

February 10, 2011

Project No.: 204-00-08-18

Mr. Akin Okupe
Senior Civil Engineer
City of Woodland
655 N. Pioneer Avenue
Woodland CA 95776

SUBJECT: Response to a Public Comment on the City of Woodland
Draft Groundwater Management Plan

Dear Mr. Okupe:

This letter summarizes the response to a comment received from a member of the public on the City of Woodland's draft Groundwater Management Plan during the public review period. On December 2, 2010, Ms. Christine Shewmaker, a Woodland resident, submitted a comment to members of the Woodland City Council and Water Resources Association of Yolo County. The full text of Ms. Shewmaker's comment is provided in Attachment A.

The comment included a request to address climate change in the document. The Groundwater Management Plan has been revised to reflect Ms. Shewmaker's request. Attachment B documents the changes that were made to the document. These changes are summarized as follows:

- Section 2, Basin Description and Agency Water Supplies, includes a new discussion of climate change research and potential impacts, and introduces the concepts of adaptive management and mitigation as tools for addressing the impacts of climate change and the uncertainties associated with these impacts (See Section 2.1.3, Climate Change).
- Section 3, Groundwater Management Goal and Plan Components, includes a new plan component entitled, Adaptive Management and Mitigation in Response to Climate Change. This section provides a discussion of Woodland's ongoing efforts to diversify water supplies, conserve water, participate in regional planning efforts, and other measures classified as adaptive management strategies by authoritative sources. The following actions are identified (Section 3.3.4, Adaptive Management and Mitigation in Response to Climate Change):

“Continue to review scientific and policy updates related to climate change as they become available through the IPCC, State, CUWA and other climate change authorities. Continue to implement the components of this groundwater management plan. Continue to include adaptive management principals in water supply and infrastructure planning.”

- Figure 3-1, Groundwater Management Plan Components, now shows “Climate Change” with “Groundwater Sustainability” as a groundwater management plan component.

Mr. Akin Okupe
February 10, 2011
Page 2

We appreciate Ms. Shewmaker's interest in reviewing the draft groundwater management plan and her insight on the need to address climate change in the document. We hope that the revisions made to the document fully address her concerns and that the revised document provides the City of Woodland with the planning tools needed to address the range of groundwater management issues, including climate change.

Sincerely,

WEST YOST ASSOCIATES



Kenneth L. Loy
Principal Hydrogeologist
P.G. #7008

KLL:nmp

attachments

Attachment A

On December 2, 2010, Ms. Christine Shewmaker, a Woodland resident, submitted the following comment to members of the Woodland City Council and Water Resources Association of Yolo County.

Dear members of the WRA and the Woodland City Council:

Thank you for the opportunity to comment on the Draft of the Groundwater Management Plan for the City of Woodland.

The impacts of climate change are becoming ever more evident. This is very clear here in California and California may be one of the earlier geographic areas to feel the effects. The water supply in California is one of the resources that is predicted to be impacted heavily. In 2009, the California Natural Resources Agency released a study "California Climate Adaptation Strategy" (<http://www.climatechange.ca.gov/adaptation/index.html>) One of the areas that was highlighted in the report was water. In discussing water management challenges in a warming California at the top of the list was "*Reduced Water Supply from the Sierra Snowpack*" (See page 80 of the report for further information and figures <http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-F.PDF>) Just recently the Task Force on California's Adaptation To Climate Change released a report "Preparing for the Effects of Climate Change" <http://www.pacificcouncil.org/climatechange/report> They highlight water as a area of risk and in an editorial (<http://www.sacbee.com/2010/11/21/3199398/the-conversation-californiamust.html>) they state that they "*conclude that California must prepare for a future that is likely to bring more frequent and intense rains and droughts, higher temperatures,.....*" At a forum here in Woodland, Elissa Lynn with the Department of Water Resources (DWR), described what she called atmospheric rivers which are likely to be more intense in the future due to climate change. In fact, on the DWR website(<http://www.water.ca.gov/climatechange/>) it states that "*Climate change is having a profound impact on California water resources, as evidenced by changes in snowpack, sea level, and river flows . These changes are expected to continue in the future and more of our precipitation will likely fall as rain instead of snow. This potential change in weather patterns will exacerbate flood risks and add additional challenges for water supply reliability*". So with predicted lower Sierra Snowpack, and increased extremes in drought and rain, climate change will bring new challenges to water management in California. My opinion is that these challenges should be addressed in any plan for water in California for the future and therefore in the City of Woodland's Groundwater Plan.

In reading the draft I did not see climate change addressed. There is mention of dry periods in sections 2.1.1.2 and 2.3.1 but they do not address that these are predicted to worsen with climate change. In section 3.3.3, Sustainability, they do discuss conjunctive use, recycling and conservation. These are all efforts which can be used to help adapt to some of the effects of climate change on water, but they are not discussed as such.

It is my impression that California encourages the inclusion of climate change in water planning for the future. Whether it is required, I do not know. From my perspective, required or not, it is the right thing to do.

In summary, I urge you to include climate change in this plan. Some mention of the challenges and possible solutions or approaches needs to be included. It could be a section or subsection on its own, or it could be mentioned throughout the whole document.

The City has addressed Climate Change with the formation of a clean energy committee and by passing a resolution in 2008 committing to lower emissions and energy use. The City has made steps to address climate change and including climate change in this Groundwater Management plan would be an appropriate next step.

As many of you know, climate change in general is something I feel needs to be addressed and aggressively. It needs to be considered in all areas of planning as we go forward. Water is clearly one of those areas.

I look forward to any comments and to seeing climate change addressed in the Groundwater Management Plan.

Attachment B

2.1.3 Climate Change

National and international research for the past several decades has indicated a growing concern that our climate is changing, to a large extent due to human activities related to the generation of greenhouse gasses such as carbon dioxide. In the past there has been substantial uncertainty, and some doubt in public discourse and debates. Over the last few years there have been landmark advancements in scientific studies, ultimately leading to major conclusions in the Fourth Assessment of the Intergovernmental Panel on Climate Change (IPCC).

The IPCC was established to provide the decision-makers and others interested in climate change with an objective source of information about climate change. It was set up by the World Meteorological Organization and the United Nations Environment Programme, and has served since 1988 as a clearinghouse for research and policy discussions related to climate change. The role of the IPCC "...is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced worldwide relevant to the understanding of the risk of human-induced climate change, its observed and projected impacts and options for adaptation and mitigation" Agencies of the United States government have provided major input to both research and discussion, particularly through the U.S. Geological Survey. Science organizations worldwide have been following climate change research and in 2009 the Academies of Sciences from 13 nations issued a letter calling for urgent and coordinated action to combat climate change.

The IPCC has issued four major "assessments" of the status of climate change research, current levels of understanding, and potential policy implications. The Fourth Assessment Report was released throughout 2007, indicating for the first time clear links between human activities and global warming. The Fifth Assessment Report is scheduled for finalization in 2014. The historical and projected continued warming of the earth has and will continue to cause changes to our climate. While such induced "climate change" has implications to a number of environmental factors, of concern in this discussion is implications to water supply reliability.

The State of California has provided major focus and funding on climate change research and impacts, with particular focus on developing both "adaptation" and "mitigation" strategies. In the context of climate change and its impacts to water resources, "adaptation" is simply the identification and development of strategies to cope with the expected impacts to water supply reliability. "Mitigation" is the identification and development of actions that will reduce the drivers for climate change; for the most part this translates into programs to reduce greenhouse gas emissions and lower the "carbon footprint" of activities associated with water supply and use.

The State's research and continuing recommendations are readily available. The State's Climate Action Team has noted a clear connection between water use and energy consumption, and consequently also with greenhouse gas production (see California Climate Change Portal for the most recent technical and policy information: <http://www.climatechange.ca.gov/>). The 2005 California Water Plan Update addressed climate change and water in a general way, noting the many potential interconnections as well as the potentially serious impacts of ongoing climate change on water supply reliability. The 2009 Update to the California Water Plan addresses this topic in a more substantive way (<http://www.waterplan.water.ca.gov/climate/index.cfm>), and includes recommendations and advice on how to incorporate climate change into long-term water

resources planning. It is also recommends specific actions in the areas of adaptation and mitigation as discussed above.

DWR maintains an updated web site on climate change and California's water resources (<http://www.water.ca.gov/climatechange/>). That web site notes, in part: "Climate change is already impacting California's water resources. In the future, warmer temperatures, different patterns of precipitation and runoff, and rising sea levels will profoundly affect the ability to manage water supplies and other natural resources. Adapting California's water management systems to climate change presents one of the most significant challenges for the 21st century". In 2006 DWR published a major report on climate change and California's water resources, *Progress on Incorporating Climate Change Into Management of California's Water Resources*. This was summarized and updated in a paper published in a special issue of the *Journal of Climate Change* in 2008 (http://www.dwr.water.ca.gov/climatechange/docs/CCprogress_mar08.pdf). In 2010, DWR provided another update entitled *Climate Change Characterization and Analysis in California Water Resources Planning Studies*. This report provides a summary of the climate change characterization approaches and methodologies that have been used in recent planning studies conducted by DWR and its partner agencies. The report is intended for use by DWR to consider how to include climate change analyses in planning studies, with emphasis on the State Water Project planning studies.

Collectively, this State information provides the most updated information related to potential specific impacts of water supply reliability in California related to impacts of a changing climate.

DWR and others have done studies to model potential future impacts at the regional level on both streamflow and temperature. The focus has been on the Sacramento River system since it is a major source of water for much of California.

The different models are split on whether future annual average runoff will be wetter or drier. Other studies make it clear, however, that we are likely to see more extreme hydrology: more floods and droughts, regardless of the "average" hydrology. However, these same regional models agree that the future will likely be warmer than it is today.

Other potential changes include less snowpack, earlier runoff from snowmelt, more precipitation as rain than snow, changes in the amount and timing of stream flows, changes in water resources system operations, and rising sea levels. In turn, these changes could have serious impacts to water supply reliability, including water quality. DWR has confirmed that some impacts have been underway for many years. For example, the historical Sacramento River snowmelt runoff has been decreasing as a percentage of total annual flows for much of the 20th century. This is an indication of a long-term decrease in snowpack, and perhaps an increase in wintertime flows and floods.

There are few published examples of water supply adaptation and mitigation strategies. In December 2007 the water user organization, California Urban Water Agencies (CUWA), published a summary report of a survey of its 11 large urban water agencies on this topic (CUWA agencies are major urban water utilities throughout the state, and include such agencies as the Metropolitan Water District of Southern California, East Bay Municipal Utility District, and the San Francisco Public Utilities District). This report, "Climate Change and Urban Water Resources, Investing for Reliability", identifies a number of adaptation and mitigation strategies currently being employed to address climate change. The table below lists some of these strategies. The CUWA report is available on their web site: http://www.cuwa.org/library/ClimateChangeReport12_2007.pdf.

CUWA Adaptation and Mitigation Examples	
Adaptation Examples	Mitigation Examples
Develop groundwater storage	Renewable energy generation
More aggressive conservation	Conserve energy in water facilities
Water transfers	Decrease energy use in fleet, equipment
Optimize local storage	Increase employee incentives for action
Develop regional water projects, partnerships	Develop methane offsets (biogas at wastewater facilities used in place of natural gas or other fuels)
Take leadership role on this issue	Take leadership role on this issue

Despite the high level of attention both in California and internationally, there is very little information developed on the potential impacts of climate change on groundwater. The principal concern is rising sea level and potential salinity intrusion into coastal groundwater aquifers. While this is a concern for coastal areas of California, it is not a concern in the portion of Yolo groundwater subbasin near the City.

While not addressed specifically in IPCC reports, there are potential impacts to groundwater resources that have been discussed over the past few years. These include the following concerns:

1. Decreased reliability of surface water supplies could lead to increased reliance on groundwater, further stressing such supplies.
2. Changes to surface water hydrology – increased winter flood flows, reduced spring and summer snowmelt runoff – could decrease groundwater recharge.
3. Increased landscape and irrigation water demands due to increased temperatures will further increase pressures on groundwater supplies.

3.3.4 Adaptive Management and Mitigation in Response to Climate Change

The City's commitment to the development of diversified water supplies, including both groundwater and surface water sources, will provide opportunities for adaptive management and mitigation in response to climate change. Some of the potential impacts of climate change on water supply are discussed in Section 2.1.3. However, specific impacts to the City's water supplies can not be predicted with certainty. The available data and information on the potential impacts to groundwater are especially limited. The City will use adaptive management and mitigation approaches to address the potential water supply-related impacts of climate change and the uncertainty associated with these impacts. The groundwater sustainability measures discussed in the previous section, including implementation of the Davis Woodland Water Supply Project (DWWSP) and water conservation, will be important tools in both strategies. Potential adaptive management strategies include:

- Development of groundwater recharge, storage, and conjunctive use projects
- Water transfers
- Development of regional water projects and partnerships
- Water conservation
- Optimization of local storage

The City's involvement in the DWWSP will enable implementation of several of these strategies, and the City has implemented the others in its service area. Groundwater storage will be increased as a natural consequence of the DWWSP. Average annual groundwater use by the City will decline because of the DWWSP, and this will result in additional groundwater in storage, assuming groundwater use by others does not increase. Through the Woodland-Davis Clean Water Agency (WDCWA), the City is also evaluating Aquifer Storage Recovery (ASR). ASR is the storage of water in the aquifer during times when water is available and recovery of the water from the aquifer when needed at a later time. There is potential to use seasonally available excess capacity in the DWWSP water treatment plant (WTP) to treat Sacramento River water, which could then be injected through existing or new municipal wells. This water could then be extracted from the same wells during times when surface water is less available to meet municipal demands. A key advantage of this ASR concept, with respect to climate change, is that it would provide a reliable source of supply to the City without placing additional demands on the overall surface water and groundwater supply of the region. ASR could result in water quality benefits within the portions of the groundwater basin underlying the City, because the quality of the recovered water would be similar to the quality of treated surface water.

Water transfers are also a tool used in the DWWSP. The DWWSP's certified Environmental Impact Report evaluated a range of water transfer alternatives. Because the environmental review of these water transfer alternatives has been completed, they can more easily be considered as part of an adaptive strategy to mitigate future dry conditions.

The City is a member of the WDCWA, the entity implementing the DWWSP, and the WRA. The WDCWA is actively engaged in implementing the DWWSP, and the WRA is an active participant the Westside Regional Water Management Group (RWMG). The Westside RWMG represents entities in the Cache Creek and Putah Creek watersheds. The watersheds of these two creeks encompass portions of Yolo Counties, Solano, Lake, Colusa, and Napa. Public agencies in the Westside RWMG coordinate with each other at present, and in the future will cooperate more closely with overlapping and immediately adjacent regions, such as the northern Sacramento

Valley. The Westside RWMG was recently awarded a \$1 million Prop 84 planning grant for use in preparing the Westside IRWMP. The Westside IRWMP is expected to be completed in 2013.

The City has also embarked on a water conservation program, as described in Section 3.3.3.4. The City's water conservation efforts are expected to result in a 20 percent in reduction in demands by 2020, as mandated by the State in SB7. In addition to the water supply benefits of this conservation program, energy will be conserved, thereby potentially aiding in the control of green house gas emissions.

The City is evaluating measures to optimize storage of potable water, potentially using ASR, as part of its ongoing planning for future capital improvements. The City is coordinating these evaluations with the DWWSP planning efforts through its involvement in the WDCWA.

Action: Continue to review scientific and policy updates related to climate change as they become available through the IPCC, State, CUWA and other climate change authorities. Continue to implement the components of this GWMP. Continue to include adaptive management principals in water supply and infrastructure planning.

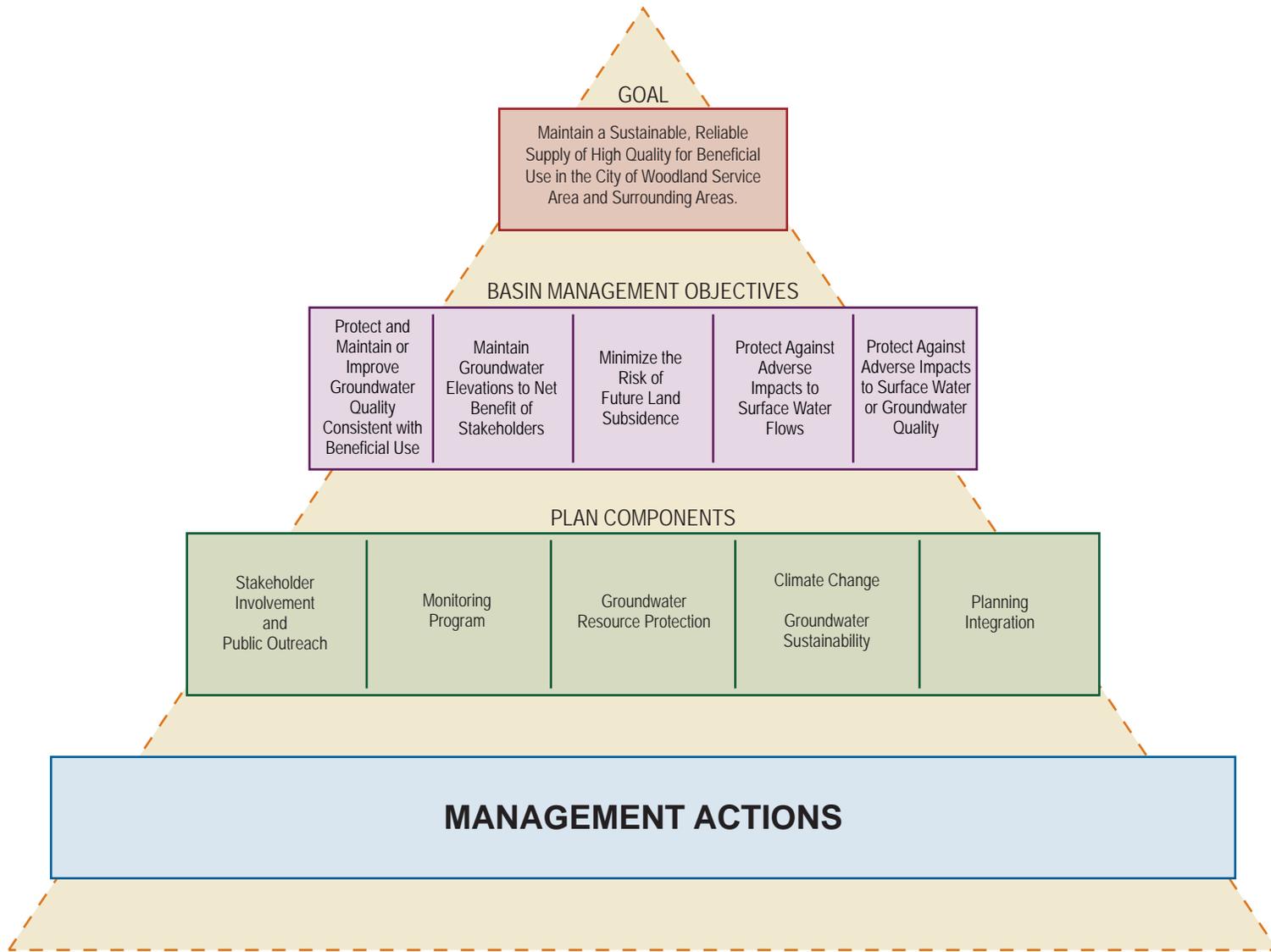


Figure 3-1
City of Woodland
Groundwater Management Plan
 GROUNDWATER MANAGEMENT COMPONENTS

