

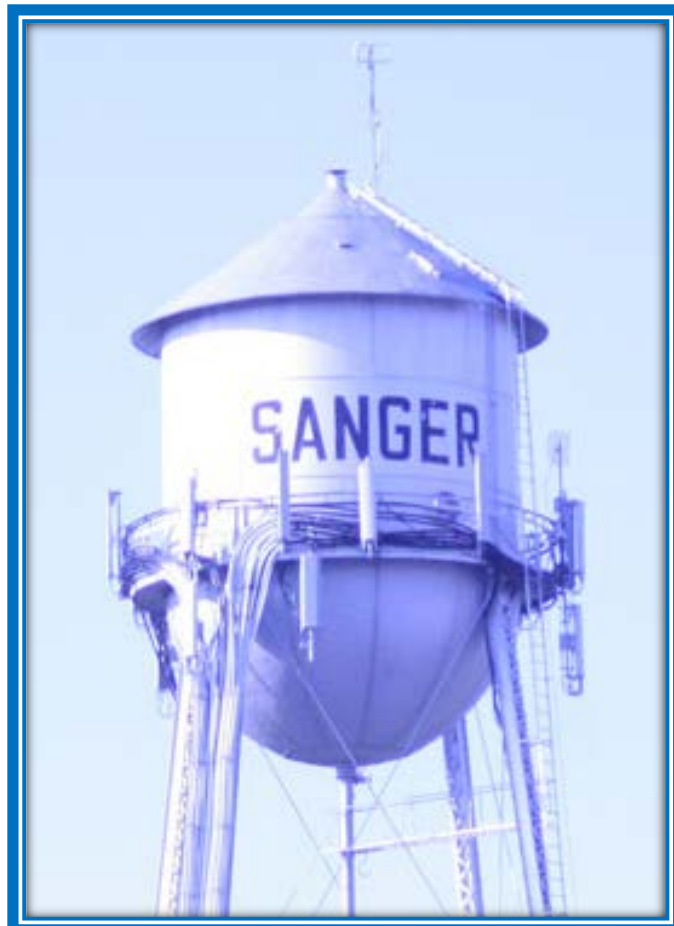
SCADA System Upgrades for Accuracy, Efficiency and Reliability

City of Sanger, California

1700 7th Street • Sanger, CA 93657 • Phone: (559) 876-6300

Project Manager: John Mulligan, Public Works Director

jmulligan@ci.sanger.ca.us



**WaterSMART Grants: Small-Scale
Water Efficiency Projects for Fiscal Year 2017**

Funding Opportunity Announcement No. BOR-DO-17-F011

May 2017

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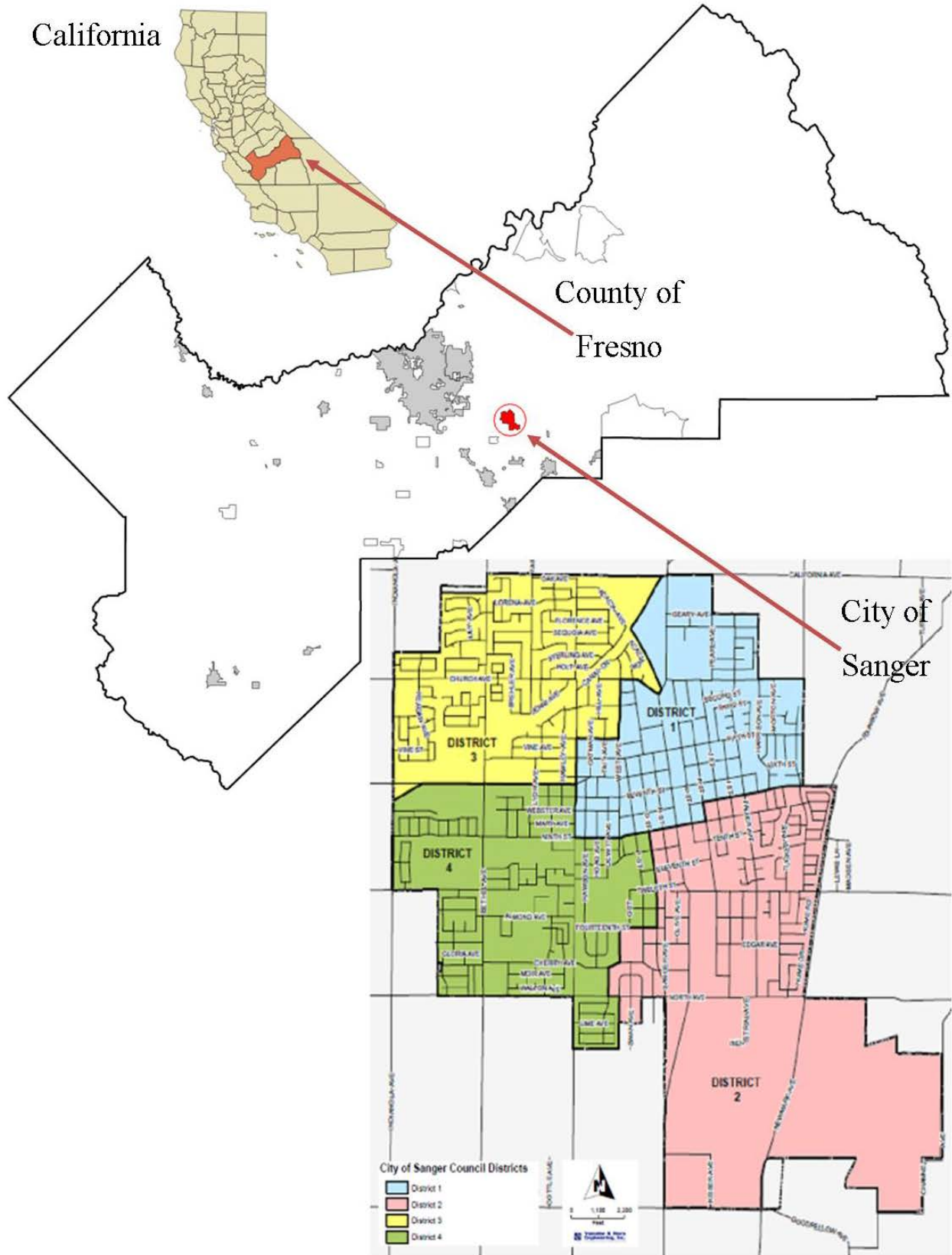
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Technical Proposal

Executive Summary

May 2017 • City of Sanger, Applicant • Sanger, Fresno County, California

The SCADA System Upgrades for Accuracy, Efficiency and Reliability project is a small-scale on-the-ground efficiency project which seeks to implement policies identified in the City of Sanger Urban Water Management Plan (UWMP). It will improve the Supervisory Control and Data Acquisition and Automation (SCADA) system that operates the Sanger municipal water system by installing Programmable Logic Controllers (PLCs), magnetic flow meters and associated communications equipment at each of the well sites. Reliability of the water system will be greatly improved and water consumption will be measured more accurately, making it possible to detect and correct inefficiencies in water use. Because the improvements will be installed on existing equipment at City-owned, operational well sites, implementation will take only several months and will have no significant environmental impacts. Installation will be timed to avoid shutting down wells during periods of high water demand. If a funding agreement is in place early in 2017-18 the project will be completed by the end of the fiscal year. No Federal facilities are involved.

Background Data

Sanger is located in Fresno County in the central San Joaquin Valley in Central California, not far from the Sierra Nevada foothills. It is four miles east of the edge of Fresno, the county seat and a city of over half a million residents. Maps on the previous page show Sanger's location.

Sanger's municipal water system had its 100th birthday a few years ago. The town's first water works were developed in 1890 by J.S. Filloon and consisted of a boiler room, pump house and water tower. In 1904, Frank Kummeth took over and operated the water works until 1914 – three years after Sanger was incorporated – when he sold them to the City for \$8,513. A still-utilized steel tower and water tank (depicted on the cover) were erected at Fifth Street and Academy Avenue in the first major improvement to the City system, which has been continually expanded and gradually modernized ever since. Some of the aging components have been replaced, but portions of the water system are in serious need of upgrade – especially those that monitor and control well production.

Consolidated Irrigation District controls surface water around Sanger, but groundwater is the sole source of potable water for the City. Sanger is located in the San Joaquin Valley basin of the Tulare Lake hydrologic region. Specifically, the City falls within the Kings sub-basin, 5-22.08, consisting of an area of approximately 976,000 acres.

Depth to groundwater in the Sanger area varies from 0 feet near the Kings River bottom to approximately 43 feet, according to groundwater contour maps prepared by the California Department of Water Resources. Flows are generally northeast to southwest. The river and runoff from the Sierra Nevada foothills help to recharge the aquifer, with much of the river flow

resulting from snow melting high up in the mountains to the east. The City of Sanger operates its own storm water collection system, which includes numerous ponding basins, and these ponds allow water to percolate, seasonally recharging the groundwater basin. In addition, the City operates its own secondary effluent percolation basins. The effluent basins continuously hold water, generating constant recharge that increases the reliability of the groundwater supply in the Sanger area.

Sanger has eight active wells, one well on standby and two old but functional above ground storage tanks, each with a capacity of around 70,000 gallons. They supply water through a distribution system consisting of 4, 6, 8, 10 and 12 inch diameter water mains. In September 2016 Sanger was awarded a \$1.2 million grant from the U.S. Economic Development Administration that is paying for a third above ground tank with a capacity of 750,000 gallons that will enhance the City's ability to serve industry. It will have booster pumps controlled by pressure valves that will allow pressure to be maintained in the system at peak times.

Sanger utilizes activated carbon treatment to remove the pollutant dibromochloropropane (DBCP), a now-banned agricultural pesticide, from water produced by two wells. This treated water and water from the wells that do not require treatment is chlorinated prior to delivery. The water meets all State and Federal water quality requirements.



Sanger's water treatment equipment

The City is capable of producing 14,458 acre feet of water per year from its wells, which have an average depth of 235 feet. As of 2005, when the last adopted UWMP was prepared, demand was 5,364 acre feet of water per year. The City is now in the process of updating that plan. When the 2005 Master Plan was prepared the population was 21,883 persons; today it is over 25,000 – about 10 times the population at its incorporation. Sanger has grown steadily throughout its history: 2,578 residents in 1920; 4,017 in 1940; 8,072 in 1960; 12,542 in 1980; and 16,763 in 1990.

The Sanger water system has about 6,210 residential service connections, plus it serves commercial, industrial and institutional users.

Project Description

The project involves the installation of equipment that will allow the SCADA system to perform reliably and efficiently and allow water consumption to be monitored and controlled accurately so conservation measures can be implemented effectively.

Modern PLCs are badly needed. EtherLogic equipment in place is obsolete. Technical support and replacement equipment are no longer available. PLCs are industrial digital computers which have been “ruggedized” and adapted for activities that require high levels of reliable control, ease of programming and process fault diagnosis. They are now widely used as high-reliability automation controllers suitable for harsh environments. Accuracy is imperative because a PLC is a “hard” real-time system that must produce output results in response to input conditions within a limited time or unintended operation will result. Harsh conditions, age and obsolescence have made the existing equipment impossible to trust.

“Should the central data collector at City Hall fail we would lose SCADA until a new PLC system is installed,” says George Jasso, Chief Operator of the Sanger water system. “This would cause a water related crisis.”

The consequences of continuing to rely on aging propeller flow meters and analog communications may not be as dire as a SCADA system failure, but the avoidable water losses that are occurring are undoubtedly substantial. They result from an inability to match up flows measured at the well heads with the volumes recorded by the SCADA system. The discrepancies make it difficult to isolate leaks, unauthorized water use, overwatering or other instances of excessive consumption. The solution is to install modern magnetic flow meters and digital communication equipment.

Currently the propeller flow meters – some of which are over 20 years old – generate 4-20 mA current signals that send to SCADA averages of their flow readings. Totals of those averages don’t match the actual volumes recorded at the wells by the flow meters. Accurate volumes would be conveyed to SCADA by implementing digital technology (real time reads or pulse counters).

The SCADA System Upgrades for Accuracy, Efficiency and Reliability project can be rapidly implemented because the City owns all the well sites, no adverse environmental impacts will result from replacement of the affected equipment, and any permits that are required are within the City’s authority to issue. Once equipment is procured installation will require only a few months worth of labor, though water demand will make it prudent to wait until the peak season is over (probably September) before work commences at the nine operational well sites. The project will be completed in no more than one year from the time a funding agreement is executed.

Evaluation Criteria

Criterion A – Planning Efforts Supporting the Project

“The loss of SCADA due to obsolete hardware is a catastrophe waiting to happen,” according to Chief Operator George Jasso. A shutdown of the system would be a hazard to health and safety anytime even without considering the possibility of it occurring during an emergency, such as a structure fire or extreme heat wave. The UWMP identifies specific water-critical customers such as hospitals, nursing facilities, schools, and individual customers with medical conditions

dependent on continuous water availability. Sanger's emergency planning efforts are dedicated to minimizing the possibility of a water supply crisis.

State law (California Water Code Division 6, Part 2.6) requires the City of Sanger to address water system reliability (10631 (c)). The UWMP declares, "As the water purveyor, the City must provide the minimum health and safety water needs of the community at all times. The water shortage response is designed to provide a minimum of 50% of normal supply during a severe or extended water shortage." Since even a 50% supply may not be possible to deliver in the case of hardware failure, the City must plan to replace suspect components.

Water system needs are being extensively discussed among City staff and decision makers as the update to the 2005 Master Plan is being prepared, and installation of PLCs has risen to the top of the list. Magnetic flow meters and digital communication equipment are also high priorities as the City seeks to conserve water and more accurately measure the savings.

In the 2005 Master Plan the City reported unaccounted-for water losses of 10 percent or more since 1991 when comparing well production records and customer meter readings. Alleviation of these losses was a top priority. A meter replacement program was launched, and a State Department of Water Resources grant funded replacement of 30,000 feet of leaking mains, but substantial water losses remain. The variations in flow records undermine efforts to implement an accompanying UWMP priority: quantifying reductions in water use. For example, the effectiveness of landscape irrigation and car washing restrictions imposed during the recent drought – the worst in California's recorded history – proved difficult to evaluate.

Criterion B – Project Benefits

New, up to date PLCs will make a huge difference in the reliability of operation of the Sanger water system. The threat of malfunction of the SCADA system and a resulting shutdown of the water system will be reduced to a small fraction of the current level. Confidence in accurate and effective operation of the PLCs will greatly increase. Coupled with the increase in the accuracy of flow metering resulting from installation of magnetic flow meters and digital communications equipment, Sanger water operators will have the management tools they need to determine where water losses are occurring and how to alleviate them. Collaboration and information sharing about the newly-implemented technologies could benefit other water managers in the region.

If just half of the water losses are eliminated the savings could amount to over 80 million gallons of water per year (5% x 5,000 acre feet x 325,851 gallons per acre foot). Reduced consumption would result in less chance of groundwater over drafting, more water available in the Kings sub-basin, and a bigger reserve for Sanger customers.

Reduced losses would also result in a more efficient water system operation. Less water would have to be pumped to achieve the same deliveries to customers, which would conserve electricity, extend the lives of pumps and other components, and benefit rate payers, since municipal utility charges are based on actual costs of operation.

Criterion C – Project Implementation

The project can be quickly implemented. The City of Sanger owns the well sites where work will occur and it has the authority to issue all necessary permits. Because the project consists only of removal and replacement of equipment on existing wells, piping and control panels, there is no possibility that significant environmental effects could occur. Once equipment has been ordered the only potential delays would be waiting for delivery and then timing the work to avoid shutting down wells during periods of high water demand.

The detailed plan, including major tasks, milestones, and dates:

- June 2017: Announcement of grant awards by Reclamation
- June-July 2017: Preparation of a grant agreement by Reclamation; review and execution
- July 2017: Submittal of plans and specifications and applications for permits to the City of Sanger Public Works and Planning Departments
- July-September 2017: Procurement of equipment – bidding/pricing, ordering, delivery
- August 2017: Issuance of plumbing, electrical and encroachment permits by the City
- September 2017-March 2018: Installation of equipment, programming of the SCADA system
- April-June 2018: Submittal of final invoices and reports to Reclamation, close-out activities

No new policies or administrative actions are required to implement the project.

Criterion D – Nexus to Reclamation

The Sanger water system – which relies on groundwater pumping – does not directly connect to a Bureau of Reclamation project, but the Kings River that flows past Sanger and recharges the groundwater basin does (see the aerial photograph, next page). Pine Flat Dam, about 20 miles upstream from Sanger, provides flood control and irrigation and is jointly managed by Reclamation and the Army Corps of Engineers.

Other Reclamation projects are found in the Kings sub-basin as part of the Central Valley Project, such as the California Aqueduct and Friant-Kern Canal. Water savings resulting from the Sanger project will benefit the entire Kings sub-basin.

Environmental and Cultural Resources Compliance

- The proposed project will have no significant impact on the surrounding environment (e.g., soil, air, water or animal habitat) with no earth-disturbing activity, minimal noise and limited used of power equipment.
- The work sites are all operational well sites in urban areas so there is no critical habitat and there is no evidence of any species listed or proposed to be listed as a Federal threatened or endangered species.



- The project boundaries include no wetlands or other surface waters that potentially fall under Clean Water Act jurisdiction as “Waters of the United States.”
- Sanger’s first water works were constructed in 1890 though it is unlikely that any of those facilities are still in use. The system expanded in step with the City as Sanger has grown to 10 times its size at the time of incorporation in 1911. Components like the two existing water towers continue to be used after almost a century. Because much of the City’s growth occurred during the last few decades, a large portion of water system is much newer.
- No irrigation system modifications will directly occur as a result of the project. Once the project makes it possible to isolate wasteful water uses it is possible that irrigation modifications will occur in an effort to curb water losses.
- The only building, structure, or feature with a Sanger address listed on the National Register of Historic Places is not within the city limits and will be unaffected by the proposed project. The Stoner Mansion at 21143 E. Weldon Avenue is approximately 10 miles northeast of the City.

- The well sites where work will occur do not encroach upon any known archeological sites.
- The proposed project will not have a disproportionately high and adverse effect on low income or minority populations. Well sites are distributed throughout the City and the work will not result in adverse effects.
- The proposed project will have no known effect on Native American sacred sites or tribal lands.
- The proposed project will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area.



Treated wastewater, in percolation ponds and applied to crops, helps to recharge the groundwater basin at the Sanger wastewater treatment plant.

Required Permits or Approvals

The City would routinely issue the only kinds of permits that would be required for the sort of project proposed (an encroachment permit and plumbing and electrical permits.)

Official Resolution

Attached is an official resolution of the Sanger City Council that meets the requirements stated in Funding Opportunity Announcement BOR-DO-17-F011, including:

- That the City of Sanger will provide the amount of funding specified in the funding plan; and
- That the City will work with Reclamation to meet established deadlines for entering into a grant or cooperative agreement.

Budget narrative

SALARIES AND WAGES: None are budgeted.

FRINGE BENEFITS: None.

TRAVEL: Any travel costs will be absorbed by the City of Sanger.

EQUIPMENT: Counting the standby well, there are nine wells that will receive magnetic flow meters, which cost \$8,368.88 each for a 10-inch connection (eight wells) and \$4,355.17 for an 8-inch connection (one). Also, sales tax of 9.5% will be applied to the \$71,306.21 subtotal, adding \$6,744.09. A bundled price was quoted for the Programmable Logic Controllers, associated equipment and taxes, \$34,664. Equipment makes up 75% of the cost of the project, \$112,714.30.

MATERIAL AND SUPPLIES: Costs will be minor and will be absorbed by the City.

CONTRACTUAL: The other 25% of the project costs are incurred in installing the flow meters (\$750 each, total of \$6,750.00), tying them into SCADA (\$500 each, total of \$4,500.00), and programming the Programmable Logic Controllers (\$26,035.70), making sure SCADA operates flawlessly. Contractors account for \$37,285.70 of the budget.

ENVIRONMENTAL AND REGULATORY COMPLIANCE COSTS: The minor costs of filing categorical exclusion and exemption environmental documents and obtaining permits will be borne by the City.

OTHER EXPENSES: None identified.

INDIRECT COSTS: None charged to the project.

TOTAL COSTS: \$150,000, with half (\$75,000) being defrayed by the City, and half coming from Reclamation.

RESOLUTION NO. 2017-17

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SANGER
APPROVING THE APPLICATION FOR GRANT FUNDS FOR
WATERSMART GRANTS:
SMALL-SCALE WATER EFFICIENCY PROJECTS FOR FY 2017

WHEREAS, the US Bureau of Reclamation has been delegated the responsibility for the administration of this grant program, establishing necessary procedures; and

WHEREAS, said procedures established by the US Bureau of Reclamation require a resolution certifying the approval of application(s) by the Applicants governing board before submission of said application(s) to the Bureau; and

WHEREAS, the applicant, if selected, will enter into an agreement with the Bureau of Reclamation to carry out the Project.

NOW THEREFORE, IT IS HEREBY RESOLVED, by the City Council of the City of Sanger, State of California as follows;

1. The City Council and appropriate official have reviewed and support the application submitted and approves the filing of an application for the City of Sanger Water Well Efficiency Upgrades; and
2. Certifies that applicant understands the assurances and certification in the application; and
3. Certifies that applicant will have sufficient funds to provide the amount of funding and/or in-kind contributions specified in the funding plan; and
4. Appoints the City Manager, or designee, as agent to conduct all negotiations, execute and submit all documents including, but not limited to applications, agreements, payment requests and so on, which may be necessary for the completion of the aforementioned project(s).

* * * * *

I hereby certify that the foregoing is a full, true and correct copy of a Resolution duly and regularly adopted and passed by the City Council for the City of Sanger, California, at a regular meeting held on the 20th day of April, 2017 by the following vote:

AYES:	COUNCIL MEMBERS:	GONZALEZ, ONTIVEROS, GARZA, MARTINEZ
NOES:	COUNCIL MEMBERS:	NONE
ABSTAIN:	COUNCIL MEMBERS:	NONE
ABSENT:	COUNCIL MEMBERS:	HURTADO



Rebeca Hernandez, City Clerk