave of CVP authorizations. Martinez Dam, constructed in 1946-1947 as a small storage dam at the western terminus of the Contra Costa Canal, is considered a contributing feature to that canal's historic and present function.

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Friant Dam, Friant Division (Bureau of Reclamation, Jim Bailey)

Significance

In addition to the pivotal role they play in irrigation, the dams also provide flood control while some store water for hydropower generation. Additionally, water releases from Shasta Dam help check saltwater intrusion into Suisun Bay. Without these key components, the CVP would not exist. Eligible CVP dams are most likely significant under Criterion A for their association with the large-scale agricultural and economic development and expansion of California's Central Valley (Friant) and for the prevention of devastating floods (Folsom, Nimbus, Shasta).

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An early CVP dam like Shasta Dam could also be associated with the rise in federally sponsored public works developments during the Great Depression and World War II. Additionally, dams with unique engineering features (Shasta) or groundbreaking construction methods (Shasta, Friant) could also be considered eligible under Criterion C.



Folsom Dam, American River Division (Bureau of Reclamation, Jim Bailey)

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Registration Requirements

The period of significance for the initial wave of CVP authorizations begins in 1938 with the commencement of construction of Shasta Dam on the Sacramento River, and ends in 1956 with the completion of Folsom Dam by the U.S. Army Corps of Engineers (USACE) on the American River. Other CVP dams like Trinity and New Melones came in subsequent authorizations, and are thus not yet considered eligible for consideration. While all dams play an important role in CVP operations, one or more may qualify as individually eligible for the following reasons:

Criterion A: They are demonstrably associated with the agricultural development of the area, played a determining role in CVP history or the Bureau of Reclamation, or created key storage reservoirs associated with the CVP. Because of its role as the CVP's "keystone" feature—and that it was the first CVP dam completed and operational—Shasta Dam has already been deemed individually eligible at the state level by the Bureau of Reclamation under this criterion.

Criterion B: They best represent important contributions of someone significant in engineering or Reclamation history, or in the overall realization of the CVP.

Criterion C: They exemplify the distinctive characteristics of a certain type of dam or method of construction; they embody the work of a significant engineer or builder; they dominate the project in terms of their key size and function; they represent the evolving technology of dam design or an innovative design solution. As with Criterion A, Shasta Dam has already been deemed individually eligible at the state level under this criterion.

Criterion D: They have the ability to yield information important to understanding the history of the CVP. None of the CVP dams are eligible under this criterion.

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Dams require continual maintenance and periodic repairs to keep them operating safely and efficiently. Oftentimes, parts such as gates or valves are replaced due to wear or improved design. Integrity considerations must take this into account. For a dam to be eligible for the National Register, it obviously must retain integrity of location, which all initial authorization CVP dams retain. The overall design, workmanship, and materials must remain intact; if elements have been altered they cannot change the character, function, or design to the extent that the original is no longer readily apparent. If a dam is eligible for significant engineering innovations or technology, those features must still be present. The current setting should embody the same overall character as the historic setting, with minimal visual or physical intrusions. This aspect may be less critical if the dam is being nominated under Criterion C for engineering significance. If elements of design, workmanship, materials, and setting are intact for a dam, then integrity of feeling and association will also be maintained.

Other features such as camp sites, construction site features, transformer stations, tailraces, and diversion elements, if applicable, may not be individually eligible, but may constitute important site features can be considered as integral to the integrity and significance of a major property type feature. However, loss of these features, or a loss of integrity of these features, should not have a detrimental effect on the eligibility of the main resource if it still retains integrity.

And, while reservoirs are considered vital features of a dam site, the inclusion of reservoir areas is, in an operational sense, very problematic, due to widespread seasonal fluctuations in overall water levels. Thus, reservoir inclusion need not be a prerequisite for the eligibility of a major dam and its features.

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Additionally, since the events of September 11, 2001, the issue of dam security has risen to Reclamation's forefront. The addition of perimeter cameras, Jersey barriers, and concertina/razor wire to Reclamation's dams is a result of this heightened security awareness, especially with Folsom and Shasta Dams (due to its close proximity to the metropolitan Sacramento area, Folsom Dam is currently Reclamation's number one security priority). Security related accoutrements must be taken into account when analyzing overall integrity, and whether the security equipment detracts from the dams' overall appearance.



Nimbus Dam, American River Division (Bureau of Reclamation, Jim Bailey)

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B. Powerplants

In addition to the primary purposes of providing flood control, salinity repulsion, and irrigation water, the CVP provides hydroelectric power. Project hydropower facilities generate nearly 5.7 billion kilowatt-hours of electricity annually. This power is dedicated first to meeting the



Shasta Powerplant, Shasta Division (Bureau of Reclamation, Jim Bailey)

requirements of project facilities, such as pumping power for project water and station service at pumping and generating plants, fish facilities, and project construction facilities. The remaining energy is marketed to various preference customers in northern California: twelve irrigation districts, seven federal agencies; six municipalities; five state agencies; two utility districts; and one rural electrical cooperative. The first CVP powerplant to become operational was the Shasta

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Powerplant in 1942, which supplied limited hydroelectric power to northern California's defense industries before Shasta Dam proper was completed a couple years later. Although numerous CVP powerplants exist, only Shasta, Keswick, Folsom, and Nimbus powerplants are considered part of the historic initial CVP authorizations. All four are directly connected and integrated to their respective dams. Friant Dam has no historic integrated powerplant (although some very small powerplants were integrated into the dam by a local water user authority in the 1980s.)

Significance

Although the primary and secondary purposes of the CVP are to provide flood control and irrigation water, the production of power has been an important tertiary benefit. For the role they play in generating electricity that helps keep the project running, powerplants are therefore significant. For example, the Tracy Pumping Plant (C.W. "Bill" Jones Pumping Plant), a key feature in the geographic redistribution of water from north to south, operates mostly on electricity generated at Shasta and Keswick powerplants and directed south by the Shasta-Tracy East/West Transmission Lines.

The same issues surrounding the integrity of conveyance systems apply to powerplants. They require periodic maintenance and repair, as well as security upgrades. In some cases, equipment is replaced due to malfunction, deterioration, or evolving technology. This is part of an ongoing evolution of a powerplant and does not necessarily preclude eligibility. Eligible plants will retain integrity of most of their components so that the significance of the total system and the essential character is preserved. If the significance of the plant is based on specific piece(s) of equipment being removed—or extensive modifications to the exterior are performed that compromise historic integrity—the plant would no longer be eligible.

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Folsom Powerplant, American River Division (Bureau of Reclamation, Jim Bailey)

Registration Requirements

The period of significance for historic CVP powerplants begins in 1940 with the construction of Shasta Powerplant, and ends in 1956 with the completion of Folsom and Nimbus powerplants. For evaluation purposes—and because all historic CVP powerplants are directly connected and integrated in some way to their respective dams—powerplants will be considered as primary contributing elements to their respective dams.

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Nimbus Powerplant, American River Division (Bureau of Reclamation, Jim Bailey)

C. Dikes

Dikes are built to fill in low-lying areas in order to create reservoirs, or are constructed so that reservoir capacity can be increased. No CVP dikes or series of dikes could be individually eligible for the National Register since they are of plain, utilitarian design with no significant features, and require frequent modifications and reinforcements, especially in seismically-sensitive areas.

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II. PROPERTY TYPE: WATER CONVEYANCE STRUCTURES

Description

Another core component of the CVP are the conveyance systems used to carry water from the storage and diversion facilities to the farmlands, or to pumping plants for further geographical redistribution. For the CVP, the water conveyance scope is huge: it includes over 350 miles of main canals, and thousands of miles of laterals (and sub- and sub-sub-laterals) that deliver water from the main canals to irrigation ditches on farms. Also falling within this property type are about 84 miles of drains that carry excess water away from farm fields. Canal right-of-ways usually include operating roads on one or both sides of the canal prism.

Associated with the many miles of canals, laterals, and drains are numerous types of appurtenant features that play an integral role in water delivery. Most are small in scale, yet are instrumental in the functioning of canals and laterals. Although these appurtenant features are all thematically and operationally related to canals/laterals/drains, they can be divided into categories according to their purpose: conveyance; regulating; water measurement; protective; and miscellaneous structures. For the most part, these features derive significance as contributing elements to the operation of canals, laterals, and drains. In rare instances, they may warrant individual eligibility due to a significant or innovative design or construction technique, and/or due to the major role they play.

Because of the complicated ownership patterns when dealing with any conveyance structures below the main canal level (many are located on easements within private property), for the purpose of this MPL and respective nominations *only the main CVP canals and related attached appurtenant structures or objects central to the canal's operation* will be considered.

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Friant-Kern Canal, Friant Division (Bureau of Reclamation, Jim Bailey)

A. Main Canals

Main canals form the CVP's primary arteries. These canals consist of Contra Costa (the first built and operational), Madera, Delta-Mendota (both intake and distribution sections), Delta Cross Channel, and the Friant-Kern, all built and operational before 1952. The longest main canal is the Friant-Kern Canal at 151.8 miles, while the shortest is the Delta Cross Channel at 1.2 miles. All main canals are located on Reclamation fee title or easement land.

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**B. Appurtenant Features: Conveyance; Regulating; Water Measurement; Protective; and
Miscellaneous Structures and Objects**

1. *Conveyance Structures*

Conveyance structures are features such inverted siphons, drops, chutes, flumes, tunnels, and pipelines that are used to safely transport water from one location to another traversing various existing natural and manmade topographic features along the way.

2. *Regulating Structures*

Regulating structures are used to raise, lower, or control the release and volume of the water flow. Regulating structures that are located at the source of the water supply include headworks and turnouts. Headworks control the release of water into the canal, and are often located



Contra Costa Canal, Delta Division (Bureau of Reclamation, Jim Bailey)

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downstream from a major diversion or storage facility. Regulating structures located along the course of a canal include turnouts, checks, check-drops, and diversion structures. The smaller regulating structures like checks and turnouts are basic components of an irrigation system.

3. Protective Structures

Protective structures protect the canal system and adjacent property from damage which would result from uncontrolled storm runoff or drainage water, or an uncontrolled excess of flow within the canal. Several different types of structures perform this function, including overchutes, drainage inlets, siphon spillways, and wasteways.

4. Water Measurement Structures and Objects

Water measurement structures are used to gauge water flow and ensure its equitable distribution. Many different types of water measurement structures are used in irrigation systems. The type most commonly used in Reclamation systems are Parshall flumes, weirs, open-flow meters, and constant head orifices.

C. Drains

Drains are water conveyance structures (either open channels or buried pipes) that carry excess water away from irrigated agricultural fields to prevent rising water tables. A drain classification was instituted by Reclamation in 1920 that categorized drains into three classes according to their size and relative importance. Class I or “deep drains” are the largest and most significant, with Class III being the smallest and least significant.

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Madera Canal, Friant Division, Friant Dam in Background (Bureau of Reclamation, Jim Bailey)

Significance

In conjunction with the storage and diversion dams, canals form the CVP's backbone. They provide the means to transfer, transport, and deliver water through the system and ultimately to the water users. Traveling for hundreds of miles, the canals form a significant feature of the physical landscape and define the geographical limits of the project. In keeping with the original CVP plan of large-scale water transfers, canals are the primary means behind the geographical redistribution of fresh water from the valley's wetter northern reaches to the drier southern stretches.

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Delta-Mendota Canal, Delta Division (Bureau of Reclamation, Jim Bailey)

The need for continual maintenance and repairs to canals requires special consideration of integrity. Irrigation systems are constantly evolving as features are upgraded, repaired, or replaced. Alterations made to canals during the period of significance and even subsequent to that may not nullify eligibility if a canal retains certain basics. Most important are integrity of location, association, and overall design configuration of the prism (i.e. depth and width). A canal which has retained its original form and associated appurtenant features has a high degree of integrity. It is not uncommon for a canal lining to be replaced, or for previously unlined segments to be lined. Such changes may not preclude a canal's eligibility if they do not significantly damage the canal's historic association or its overall design. If in addition to

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integrity of association, location, and overall design, the historical setting and feeling of a canal are maintained, then the likelihood is even higher that an altered canal would be eligible. On the other hand, if an entire canal is piped, it would no longer convey any of its original design, workmanship, materials, or historical association and would not be contributing. Conversely, partial piping of a significant canal may not preclude eligibility if a majority of a canal is still open and intact.

Secondary to the canals in distributing water are the thousands of laterals and their appurtenant features. As with canals, many appurtenant features are upgraded, altered, or even replaced over time due to the constant ongoing maintenance needs. For laterals to be considered contributing, they must exhibit a high level of integrity, and serve as principal laterals or incorporate a larger number of contributing appurtenant features. Because of the vast number of appurtenant features and the many miles of laterals, it may only be appropriate to identify representative samples as contributing elements. In unusual cases, laterals and appurtenant features may have individual significance if they are: surviving examples of a rare type of design or construction; of innovative engineering design that impacted subsequent designs; or were specifically designed to meet an unusual engineering challenge.

Sub-lateral canals and their branches are not considered as contributing resources to the CVP. The small size of sub-laterals does not make a significant contribution to the function or design of the CVP and are not individually eligible. Sub-laterals could, however, be eligible if they are associated with a historic farm or district where the impact the lateral has in combination with the other resources is substantial.

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Delta Cross Channel's Radial Gates, Delta Division (Bureau of Reclamation, Jim Bailey)

The evaluation of the significance of drains is similar to that of laterals. The principal, or Class I drains, are contributing features if they retain a high level of integrity and fall within the period of significance. Class II and III drains are not considered contributing resources. In unusual cases, drains may have individual significance if they fall within the period of significance and are: rare, surviving examples of a type of design or construction, of innovative engineering design that impacted subsequent designs, or were specifically designed to meet an unusual engineering challenge. Like laterals and sub-laterals, drains are considered as ineligible components of the CVP.

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Registration Requirements

The period of significance for historic water conveyance structures begins in 1937 with the initial construction of the first CVP canal, the Contra Costa Canal, and ends in 1952 with the completion of the Friant-Kern, Delta-Mendota, and Delta Cross Channel canals. Like the dams, these canals are part of the initial CVP authorizations.

Water conveyance structures with adequate integrity are considered eligible as part of the multiple property listing for the National Register for the following reasons:

Criterion A: They have had a significant impact on the settlement, agricultural economy, or development patterns of the project area; they have been defining elements in the evolution of the cultural landscape; they are directly associated with important events.

Criterion B: They are the result of the direct efforts of a prominent individual associated with the CVP and are the most prominent feature associated with that individual.

Criterion C: They represent the distinctive characteristics of Reclamation canal design and/or methods of construction used on the CVP; they involved challenging engineering design problems due to topography, grade, length, natural obstacles, and resulted in complex or innovative solutions; they are among the best or a rare surviving example of a distinctive type of water conveyance structure; they represent the evolving technology in the design of water conveyance structures; they were identified during the construction period as a individually significant feature; or they embody the work of a significant engineer or builder.

Criterion D: They have the ability to yield information important to understanding the history of the CVP. None of the CVP water conveyance structures are eligible under this criterion.

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III. PROPERTY TYPE: PUMPING PLANTS

Description

Pumping plants are needed to lift water to a higher elevation to serve a desired purpose, such as expanding the land area available for irrigation.



Tracy Pumping Plant (C.W. "Bill" Jones Pumping Plant), Delta Division

(Bureau of Reclamation, Jim Bailey)

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Significance

Pumping plants are significant for making possible water delivery into otherwise inaccessible areas. Pumping plants can also be significant as engineering features that represent innovative technological and engineering advances, such as the fact that Tracy Pumping Plant, when completed in 1951, was the most heavily reinforced concrete building in America—one built adjacent to a fault line.



Tracy Pumping Plant (C.W. “Bill” Jones Pumping Plant), Delta Division

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The period of significance for historic CVP pumping plants begins in 1937 with the construction of the first three Contra Costa Canal pumping plants (evaluated as contributing elements to that canal, see below) and ends in 1951 with the completion of Tracy Pumping Plant. Like the dams and canals, these pumping plants are part of the initial CVP authorizations.

Pumping plants with adequate integrity are considered individually eligible for the National Register for the following reasons:

Criterion A: They are significant in the social, economic, or industrial development of the area.

Criterion B: They are the direct results of a prominent individual associated with the CVP and best embody the contributions of that individual.

Criterion C: They are significant in the history of pumping plant engineering, in the history of pumping plant design principles, or in the development of construction techniques; they are an innovative and/or rare surviving example of a type of pumping plant; they are significant representative examples of a Reclamation-designed pumping plant.

Criterion D: They have the ability to yield information important to understanding the history of the CVP. None of the CVP pumping plants are eligible under this criterion.

However, some pumping plants that are integrated into canals as part of their regulating systems, such as the four pumping plants on the Contra Costa Canal, would be considered as contributing features (buildings) to the canal's historic function.

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Pumping Plant #3, Contra Costa Canal (Contributing Feature) (Bureau of Reclamation, Jim Bailey)

However, some pumping plants that are integrated into canals as part of their regulating systems, such as the four pumping plants on the Contra Costa Canal, would be considered as contributing features (buildings) to the canal's historic function.

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GEOGRAPHICAL DATA

The geographical limits of this CVP Multiple Property Listing include the following 35 California Counties: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Kern, Kings, Lassen, Madera, Mariposa, Merced, Modoc, Monterey, Nevada, Placer, Plumas, Sacramento, San Benito, San Joaquin, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Stanislaus, Tehama, Trinity, Tuolumne, Yolo, and Yuba.

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H. SUMMARY OF IDENTIFICATION AND EVALUATION METHODS

The Multiple Property Documentation Form for the CVP's Historic Engineering Features is based on both research and fieldwork. The foundation for much of this report is the unpublished Bureau of Reclamation History Program manuscript *Central Valley Project*, which details not only construction histories but also post-settlement and project impact narratives drawn mostly from archival sources. Other important sources include the various official Bureau of Reclamation *CVP Project Histories* that, while informative, tend to be inconsistent in scope and content. Additionally, the narrative draws upon various government and policy works that look at the complexities behind the CVP's congressional authorizations. Important secondary works by historians Norris Hundley, Jr., Marc Reisner, and Gerald D. Nash (see sources) place California's water and economic histories, respectively, into proper context.

To complete the form, additional research was conducted to develop the sections on passage of the Reclamation Act and the CVP's various stages of authorization. Field research also yielded information on property types and specific engineering features (historic and non-historic) associated with the project's operations. Fieldwork to the sites was also conducted—including detailed digital photography of all historic features—in association with the research. Files in Reclamation offices yielded little information.

The information on the Federal Reclamation program, passage of the Reclamation Act, and the CVP's conceptual beginnings provide the necessary background to place this unusually large and complex project into broader national context, and establish its significance. Contexts are then established into six primary sections: California's Pre-CVP Agricultural Economy, 1850-1935; Pre-CVP Water Issues, 1850-1935; CVP Authorizations I, 1920-1940: Shasta, Delta, Friant Divisions; CVP Authorizations II,

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1940-1956: American River Division; Planning and Construction of Historic CVP Engineering Features, 1937 to 1956; and Non-Historic CVP Engineering Features 1956-2000: An Overview. Although the final context briefly examines all the non-historic CVP divisions/units completed after 1956, the completion of the first stage of the American River's Folsom Unit in 1956 provides a logical cutoff point. Additionally, this Multiple Property Listing is designed to facilitate future amendments, as currently non-historic CVP divisions like Trinity and New Melones become historic and National Register-eligible.

This Multiple Property Listing organizes property types according to function. Four different categories were identified: storage; water conveyance structures; powerplants; and pumping plants. Requirements for integrity were based on limited fieldwork and similar studies completed for other Reclamation projects.

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J. FIGURES AND MAPS OF THE CVP
(All courtesy U.S. Bureau of Reclamation)

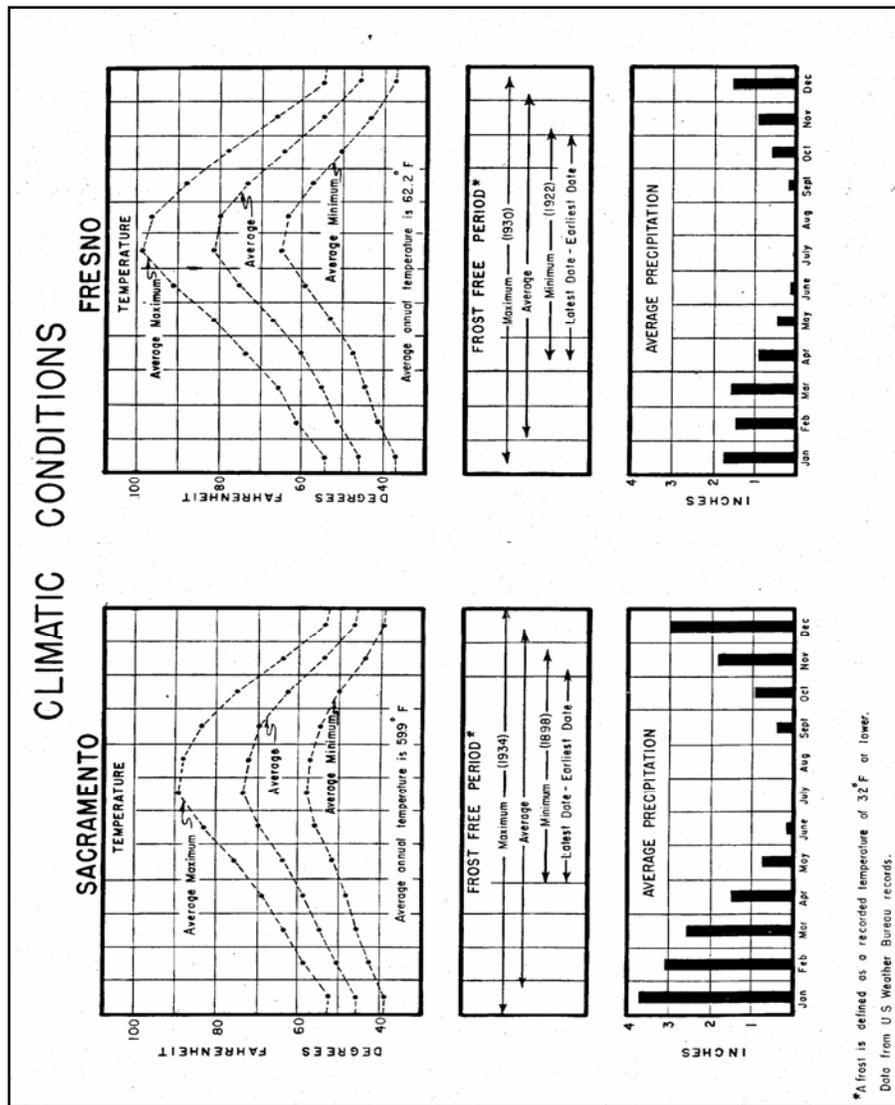


Figure J-1: Climatic Conditions, Sacramento vs. Fresno

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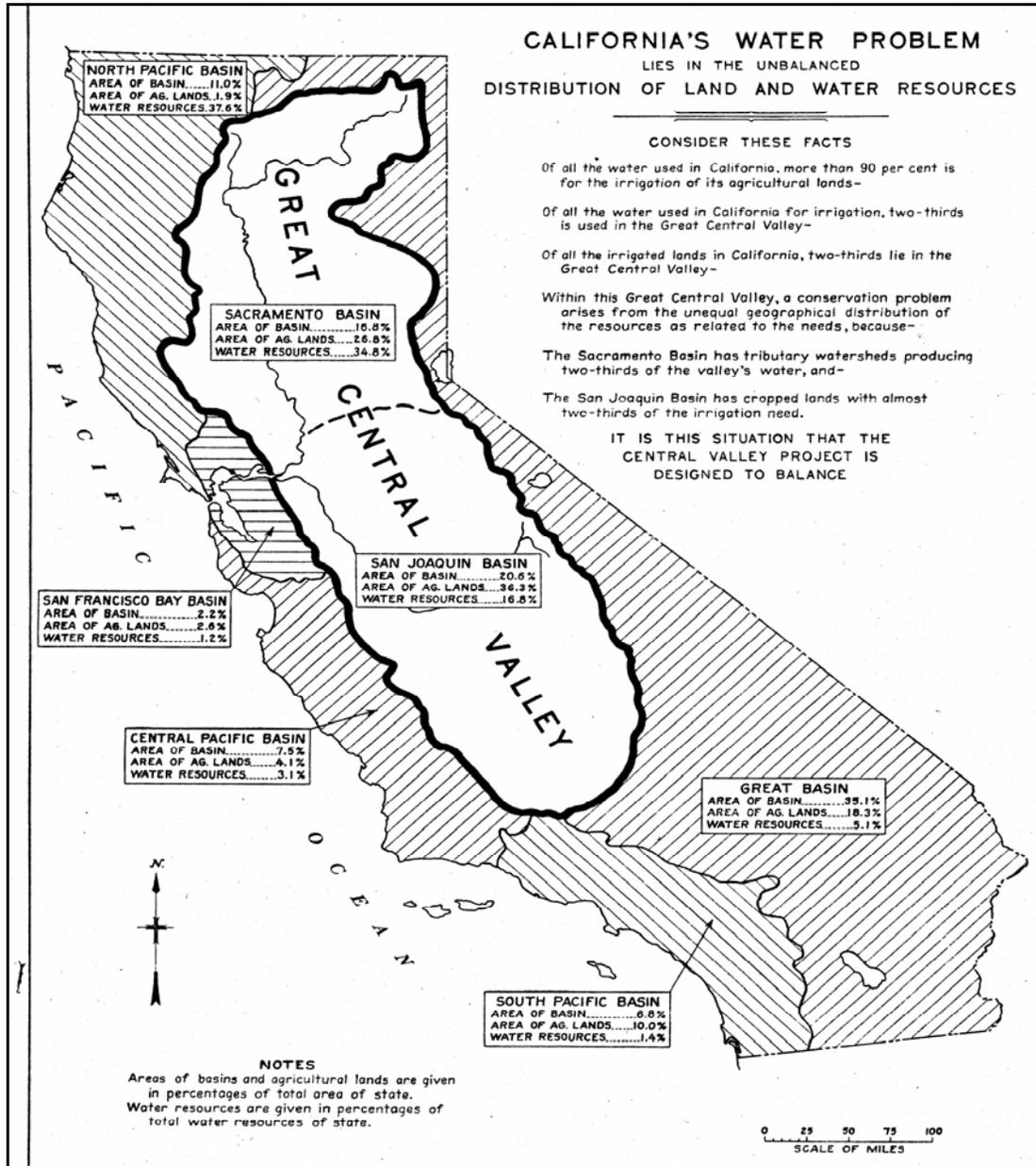


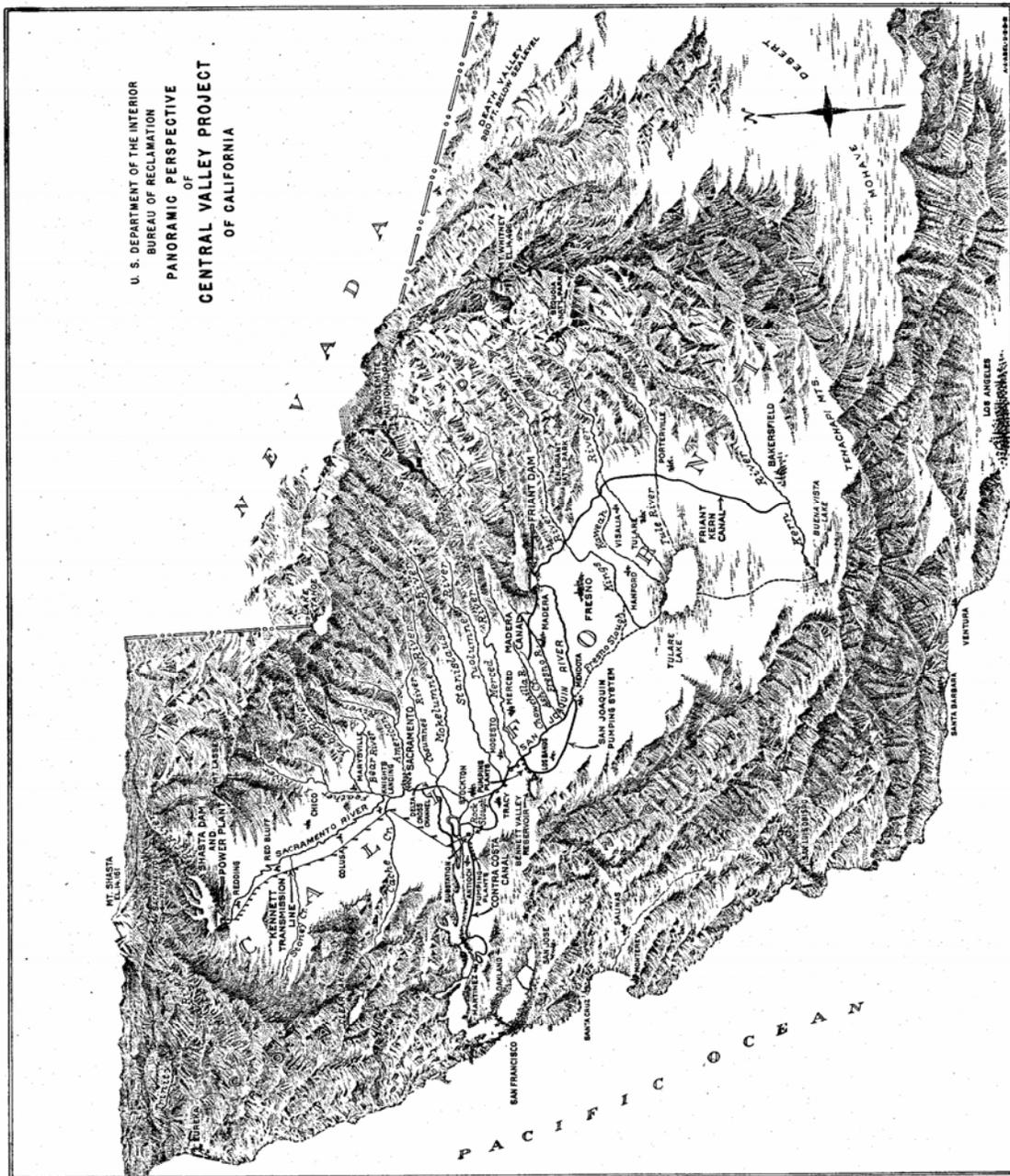
Figure J-2: California's "Water Problem"

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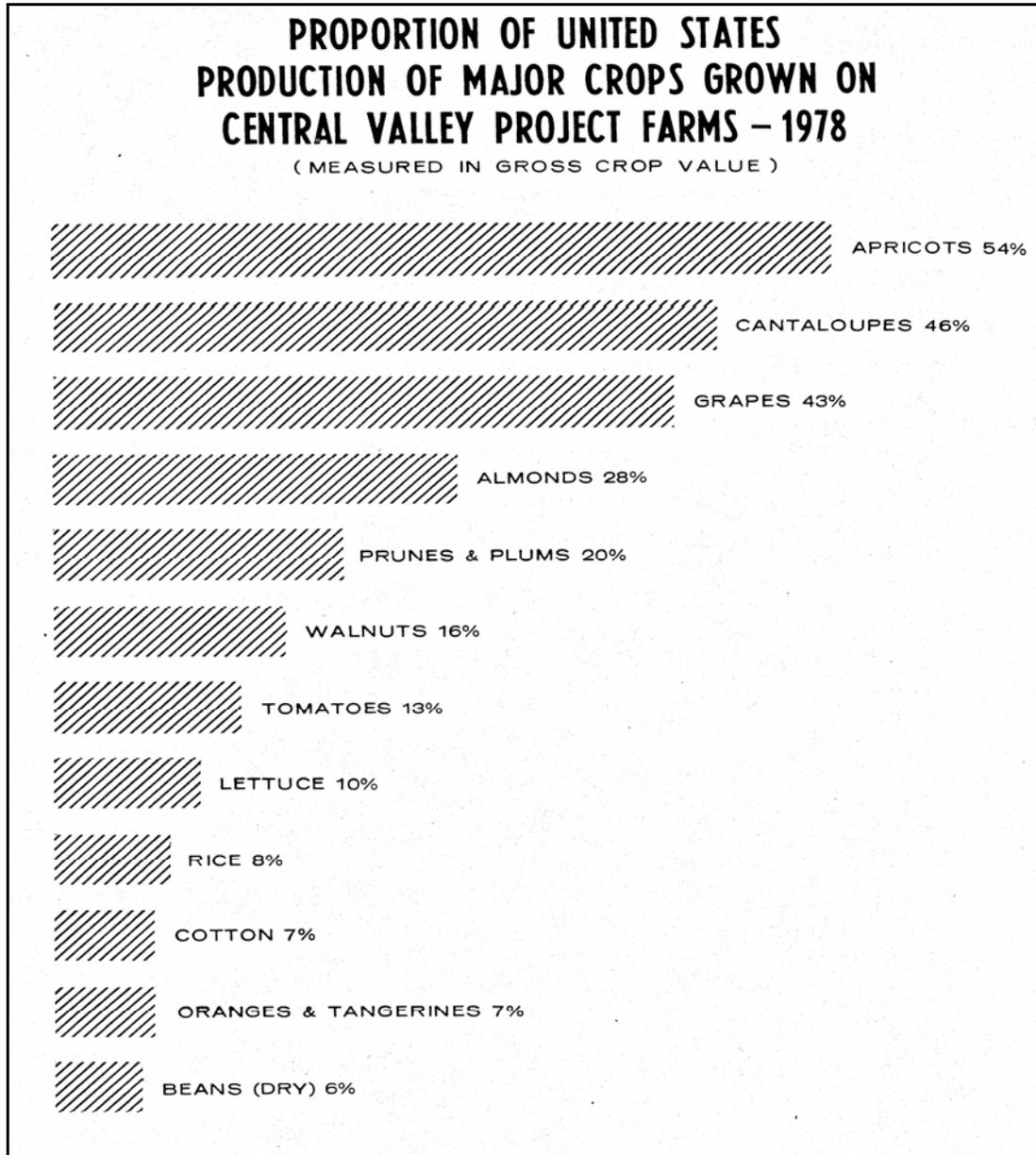


Figure J-4: Percentage of U.S. Crops Grown on CVP-Served Farms, 1978