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BUCKEYE/SUN VALLEY AREA DRAINAGE MASTER STUDY TECHNICAL DATA NOTEBOOK

CONTRACT FCD 2002C027

VOLUME VIII: SUPPORTING DOCUMENTS

FINAL

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PREPARED FOR



2801 W. DURANGO STREET
PHOENIX, ARIZONA 85009-6399

PREPARED BY



7310 N. 16TH STREET, SUITE 310
PHOENIX, ARIZONA 85020-5250
PHONE: (602) 943-1003 FAX: (602) 943-1303

IN ASSOCIATION WITH



**Buckeye/Sun Valley
Area Drainage Master Study
Preliminary Subsidence Engineering Report**

June 2004



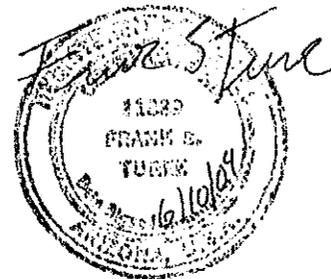
Prepared for

2801 W. Durango Street
Phoenix, Arizona 85009-6399

Prepared by

PBSJ

7310 N. 16th Street
Phoenix, Arizona 85020



Volume VIII consists of the following:

- **Preliminary Subsidence Engineering Report**
- **Area 4 Review Memorandum**
- **Alluvial Fan Memorandum**
- **Public Involvement Plan**
- **Project Administration Report (Meeting Minutes & Review Comments)**

Preliminary Subsidence Engineering Report

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Abbreviations

ADWR – Arizona Department of Water Resources

Buckeye/Sun Valley ADMS – Buckeye/Sun Valley Area Drainage Master Study

BIC – Buckeye Irrigation Company

CAP – Central Arizona Project

District – Flood Control District of Maricopa County

InSAR – Interferometric Synthetic Aperture Radar

RID – Roosevelt Irrigation District

1.0 Introduction

1.1 Purpose and Goals

The purpose of this investigation is to complete geologic, hydrogeologic and engineering assessments of available information to develop a preliminary evaluation of regional land subsidence within the Buckeye/Sun Valley Area Drainage Master Study (Buckeye/Sun Valley ADMS) area. Specifically, the goals are to determine whether:

- There is an on-going process of land subsidence and earth fissuring.
- There is no credible evidence of the potential for land subsidence.
- There is a potential for land subsidence and earth fissures to develop in the future in response to large groundwater withdrawals.

1.2 Project Overview

The Buckeye/Sun Valley ADMS study area is located in Maricopa County, Arizona and is defined by surface drainage basin areas. The study area includes portions of the Town of Buckeye. The Buckeye/Sun Valley ADMS study area (Figure 1-1) extends from the north, where the Hassayampa River enters the valley near U.S. Highway 60, south to the Gila River, a distance of about 37 miles. The width of the study area varies from about three miles in the north to about 15 miles in the south.

The Buckeye/Sun Valley ADMS area can be divided into two portions for this subsidence study. The northern part includes the portion of the study area extending from where the Hassayampa River enters the valley, south to the Roosevelt Irrigation District (RID) canal. There is very little development in this portion of the Buckeye/Sun Valley ADMS area and very little groundwater pumping. The southern portion of the study area extends from the RID canal, south to the Gila River. This portion of the area has been developed for irrigated agriculture and there is extensive groundwater pumping. The hydrogeology of the southern portion is very different from the northern portion.

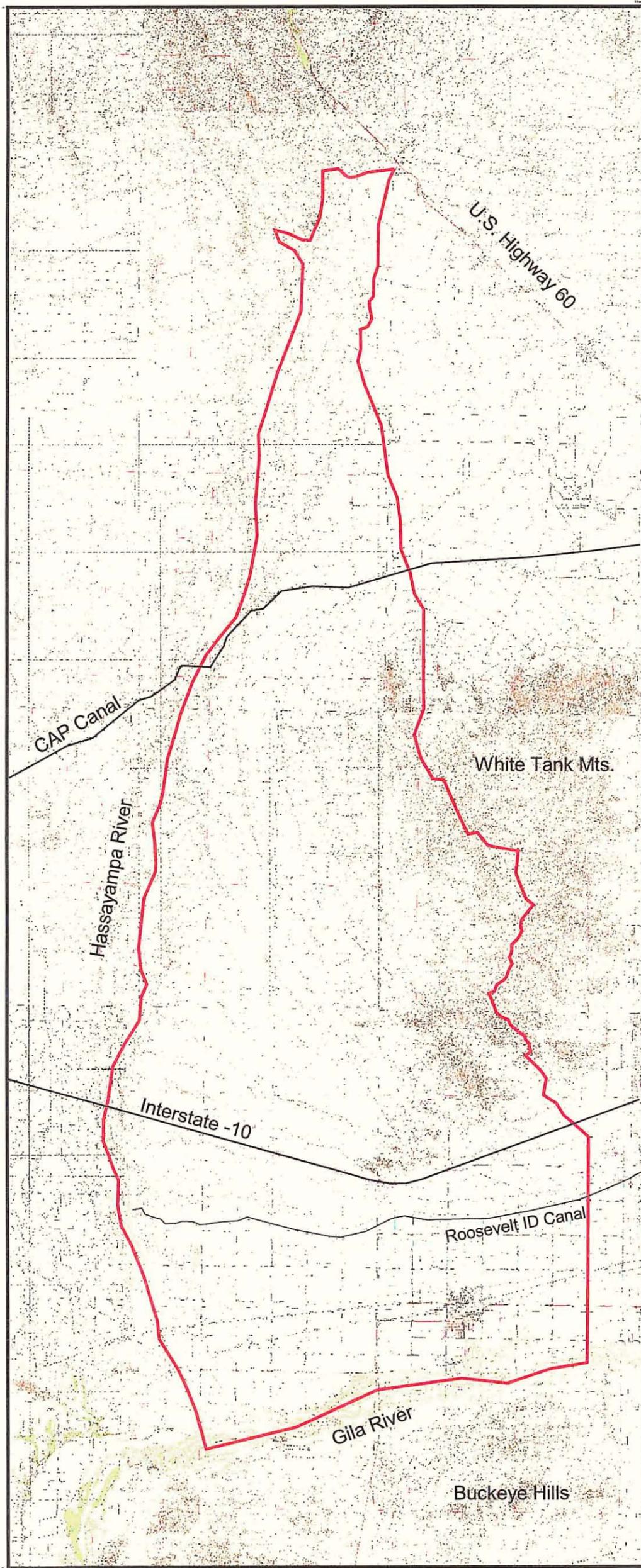


Figure 1-1
 Buckeye/Sun Valley
 ADMS Study Area

2.0 Land Subsidence

It is necessary to define what regional land subsidence and earth fissuring are before addressing if there is an on-going process of land subsidence in the Buckeye/Sun Valley ADMS area. Land subsidence is a general term that is often used when a decrease in the surface elevation of the land is noted. In some cases, what is called land subsidence is really a local condition that is a result of soil compaction. In other cases the land subsidence is a regional condition that occurs subsequent to the dewatering of an aquifer and can affect a large area. The focus of the Buckeye/Sun Valley ADMS subsidence evaluation is regional land subsidence and the associated earth fissuring..

2.1 Soil Compaction

Soil compaction is a local condition that results in the lowering of the land surface that is often called land subsidence. Soil compaction is commonly observed when a building settles and cracks occur in the foundation or walls of the structure. In other cases, a dip along the top of a long structure such as a canal bank or flood retarding structure berm is noted. Geotechnical investigations are conducted to determine why the local soil conditions changed. Several soil conditions can produce this local lowering of the land surface; including poorly compacted fill, the nature of the minerals of the soil and soil structure.

Poorly compacted fill or soils can often result in soil compaction. Some structures require raising the land surface or installing a building pad. Fill soil materials are imported and compacted to provide a good base for the structure. If the fill is not properly compacted, it can settle over time due to the weight of the structure or due to over-watering of landscaping. In some cases, the fill is properly compacted but the surrounding soil is not. Buildings or structures constructed in agricultural areas may be subjected to soil compaction. Historic agricultural activities disturbed the soils and the weight of the structure and fill can compact the underlying soils. This is a local condition related to the location of the structure and occurs in the top few feet of the soil horizon.

There are locations throughout central Arizona where there are expansive soils. These are also called shrink/swell soils because the clay minerals expand when wet and will shrink or contract when dry. This is because the minerals absorb and lose water molecules in the clay mineral structure and this changes the volume of the minerals. Expansive clay soils can occur over large areas but the soil compaction is noted when it impacts a local structure such as a home, canal, dam or pipeline. Expansive clay soils impacts are a relatively shallow condition because the soil volume changes are related to the depth moisture can penetrate and evaporate in the soil horizon.

There are areas in central Arizona with dispersive soils also called collapsing soils. Dispersive soils are fine-grained soil layers associated with flood deposits on alluvial fans. The soil lattice structure is deposited in a random pattern rather than an aligned pattern where the long axis of the soil particles line up parallel to the land surface. When the dispersive soils are saturated, the soil lattice can compact especially if the weight on the soil is increased by a structure. This type of soil is a concern when it is under a canal or flood retarding structure because percolation from the canal or retained flood water can saturate the soil and the weight of the structure and water can provide the energy to compact the soil. This is a relatively shallow condition that occurs in the soil.

2.2 Regional Land Subsidence

In Arizona, regional land subsidence is associated with groundwater pumping and a regional lowering of the water table. In other parts of the United States, regional land subsidence is associated with groundwater pumping and also the collapse of underground mines and hydrocarbon withdrawals.

In central Arizona, the principal aquifer units are made of unconsolidated or poorly consolidated alluvial sediments that accumulated in the basins over long periods of time. In some locations, these sediments are more than 10,000 feet thick. Groundwater stored in the pore spaces of the alluvium is not compressible and even as the overlying sediments were deposited over time, the groundwater held the pore spaces open. When more groundwater is pumped than is replaced by natural or artificial recharge, the aquifer is overdrafted and the water table declines. Water in the pore spaces is removed and is not replaced. Without the groundwater, the pore spaces are compressed due to the weight of the overlying sediments and there is a regional lowering of the land surface. Regional land subsidence associated with groundwater mining can cover a large area and is deep seated within the stratigraphic sequence.

Several factors influence regional land subsidence, including the amount of water table decline, nature of the sedimentary materials and the amount of time the land has been subsiding.

The depth to groundwater varies throughout central Arizona from just below the surface along the Gila River near Buckeye to more than 600 feet below the surface in north Scottsdale. The trigger mechanism for land subsidence is not the depth to groundwater but rather the distance that the water table has declined. Studies have demonstrated that land subsidence is likely to occur in unconsolidated sedimentary materials if the water table has declined more than 100 feet (Gelt, 1992).

The nature of the sedimentary material influences the amount of land subsidence. Silt and clay sediments have a porosity that averages about 40 percent while sand has an average porosity of 30 percent and sand and gravel mixes has a porosity of about 20 percent (Driscoll, 1986). At first this may seem reversed because sand and gravel has large pore spaces that can easily be seen while silt and clay appear to be a solid mass. However, silt and clay have many small pores between the sediment grains and these total a large portion of the volume of the sediments. When the water table declines, sediments with the greatest amount of pore space are the most susceptible to compaction and most likely to produce land subsidence. In central Arizona where there has been significant water table decline and where there is a substantial thickness of fine-grained silt and clay sediments, a large amount of land subsidence has been recorded. In the area east of the White Tank Mountains in the Agua Fria River basin, the land has subsided about 18 feet (Leake, 1997).

The period of time the land has been subsiding will influence the total amount of land subsidence. Regional groundwater pumping can lower the water table five to 10 feet per year. This can produce a large change in the water table depth in a relatively short period of time. Land subsidence is a slow process and the land surface changes will occur over a long period of time once subsidence begins. Land subsidence is a process that is not easily slowed or reversed. Once the water table is lowered and compaction is initiated, the pore space is lost. Recharge can not cause the sediments to swell and recover the pore space. Recharge can reduce or eliminate water table decline and this can reduce the

amount of land subsidence that may occur in the future but once the land surface has been lowered it will remain lowered.

Land subsidence is a geologic hazard and can cause many problems particularly in facilities designed to function under gravity flow conditions such as storm drains and sanitary sewers. Land subsidence can lower the hydraulic gradient and reduce the conveyance capacity. Subsidence can also increase the gradient and produce flow velocities in pipelines and channels that exceed the recommended velocity. Land surveys are often impacted by land subsidence because the bench mark level stations used in topographic or elevation surveys will change and old surveys rapidly become obsolete. Land subsidence can impact flood control structures including flood control dams, basins, channels and floodways

2.3 Earth Fissuring

Earth fissures are a geologic hazard associated with land subsidence. Earth fissures are not the desiccation cracks that form in mud when it dries. Earth fissures are large, deep structural features. Commonly what is called an earth fissure is really a fissure gully, the erosion remnants of an earth fissure. When an earth fissure forms, it can be one inch wide but very long and extend several hundred feet below the surface. If the fissure intersects a surface drainage channel, storm water will flow into the fissure and erode it. The result is the large fissure gully shown in most photographs.

Earth fissures form due to horizontal and vertical stresses that occur in the sediments as a result of land subsidence. Land subsidence does not occur equally over the large area. The character of the subsurface sedimentary material changes from coarser near the mountains to finer toward the center of the basin. Finer materials have greater pore space and will compact more than the coarser materials. Consequently, the materials in the center of the basin will subside more than the edges of the basin with an equal amount of water table decline.

Another factor is the total water table decline because the amount of water table decline is greatest near the center of the concentration of pumping. Land subsidence will be initiated closer to the center of the decline and will have continued for a longer period than the land around the periphery of the water table decline. These conditions produce differential compaction and this causes a horizontal component of stress in the sediments. Buried bedrock ridges or structures such as the Luke Salt Dome in the West Salt River Valley will also produce differential compaction because the thickness of sediments that overlies these structures is less than the thickness of the sediments that surrounds them. The horizontal stress builds until the earth fissure forms, extending from several hundred feet underground to the surface.

Very few earth fissures have a vertical movement component. An example of a fissure with vertical movement is the Picacho fissure east of Eloy (Holtzer, 1984). The vertical impacts can be seen where the fissure crosses Interstate 10. Most of the earth fissures in the Phoenix area do not have a vertical component.

Earth fissures can impact a wide range of structures, especially if they erode into fissure gullies. Fissures and fissure gullies can crack water features such as canals, drainage channels and flood

retarding structures causing them to leak. Fissures can provide a path for surface pollution to reach groundwater and can lead to contamination of water resources.

If an earth fissure forms it does not mean the land can not be used. The general design procedure to mitigate earth fissure impacts includes over excavation of the fissure area, installing a geofabric liner to prevent erosion of soils down the fissure, filling the excavation with a compacted engineered fill and designing the area so drainage flows away from the fissure area to prevent the formation of a fissure gully. Construction of storm water detention or retention structures should be avoided above an earth fissure. Conveyance channels can be constructed if sealed to prevent seepage into the engineered fill.

3.0 Information Sources

Existing records and published reports provided the foundation for these regional land subsidence analyses. The following is a summary of the information sources researched.

3.1 Study Area Wells

The Arizona Department of Water Resources (ADWR) maintains the well registration database and water level measurement information for Arizona. The well investigations included research of the ADWR well database records updated in June 2003 (ADWR, 2003). The well registration database includes the well location, registration number, owner, depth drilled, water production, well construction data and if there is a driller's log on file.

Figure 3-1 shows the Townships and Ranges in the study area. Using this map as the well location key, the ADWR records show that there are 1,175 registered wells in and around the Buckeye/ Sun Valley ADMS study area (Table 3-1). The records show 1,013 wells are located in the southern portion of the study area in the Ranges in Townships 1 North and 1 South, the agricultural area. The 162 other wells are located in the Ranges in Townships 2 through 6 North in the relatively undeveloped northern portion of the study area.

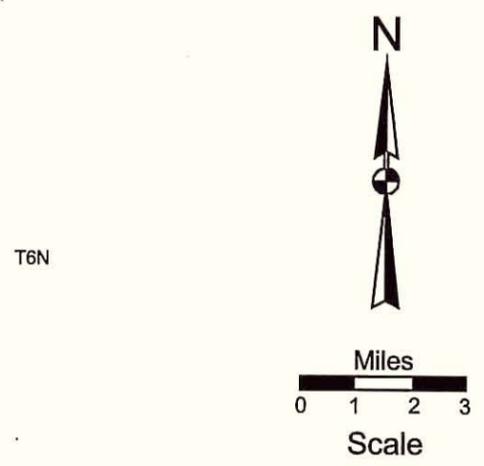
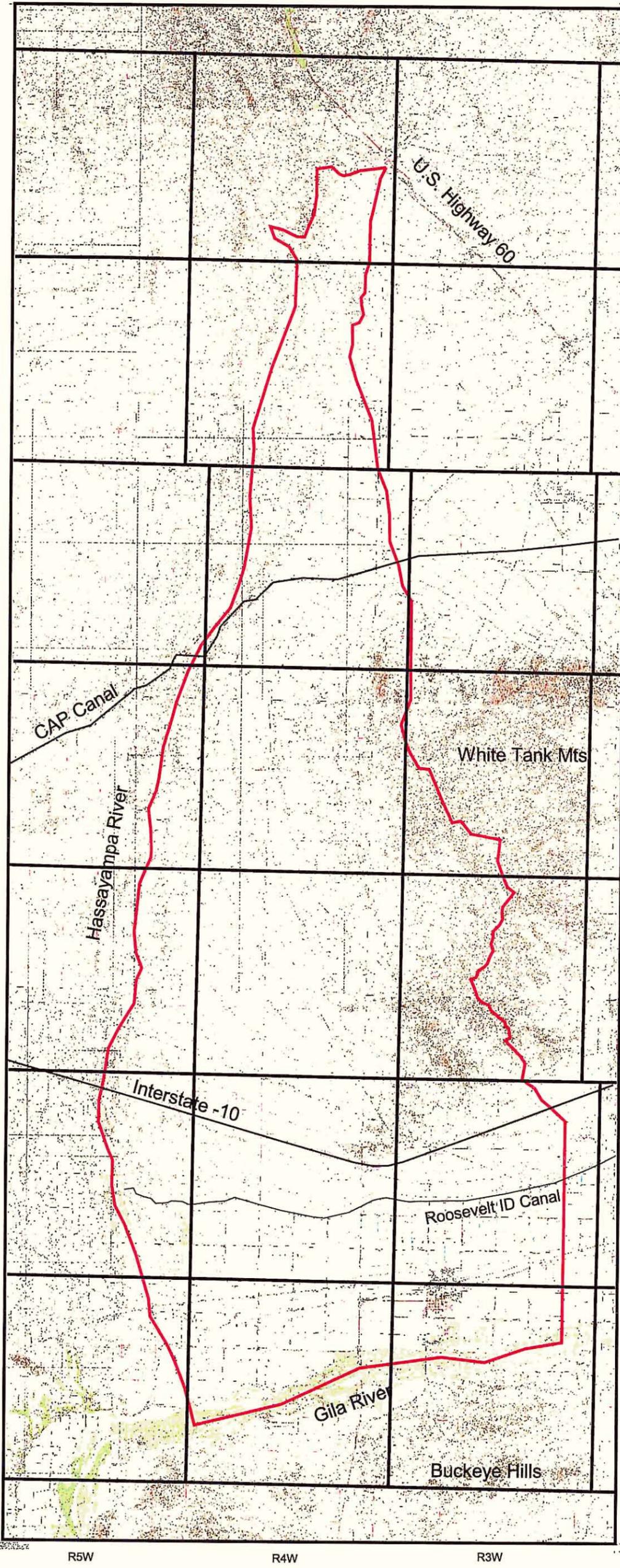
Registration records were used to identify the deepest wells with driller's logs. Information contained on the logs included a record of the subsurface materials penetrated during well drilling. This was used to interpret the character of the subsurface materials in the area, thickness of the sediments and depth to bedrock. ADWR records were researched to obtain groundwater table information. ADWR periodically measures the depth to water in different regions of Arizona.

3.2 Interferograms

Interferograms are images produced by interpreting two Interferometric Synthetic Aperture Radar (InSAR) satellite images. InSAR is capable of remotely sensing small changes in the elevation of the land surface. Interferograms can show vertical changes in the land surface as small as 3.0 centimeters (about 1.2 inches). The period between InSAR images can be a few weeks or a few months. A longer period between images has the greatest potential to show land subsidence impacts.

While interferograms are a powerful new tool to identify areas of land subsidence, they do have limitations. The area included in a single pixel or picture element on an InSAR image may be as small as tens of thousands of square feet. An area of 10,000 square feet is equal to about 0.22 acres. This means interferograms are useful tools to identify large areas where land subsidence may be occurring.

Another consideration is that InSAR images are collected from space and atmospheric interference can influence the image and the interferogram produced using the image. Atmospheric interference can produce conditions that resemble land subsidence in the interferogram. This is why a single interferogram should not be used as the sole source of information to identify potential land subsidence. Additional interferograms, preferably with longer periods between InSAR images than the period in the interferogram with the suspected land subsidence, should be viewed to verify land



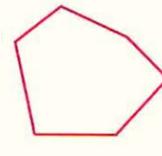

 ADMS Study Area

Figure 3-1 Townships and Ranges in the Buckeye/Sun Valley ADMS Study Area

**Buckeye/Sun Valley
Area Drainage Master Study
Contract FCD 2002C027**

Table 3-1 Study Area Well Summary

Township and Range	Domestic or Public Supply	Irrigation	Stock	Piezometer or Monitoring	Geotech Mineral Cathodic	Drainage	Abandoned	Total Registered Wells
T1S, R3W	63	13	11	68	12	13	12	192
T1S, R4W	124	29	13	32	11	7	9	225
T1S, R5W	27	13	0	39	4	1	8	92
T1N, R3W	115	29	5	17	8	0	5	179
T1N, R4W	118	65	8	4	1	0	2	198
T1N, R5W	70	46	4	1	0	0	6	127
T2N, R3W	0	0	0	0	0	0	0	0
T2N, R4W	5	1	1	2	0	0	3	12
T2N, R5W	14	0	1	0	0	0	0	15
T3N, R3W	0	0	0	0	0	0	0	0
T3N, R4W	4	0	2	2	0	0	1	9
T3N, R5W	1	2	1	1	0	0	0	5
T4N, R3W	0	0	0	0	0	0	0	0
T4N, R4W	6	1	7	2	2	0	3	21
T4N, R5W	0	0	0	0	0	0	0	0
T5N, R4W	6	0	0	0	0	0	2	8
T6N, R4W	62	7	6	4	12	0	1	92
Total wells in study area =								1,175



subsidence. It is also essential to verify if regional water table decline conditions exist that could be producing land subsidence.

Interferograms used in this Buckeye/Sun Valley ADMS subsidence evaluation were provided by ADWR. Dr. Sean Buckley of the University of Texas - Austin produced the interferograms for ADWR. The four images used in this evaluation are:

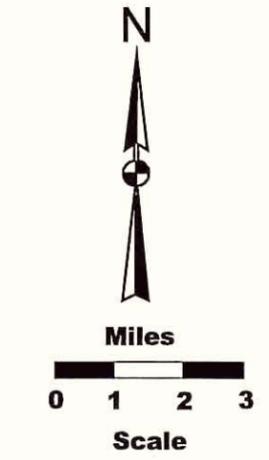
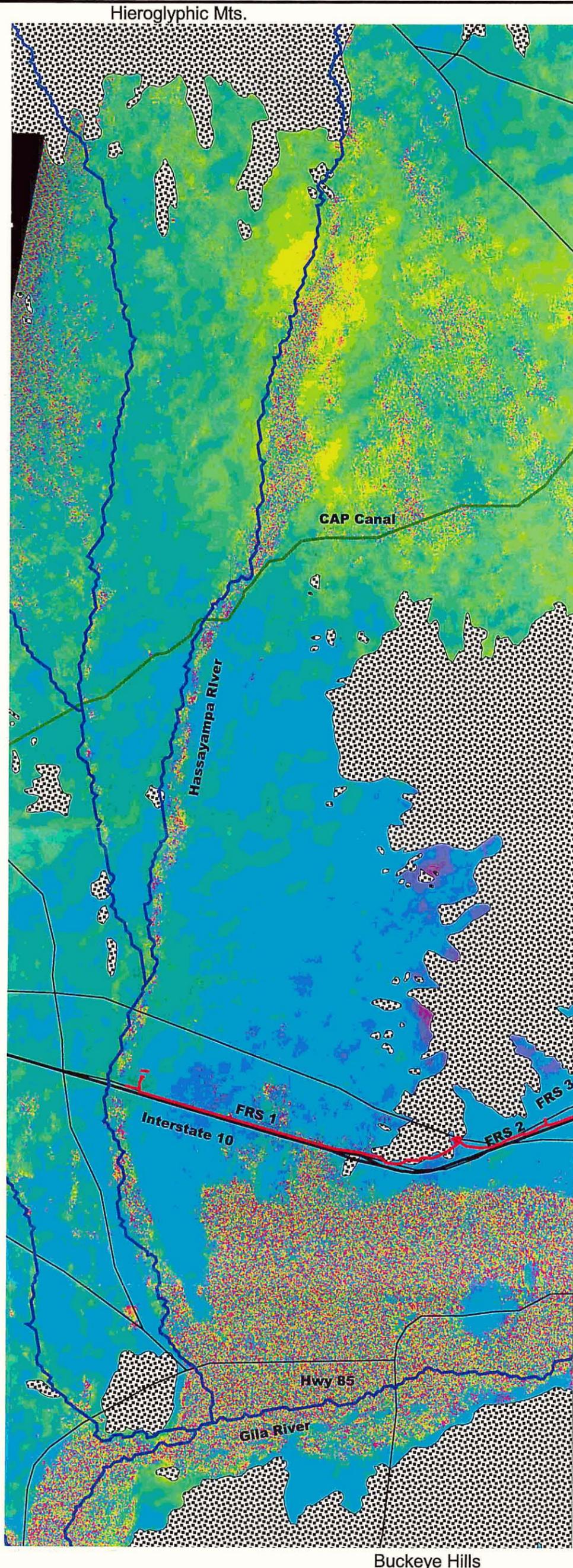
- Figure 5-2 June 8, 1998 to May 8, 2000, a 700-day interferogram
- Figure 5-3 December 30, 1996 to November 30, 1998, a 700-day interferogram
- Figure 5-4 December 30, 1996 to December 20, 1999, a 1,085-day interferogram
- Figure 5-5 March 10, 1997 to October 30, 2000, a 1,330-day interferogram

Disturbed ground with an uneven surface is shown as a fine-grained multi-colored area on the four interferograms. The Hassayampa River is not a smooth even surface and is a very distinct disturbed ground pattern on the four interferograms. Agricultural areas are also disturbed ground and the farmed lands in the RID, Buckeye Irrigation Company (BIC) and other irrigation districts along the Gila River can be readily identified in the four interferograms. ADWR added bedrock areas to the interferograms and these are represented by the stippled pattern on Figures 3-2 to 3-5.

3.3 Previous Hydrogeologic Reports and Subsidence Studies

The amount of geologic, hydrologic and groundwater information available for the Buckeye/Sun Valley ADMS area varies greatly. In the southern portion of the Buckeye/Sun Valley ADMS area, south of the RID canal, there are many wells, groundwater level measurements and studies that have defined the surface and subsurface geology. ADWR has a groundwater model that projects the future water table impacts in this area.

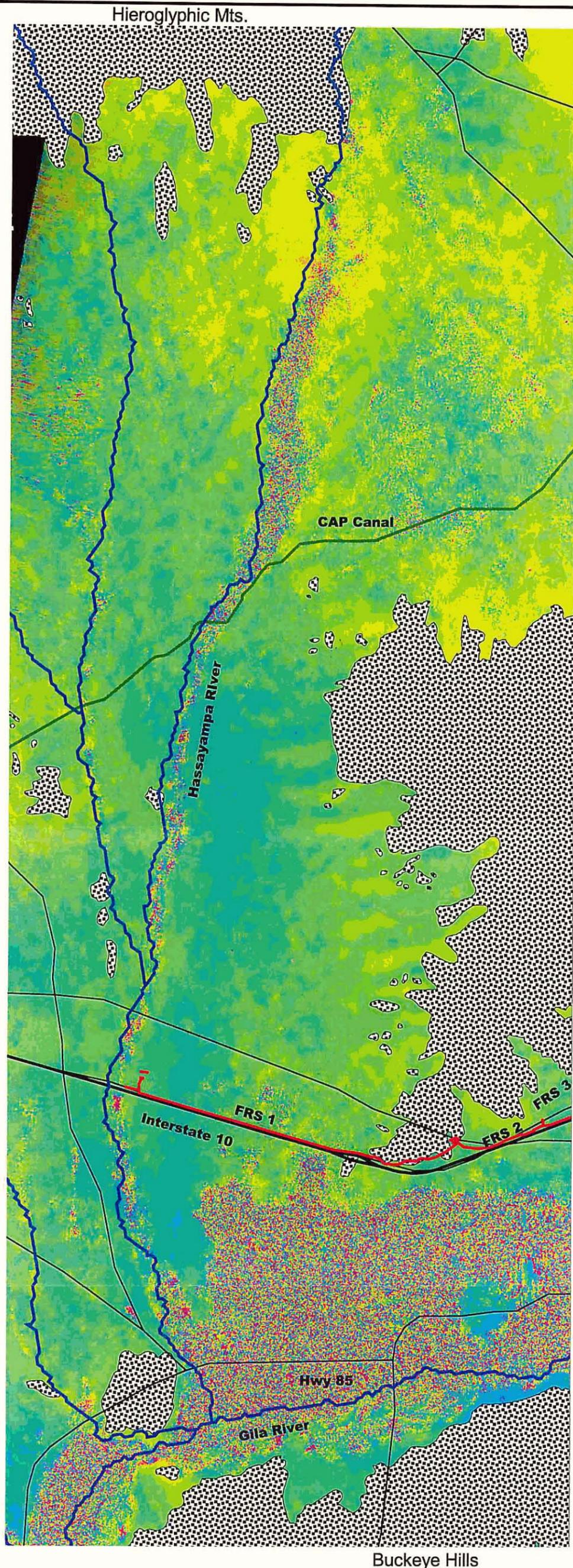
There is very little information available for northern part of the Buckeye/Sun Valley ADMS area. Very few wells exist and only a few studies have been completed. These studies were done to identify the water resources that may be available to support future land development projects. ADWR, the Town of Buckeye and the major landowners in this northern area are teaming to develop a groundwater model that ADWR will use to predict future water table changes and areas where the potential changes may produce the conditions that could result in land subsidence. This groundwater model may not be completed until Spring 2005. ADWR has collected the geologic and hydrologic studies that contain information that can be used in the proposed groundwater model. These studies were reviewed as a part of the data collection for this Buckeye/Sun Valley ADMS subsidence evaluation.



White Tank
Mountains

Interferograms produced by:
Dr. Sean Buckley
Center for Space Research
University of Texas-Austin
for the ADWR

Figure 3-2
Interferogram 12/30/96
to 11/30/98

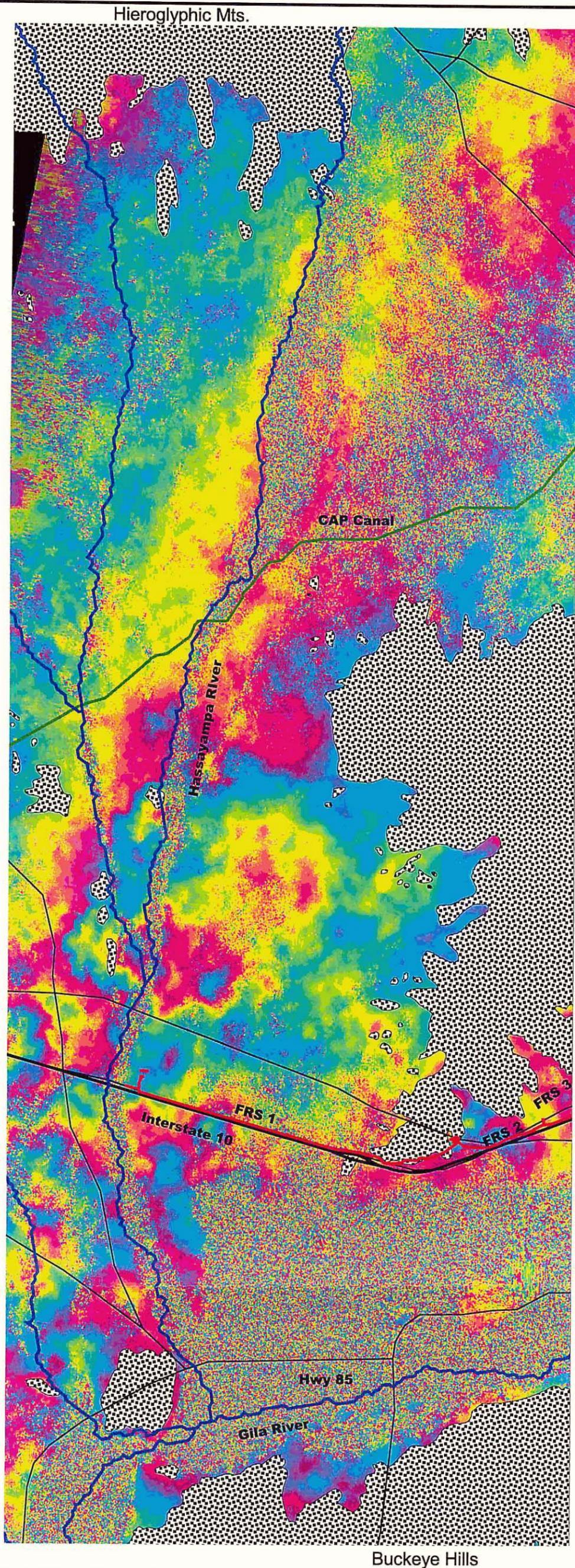


White Tank
Mountains

Interferograms produced by:
Dr. Sean Buckley
Center for Space Research
University of Texas-Austin
for the ADWR

Figure 3-3
Interferogram 12/30/96
to 12/20/97

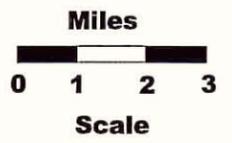
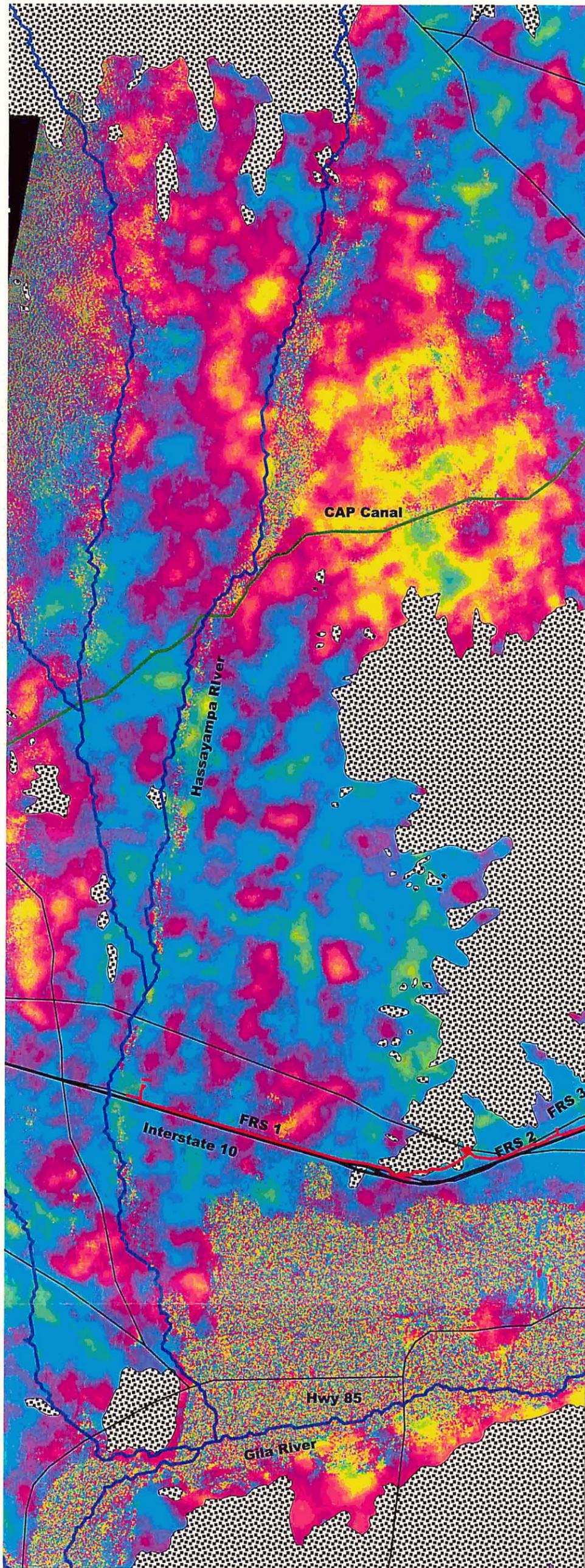
Buckeye Hills



White Tank
Mountains

Interferograms produced by:
Dr. Sean Buckley
Center for Space Research
University of Texas-Austin
for the ADWR

Figure 3-4
Interferogram 03/10/97
to 10/30/2000



White Tank
Mountains

Interferograms produced by:
Dr. Sean Buckley
Center for Space Research
University of Texas-Austin
for the ADWR

Figure 3-5
Interferogram 10/08/98
to 05/08/2000

Buckeye Hills

4.0 Regional Geology

Regional geologic interpretations are needed to evaluate if there is an on-going process of land subsidence and if there is a potential for land subsidence and earth fissures to develop in the future in response to a significant water table decline.

4.1 Physiography

The major physiographic features in the Buckeye/Sun Valley ADMS area include the White Tank Mountains and the Hieroglyphic Mountains forming the topographic high areas and the Hassayampa and Gila Rivers that form the major drainage channels (Figure 4-1).

The regional land slope in the Buckeye/Sun Valley ADMS area is from the north to the south. The land surface elevation of the basin ranges from an elevation of 1,900 feet where the Hassayampa River enters the study area to about 800 feet where the Hassayampa River joins the Gila River. This slope averages about 30 feet per mile. In the central part of the Buckeye/Sun Valley ADMS area, the land slopes west from the White Tank Mountains toward the Hassayampa River and the cross slope averages about 75 feet per mile.

The portion of the Buckeye/Sun Valley ADMS area that extends from the east boundary of the Buckeye/Sun Valley ADMS area west to the Hassayampa River and extends from the White Tank Mountains south to the Gila River has a land slope that follows the Gila River from the east to the west. The land slope averages about 6 feet per mile. The cross slope from the White Tank Mountains south to the Gila River averages about 30 feet per mile.

This information shows that the regional and local land slopes in southern area are much more level than the northern area.

The physiography of the area and information shown on U.S. Geological Survey 7.5 Minute Quadrangle maps can not be used to identify areas where there may be land subsidence. However, in some instances the topography can provide information to infer where there are buried structures that could lead to the formation of earth fissures. An example is the small hills between Luke Air Force Base and the Agua Fria River in the West Salt River Valley. These hills would normally not occur in the middle of an alluvial plain but they are a result of the buried Luke Salt Dome and the hills infer where the top of the salt dome is located. This buried structure in the West Salt River Valley land subsidence area has resulted in the formation of earth fissures. There are no topographic or physiographic surface features in the Buckeye/Sun Valley ADMS area that infer that there are buried bedrock features or other structures that could lead to the formation of earth fissures should regional land subsidence occur.

4.2 Bedrock Geology

Locations where bedrock is exposed at the surface in the Buckeye/Sun Valley ADMS area are shown on Figure 4-1. This bedrock is composed of metamorphic and igneous rocks (Wilson, et. al., 1957). Bedrock is hard and stable; it does not have pore spaces that can be compressed and contains very little groundwater except where the water can gather in fractures in the rock. Surface exposures of

bedrock represent locations where land subsidence and earth fissures will not occur now or in the future.

The non-shaded portions of Figure 4-1 are where the sedimentary materials cover the bedrock. ADWR well records were researched to identify the wells with driller's logs on file. However, most of the wells in the Buckeye/Sun Valley ADMS study area do not have driller's logs on file. The available logs were reviewed to verify if the well was drilled to bedrock and the depth where bedrock was encountered. The well data on Figure 4-1 shows the depth to bedrock. A "+" is used to indicate wells that were not drilled deep enough to encounter bedrock and, therefore, the depth to bedrock is greater than the recorded depth of the well.

The driller's log data shows the depth to bedrock in the southern portion of the Buckeye/Sun Valley ADMS study area is deeper than 500 feet. ADWR projects that the depth to bedrock in the southern portion is more than 1,000 feet (Corkhill, et. al., 1993).

The depth to bedrock in the northern portion of the Buckeye/Sun Valley ADMS area is greater than in the southern portion. West of the Hassayampa River there is a well 1,000 feet deep that did not encounter bedrock. In the area between the White Tank Mountains and the Hieroglyphic Mountains, there are wells drilled to more than 700 feet deep and did not encounter bedrock. Other estimates place bedrock between 1,200 and 1,600 feet below the surface (WRA, 1991). There is limited geologic information available for this northern portion of the Buckeye/Sun Valley ADMS area to verify the depth to bedrock. A goal of the proposed ADWR groundwater model is to develop the information needed to better define the depth to bedrock.

Knowledge of the depth to bedrock is important because it defines the thickness of sedimentary materials in an area that could be dewatered and subjected to land subsidence. In central Arizona it has been observed that earth fissures often form where the depth to bedrock is less than 1,200 feet. Based on the existing information, it appears that the majority of the Buckeye/Sun Valley ADMS study area overlies regions where the bedrock is less than 1,200 feet beneath the surface.

The buried bedrock is not a smooth surface, it more resembles the general shape of the mountains with peaks, ridges and valleys and has a basin border fault where the alluvium depth to bedrock increases rapidly. In areas where there is a substantial amount of land subsidence, buried bedrock features can provide the conditions required for earth fissures to form. Geophysical and gravity investigations can be used to identify structural features on the buried bedrock surface. However, there is insufficient information available at the present time to accurately predict the configuration of the buried bedrock surface in the Buckeye/Sun Valley ADMS area.

4.3 Sedimentary Geologic Units

The size and shape of the sediments that form the sedimentary geologic units are dependent on the conditions at the time the sediments were eroded and transported to the location where they are deposited. Sedimentary materials in the southern part of the Buckeye/Sun Valley ADMS study area were transported over geologic time from the east. Most of these materials were transported long distances and in an environment that allowed medium and fine-grained sediments to be deposited.

Sediments in the northern portion of the Buckeye/Sun Valley ADMS study area were transported a shorter distance and are generally coarser grained than those in the southern part.

Table 3-1 shows there are about 1,013 wells in the southern portion of the Buckeye/Sun Valley ADMS study area and the information contained in the driller's logs helps to define the subsurface geology. In addition, several reports help to define the geology and hydrology in this portion of the study area. The sediments in the southern portion of the Buckeye/Sun Valley ADMS area are divided into three units based on the average size of the sediments (Montgomery, 1988); Upper Alluvial Unit, Middle Alluvial Unit and Lower Alluvial Unit. These three units occur throughout the basins in the central Arizona area including the Agua Fria basin east of the White Tank Mountains, the Scottsdale area in the Paradise Valley Basin and in the Mesa-Chandler-Gilbert area of the East Salt River Valley. The sedimentary and hydrologic characteristics of these three units are well documented.

The Upper Alluvial Unit is a mixture of sediments that range in size from gravel to clay. ADWR (Corkhill, et. al., 1993) projects this unit is about 100 to 200 feet thick. The Middle Alluvial Unit lies beneath the Upper Unit. ADWR projects the Middle Unit is unit ranges from 200 to 400 feet thick. Driller's logs show the Middle Alluvial Unit contains fine-grained sediments with the majority of sediments classified as clay to fine sand. In some reports the Middle Alluvial Unit is called the Middle Fine-Grained Unit due to the nature of the sediments. The Lower Alluvial Unit is beneath the Middle Alluvial Unit and the bottom of the Lower Alluvial Unit rests on bedrock. The Lower Alluvial Unit is coarse-grained and contains primarily sand and gravel sized sediments. ADWR projects the Lower Alluvial Unit is about 500 feet thick in the southern part of the study area.

The sedimentary sequence in the northern part of the Buckeye/Sun Valley ADMS area is generally coarser grained than in the southern portion of the area. The sediments were classified as a rubble zone of poorly sorted conglomerate (WRA, 1991) and coarse grained sand (Halpenny, 1998). The differentiation between sedimentary layers is less defined in the northern portion than in the southern portion where there are three sedimentary units. Halpenny (1988) said both the older and younger sediment layers are comprised of the coarse-grained sand.

4.4 Geologic Summary

The following is a summary of the regional geology as related to the potential for land subsidence and earth fissures:

- Surface exposures of bedrock represent areas where land subsidence and earth fissures will not occur.
- The physiography of the land surface and available subsurface information does not indicate if the buried bedrock surface is irregular and could induce earth fissure formation if significant land subsidence occurs.
- The sediments in the southern portion of the Buckeye/Sun Valley ADMS area contain fine-grained materials that could be subject to compaction if there is a significant water table decline.
- The sediments in the northern portion of the Buckeye/Sun Valley ADMS area are generally coarse-grained and while they could be subject to compaction if there is a significant amount

of water table decline, the low pore space volume in these sediments would result in less land subsidence than if fine-grained sediments were present.

5.0 Groundwater Hydrology

The groundwater hydrology of an area is the controlling factor in land subsidence because the water table must be declining and have declined at least 100 feet to initiate land subsidence (Gelt, 1992). Figure 5-1 presents water level data throughout the Buckeye/Sun Valley ADMS area. These wells were selected because they have recent water level measurements collected in 2001 and have a history of water level measurements.

5.1 Water Table Conditions

The southern portion of the Buckeye/Sun Valley ADMS area is called a "water logged area" because the groundwater table is very close to the land surface (Montgomery, 1988). There are 13 dewatering wells in this area that pump groundwater, not for irrigation but to lower the water table to prevent the shallow groundwater from impacting the roots of crops. Figure 5-1 shows that the depth to the water table in the southern area ranges from 138.5 feet near the White Tank Mountains to 16.25 feet near the Gila River. The channel of the Gila River is lower than the banks and the water table is at the surface in the channel.

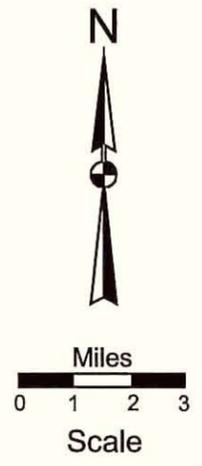
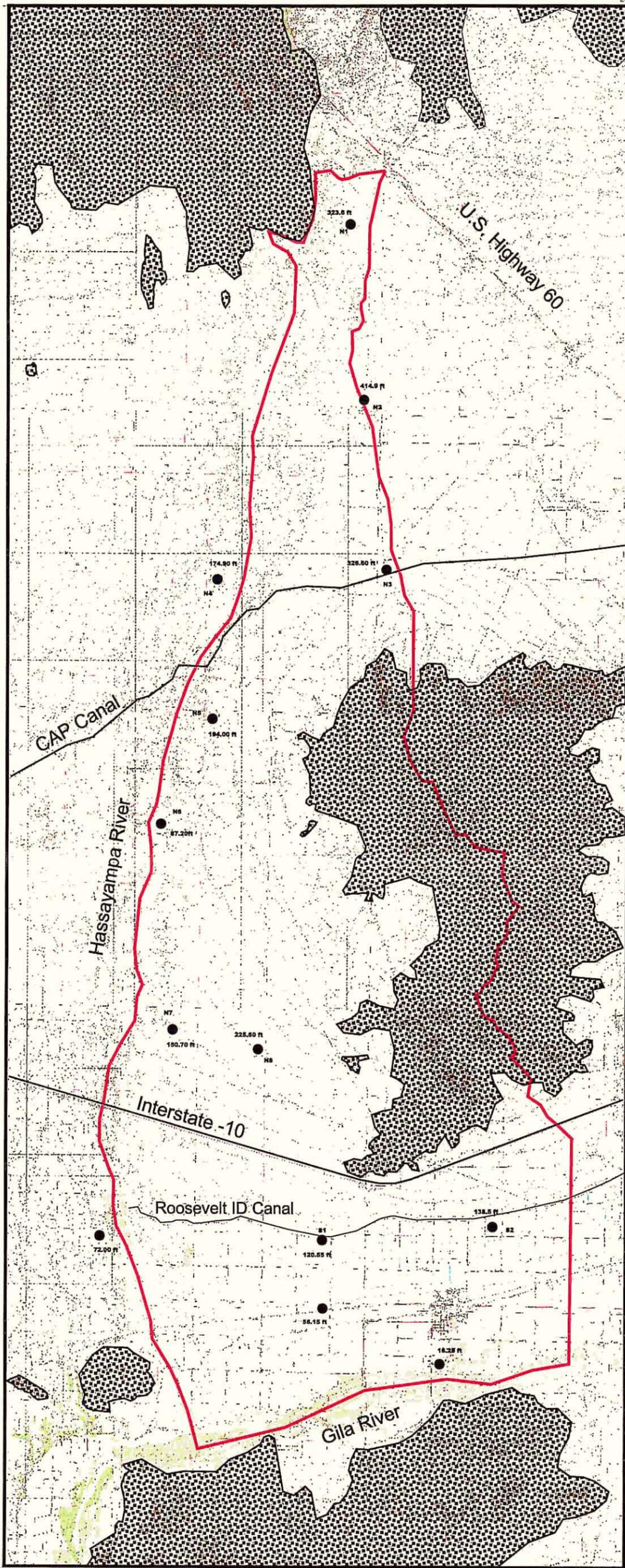
Several geologic and hydrologic factors produce the shallow groundwater and water logging. There is a narrow gap between the White Tank Mountains and the Buckeye Hills (Figure 5-1) and in this narrows area, bedrock is closer to the surface. All the groundwater moving down gradient from the entire Salt River Valley exits the basin at this point as does all the groundwater from the Gila River basin. The narrow area restricts the cross-section of sediments through which groundwater can flow, forcing the groundwater closer to the surface. Additional water is added to the system by the RID and BIC crop irrigation. The RID imports effluent from the 23rd Avenue Wastewater Treatment Plant and from wells located east of the Agua Fria River. The BIC imports water provided by Salt River Project and effluent purchased from the 91st Avenue Wastewater Treatment Plant. Most of this imported water is used by the crops but a portion sinks into the ground and adds to the water logging condition. Sediments in this area are fine-grained and this restricts the movement of groundwater through the sediments so the area can not readily drain. The slope of the land and the water table are relatively flat in this area and this reduces the speed that groundwater can travel through the sediments.

In the northern portion of the Buckeye/Sun Valley ADMS study area, the water table is much farther beneath the land surface. Depths to groundwater range from 87.2 feet near the Hassayampa River to as much as 414.9 feet north of the White Tank Mountains. There are several factors that result in this deep water table. There is no bedrock restriction or large quantity of groundwater flowing through this area, the sediments are coarse-grained and the water table gradient is steeper than in the southern portion of the area thus groundwater can move faster. The elevation of the land is higher in the northern end and when going from south to north, the land surface elevation increases much faster than the water table elevation. This results in a greater depth to groundwater.

5.2 Historic Water Table Changes

Potential water table changes in the Buckeye/Sun Valley ADMS area were evaluated to verify if the water table has declined 100 feet or more.

Hieroglyphic Mts.



White Tank Mts.

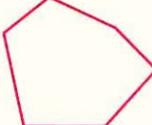
-  ADMS Study Area
-  Bedrock At Surface
-  194.0 ft Well and Depth to Groundwater

Figure 5-1
2001 Depth to Groundwater

Buckeye Hills

In the southern portion of the study area, Figure 5-1 shows that several of the wells in the water logged area have a depth to water less than 100 feet. These wells are in an area where there is no substantial water table decline that would indicate there is a potential for on-going land subsidence. There are two wells in the southern portion of the study area where the 2001 depth to groundwater is greater than 100 feet. These warranted additional investigation. Table 5-1 presents the 45 years of water table history for these two wells (S1 and S2 on Figure 5-1) obtained from ADWR records. The water table history verifies that in the southern area the water table has been very stable. The water table in these wells fluctuated during this period declining almost 30 feet, but then recovered. These wells define additional areas where there is no substantial water table decline that would be an indicator for on-going land subsidence.

The depth to the water table is much greater in the northern portion of the Buckeye/Sun Valley ADMS area than in the southern portion, but the water table has also been relatively stable. The water table history for eight wells (N1 to N8 Figure 5-1) in the northern portion is presented on Table 5-2. The period of water table records for these wells is generally shorter than for wells in the southern portion of the study area because there has not been very much historic development in the northern portion. Some the wells were drilled during the 1980's as a part of the original Sun Valley development.

The ADWR water table data show the water table was stable or rose in five of the eight wells. There was a slight decline in three wells but the water level depth change was very small, ranging from 4 feet to 11 feet. Well N4 appears to have anomalous data for 1987 and 1988. There is a significant decline in that well in those two years but a similar decline was not measured in N3, the closest well with water level data in the same period. This decline may not be a change in the water table but rather may be due to a data entry error in the ADWR database. The water table history in the northern portion of the Buckeye/Sun Valley ADMS study area does not show there has been a substantial water table decline that would be an indicator for on-going land subsidence.

5.4 Groundwater Summary

The ADWR water table data verifies the depth to groundwater has been very stable. The water table decline has been very slight and is not in the magnitude that would indicate on-going land subsidence.

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Table 5-1 Southern Area Groundwater History

Well S1 Well B-01-03 21DBB			Well S2 Well B-01-04 27ABBB		
Date	Depth to Water (Feet)	Depth Change (Feet)	Date	Depth to Water (Feet)	Depth Change (Feet)
Jan-56	137.30	0.00	Jan-56	134.39	0.00
Jan-57	138.15	-0.85	Jan-57	131.79	2.60
Jan-58	139.86	-2.56	Jan-58	134.82	-0.43
Feb-59	152.13	-14.83	Feb-59	136.58	-2.19
Feb-60	145.35	-8.05	Feb-60	140.74	-6.35
Mar-61	146.30	-9.00	Mar-61	146.31	-11.92
Jan-62	147.68	-10.38	Jan-62	142.92	-8.53
Jan-64	155.92	-18.62	Feb-63	145.74	-11.35
Feb-65	156.56	-19.26	Jan-64	143.98	-9.59
Jan-66	161.25	-23.95	Feb-65	143.45	-9.06
Feb-67	160.60	-23.30	Jan-66	145.74	-11.35
Jan-68	158.20	-20.90	Feb-67	142.30	-7.91
Jan-69	153.20	-15.90	Jan-68	138.14	-3.75
Jan-70	158.20	-20.90	Jan-70	136.00	-1.61
Feb-71	155.20	-17.90	Jan-72	159.50	-25.11
Feb-72	150.00	-12.70	Feb-73	132.50	1.89
Feb-73	151.80	-14.50	Jan-74	134.30	0.09
Jan-74	147.20	-9.90	Jan-75	139.80	-5.41
Jan-75	152.10	-14.80	Jan-76	139.10	-4.71
Dec-76	164.90	-27.60	Dec-76	137.00	-2.61
Feb-78	156.20	-18.90	Feb-78	136.40	-2.01
Mar-78	165.60	-28.30	Dec-78	135.20	-0.81
May-78	167.00	-29.70	Jan-79	134.20	0.19
Dec-78	165.80	-28.50	Jan-79	132.20	2.19
Jan-79	165.40	-28.10	Feb-79	131.40	2.99
Jan-79	161.60	-24.30	Apr-79	127.80	6.59
Feb-79	162.20	-24.90	Feb-81	133.50	0.89
Jan-80	160.10	-22.80	Jan-82	127.50	6.89
Feb-81	159.50	-22.20	Dec-82	120.30	14.09
Dec-82	159.50	-22.20	Dec-83	121.40	12.99
Dec-83	151.70	-14.40	Dec-84	120.30	14.09
Dec-84	147.40	-10.10	Jun-85	137.50	-3.11
Jun-85	151.20	-13.90	Dec-85	119.70	14.69
Dec-85	148.80	-11.50	Jun-86	125.50	8.89
Jan-86	148.50	-11.20	Dec-86	127.80	6.59
Jun-86	147.70	-10.40	Jun-87	127.70	6.69
Dec-86	148.80	-11.50	Dec-87	125.70	8.69
Jun-87	147.30	-10.00	Jun-88	132.90	1.49
Dec-87	148.30	-11.00	Dec-88	123.80	10.59
Jun-88	148.80	-11.50	Nov-89	129.10	5.29
Dec-88	148.30	-11.00	Nov-90	127.90	6.49
Nov-89	148.50	-11.20	Nov-91	129.70	4.69
Nov-90	147.10	-9.80	Nov-92	127.80	6.59
Dec-91	147.80	-10.50	Dec-93	129.60	4.79
Nov-92	145.70	-8.40	Nov-94	129.40	4.99
Dec-93	144.20	-6.90	Jun-95	157.10	-22.71
Nov-94	146.90	-9.60	Dec-95	126.50	7.89
Dec-95	145.40	-8.10	Oct-96	125.20	9.19
Oct-96	146.10	-8.80	Nov-97	122.30	12.09
Nov-97	139.80	-2.50	Dec-98	120.90	13.49
Dec-98	133.80	3.50	Nov-99	124.40	9.99
Nov-99	135.50	1.80	Nov-00	121.70	12.69
Nov-00	137.20	0.10	Oct-01	120.55	13.84
Oct-01	138.50	-1.20			

Depth change calculated from initial depth to water measurement.

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Table 5-2 Northern Area Groundwater History

Well N1 Well B-06-04 26DBC			Well N2 Well B-05-04 24CCD			Well N3 Well B-04-04 13CBD			Well N4 Well B-04-04 19BAA		
Date	Depth to Water (Feet)	Depth Change (Feet)									
Nov-77	354.67	0.00	Jan-73	440.00	0.00	Apr-46	315.60	0.00	Oct-82	178.30	0.00
Jan-88	329.30	25.37	Jan-74	441.00	-1.00	Jul-46	315.50	0.10	Jan-85	178.20	0.10
Dec-91	350.90	3.77	Feb-75	441.20	-1.20	Sep-48	315.65	-0.05	Jun-85	178.50	-0.20
Nov-97	336.10	18.57	Feb-76	442.00	-2.00	Feb-49	315.62	-0.02	Dec-86	178.70	-0.40
Dec-98	331.50	23.17	Jan-77	439.30	0.70	Nov-49	322.54	-6.94	Jun-87	180.00	-1.70
Nov-99	327.60	27.07	Nov-77	440.20	-0.20	Mar-50	315.98	-0.38	Dec-87	239.20	-60.90
Nov-00	323.60	31.07	Mar-78	439.70	0.30	Feb-51	316.15	-0.55	Jun-88	236.70	-58.40
			Jan-79	441.90	-1.90	Nov-51	316.15	-0.55	Dec-88	177.20	1.10
			Feb-80	445.30	-5.30	Jan-52	316.56	-0.96	Dec-89	170.10	8.20
			Mar-81	427.00	13.00	Feb-54	322.21	-6.61	Jan-91	178.80	-0.50
			Jan-82	422.90	17.10	Feb-55	317.60	-2.00	Nov-91	178.30	0.00
			Jan-83	421.10	18.90	Feb-56	318.12	-2.52	Dec-93	174.20	4.10
			Dec-83	417.20	22.80	Jan-57	320.22	-4.62	Nov-94	174.20	4.10
			Dec-84	414.60	25.40	Feb-62	321.48	-5.88	Nov-95	172.80	5.50
			Jun-85	414.10	25.90	Jan-63	322.40	-6.80	Dec-96	172.80	5.50
			Dec-85	414.50	25.50	Feb-64	322.80	-7.20	Oct-97	173.60	4.70
			Jun-86	413.00	27.00	Jan-65	323.55	-7.95	Oct-98	173.30	5.00
			Dec-86	413.40	26.60	Jan-66	322.70	-7.10	Nov-99	174.30	4.00
			Jun-87	413.10	26.90	Jan-68	328.20	-12.60	Nov-00	174.60	3.70
			Dec-87	413.50	26.50	Mar-69	328.20	-12.60	Oct-01	174.90	3.40
			Jun-88	414.30	25.70	Feb-70	330.50	-14.90			
			Dec-88	414.30	25.70	Jan-71	327.70	-12.10			
			Nov-89	416.40	23.60	Dec-86	329.60	-14.00			
			Jan-91	418.30	21.70	Nov-89	328.90	-13.30			
			Nov-91	419.80	20.20	Jan-91	329.00	-13.40			
			Nov-92	422.35	17.65	Nov-91	329.10	-13.50			
			Dec-93	417.10	22.90	Nov-92	329.30	-13.70			
			Nov-94	413.20	26.80	Dec-93	328.70	-13.10			
			Nov-95	410.30	29.70	Nov-94	328.10	-12.50			
			Nov-96	408.30	31.70	Nov-95	327.20	-11.60			
			Nov-97	408.70	31.30	Dec-96	326.50	-10.90			
			Oct-98	409.20	30.80	Oct-97	326.80	-11.20			
			Nov-99	411.20	28.80	Oct-98	326.00	-10.40			
			Nov-00	412.50	27.50	Nov-99	326.20	-10.60			
			Oct-01	414.90	25.10	Nov-00	326.10	-10.50			
						Oct-01	326.60	-11.00			

Depth change calculated from initial depth to water measurement.

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Table 5-2 Northern Area Groundwater History

Well N5 Well B-03-04 07BBB			Well N6 Well B-03-05 26ADD			Well N7 Well B-02-05 25BAB			Well N8 Well B-02-04 129DCD		
Date	Depth to Water (Feet)	Depth Change (Feet)	Date	Depth to Water (Feet)	Depth Change (Feet)	Date	Depth to Water (Feet)	Depth Change (Feet)	Date	Depth to Water (Feet)	Depth Change (Feet)
Nov-91	354.67	0.00	Dec-86	86.50	0.00	Dec-82	146.60	0.00	Dec-52	216.80	0.00
Oct-97	329.30	25.37	Dec-89	87.00	-0.50	Dec-86	148.30	-1.70	Jul-63	223.40	-6.60
Oct-98	350.90	3.77	Jan-91	76.70	9.80	Nov-91	149.60	-3.00	May-69	219.60	-2.80
Nov-99	336.10	18.57	Nov-91	87.00	-0.50	Nov-97	149.70	-3.10	Jan-70	218.30	-1.50
Nov-00	331.50	23.17	Nov-92	87.70	-1.20	Oct-98	149.90	-3.30	Mar-81	222.70	-5.90
Oct-01	327.60	27.07	Dec-93	83.60	2.90	Nov-99	150.40	-3.80	Jan-82	223.40	-6.60
			Dec-94	85.90	0.60	Nov-00	150.40	-3.80	Jun-85	223.00	-6.20
			Nov-95	85.20	1.30	Nov-01	150.70	-4.10	Dec-85	226.90	-10.10
			Nov-96	86.30	0.20				Jun-86	223.20	-6.40
			Oct-97	87.20	-0.70				Dec-86	224.50	-7.70
			Oct-98	85.10	1.40				Jun-87	223.50	-6.70
			Nov-99	87.10	-0.60				Dec-87	223.00	-6.20
			Nov-00	87.20	-0.70				Jun-88	223.20	-6.40
			Nov-01	87.20	-0.70				Dec-88	223.20	-6.40
									Nov-89	223.80	-7.00
									Jan-91	223.70	-6.90
									Nov-91	223.90	-7.10
									Nov-92	224.00	-7.20
									Dec-93	224.00	-7.20
									Dec-94	223.90	-7.10
									Nov-95	223.80	-7.00
									Nov-96	223.60	-6.80
									Nov-97	223.80	-7.00
									Oct-98	223.60	-6.80
									Nov-99	223.80	-7.00
									Nov-00	223.80	-7.00
									Nov-01	225.60	-8.80

Depth change calculated from initial depth to water measurement.



6.0 Land Subsidence Assessment

The goals of this study are to determine whether:

- There is an on-going process of land subsidence and earth fissuring.
- There is no credible evidence of the potential for land subsidence.
- There is a potential for land subsidence and earth fissures to develop in the future in response to large groundwater withdrawals.

The available geologic, hydrogeologic and hydrologic information was analyzed with respect determining if there is on-going regional land subsidence and earth fissure formation and if there is a potential for these geologic hazards to occur in the future.

6.1 Historic and Present Land Subsidence

The first two goals of this study relate to assessing if there is on-going land subsidence and earth fissuring. The water table information presented in Section 5.0 documents there has not been a significant decline in the water table anywhere in the Buckeye/Sun Valley ADMS study area. This means there is no credible evidence that the conditions are suitable to cause compaction of the sediments and regional land subsidence.

The interferograms (Figures 3-2 to 3-5) were reviewed in consultation with Mr. Maurice Tatlow, the interferogram expert at ADWR. The color shift on an interferogram indicates if there is land subsidence. An example of the shift is if the color goes from blue, through the spectrum and back to blue. This could indicate 3 centimeters of land subsidence. The color shift does not apply to disturbed areas. Figures 3-2 and 3-3 are primarily blue and green and do not exhibit a color shift within the Buckeye/Sun Valley ADMS area.

Figures 3-4 contains a wide range of colors and some of the information could be interpreted as indicating land subsidence. This area was included in a previous study (Tetra Tech, 2003) completed for the Flood Control District of Maricopa County (District). In that study, a suspected occurrence of land subsidence was identified at Buckeye Flood Retarding Structure No. 1 from Station 770+00 to 820+00 on the March 10, 1997 to October 30, 2000 interferogram (included in Figure 3-4). Because there was no evidence of water table decline that could produce this land subsidence, additional investigation of the interferogram was warranted. Mr. Tatlow and Dr. Buckley reviewed the interferogram and weather records. They found that on October 29, 2000 a major rainstorm occurred in the Phoenix area and several other storms had occurred just prior to October 29. They concluded that the weather had produced atmospheric interference that impacted the interferogram and that the suspected land subsidence was an anomaly not regional land subsidence.

Figure 3-5 contains a range of colors but does not have a color shift that would indicate the presence of on-going land subsidence.

Examination of these four interferograms did not indicate that land subsidence is occurring within the Buckeye/Sun Valley ADMS study area. This is additional information to verify that there is no on-going process of land subsidence. Further, if there is no regional land subsidence there is no earth fissuring.

Because there is no credible evidence that there has been a substantial amount of water table decline and the interferograms document confirm there is no on-going land subsidence, it is concluded there is no on-going process of regional land subsidence.

6.2 Future Potential Land Subsidence

The third study goal of the study is to assess if there is a potential for land subsidence and earth fissures to occur in the future. This goal statement relates land subsidence to large scale groundwater withdrawals. However, it must be noted that groundwater withdrawals do not necessarily produce the conditions that can result in land subsidence. Water table decline, produced when pumping exceeds the natural and artificial recharge, can initiate land subsidence. An example of an area where large scale groundwater withdrawals have occurred but did not result in regional land subsidence is the southern portion of the Buckeye/Sun Valley ADMS area. Groundwater pumping for irrigation has been on-going for decades but there has been no water table decline; hence there is no regional land subsidence.

The sedimentary materials within the Buckeye/Sun Valley ADMS could be subjected to compaction if significant water table declines occur in the future. The ADWR Salt River Valley groundwater model does not project significant water table decline will occur within the southern portion of the Buckeye/Sun Valley ADMS study area and this means there is a very small potential for regional land subsidence or earth fissures to occur in this area.

Currently, there is no groundwater model to project future water table conditions in the northern portion of the Buckeye/Sun Valley ADMS study area. ADWR, the Town of Buckeye and the major developers are working to develop a groundwater model but this will not be operational until 2005. The groundwater model will simulate the projected water table impacts that result when development occurs and groundwater is pumped to meet the demands. The groundwater model will also include projections of the impacts that reclaimed water direct use and recharge and Central Arizona Project (CAP) water recharge will have to reduce the amount of water table decline. Another goal of the groundwater modeling project will be to determine if the projected water table declines are sufficient to initiate land subsidence. ADWR will use the groundwater model as the foundation for future regional land subsidence modeling. It is recommended that the District coordinate with ADWR during the groundwater model development phase. Runoff projections developed as a part of the Buckeye/Sun Valley ADMS project can be incorporated into the groundwater model to better define the quantity of natural recharge. ADWR can then provide the District with water table decline and land subsidence projections.

The coarse-grained nature of the sediments in the northern portion of the Buckeye/Sun Valley ADMS study area will influence the amount of regional land subsidence that may occur even if the water table does decline. Coarse-grained sediments have less pore space and will be subjected to less compaction than fine-grained sediments. Land subsidence in the Buckeye/Sun Valley ADMS area would be less severe than that measured on the east side of the White Tank Mountains in the Sun City and Luke Air Force Base areas even with an equal amount of water table decline.

Land Subsidence Assessment

If a significant water table decline occurs in the northern portion of the Buckeye/Sun Valley ADMS area and if significant land subsidence is measured, then there is a potential for earth fissures to form. However, there is not sufficient information available at this time to predict if the fissures will form or where they may occur.

7.0 Conclusions

Based on the review of available geologic, hydrogeologic, and hydrologic information, there is no ongoing regional land subsidence or earth fissure formation within the Buckeye/Sun Valley ADMS study area. There does not appear to be a potential for regional land subsidence to occur in the southern portion of the Buckeye/Sun Valley ADMS area in the future. A regional groundwater model proposed by ADWR will provide the information needed to predict if there is a potential for regional land subsidence to occur in the northern portion of the Buckeye/Sun Valley ADMS study area in the future.

8.0 Recommendations

It is recommended the District should coordinate with ADWR during the development of the groundwater model for the Hassayampa River basin. The District can obtain information from the model to identify areas where there may be significant water table decline in the future and where regional land subsidence may occur. ADWR can also provide the District with current well depth to water measurements and if a significant decline in the water table occurs, the District can initiate planning to mitigate the effects on regional land subsidence on District facilities.

It is also recommended that potential future land subsidence and earth fissuring be evaluated in further detail specific to each alternative developed in the future Buckeye Sun Valley Area Drainage Master Plan. As a part of ongoing work under the District's dam safety program, the District has developed a technique to identify "earth fissure risk zones". Such techniques should be applied as needed as part of the Buckeye Sun Valley Area Drainage Master Plan in order to assure future flood control projects avoid or mitigate for potential future earth fissures.

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**Area 4 Review
Memorandum**

To: Kathryn Gross, Valerie Swick – Flood Control District of Maricopa County, AZ

From: William J. Spitz, R.G.

Date: October 18, 2005

Re: Buckeye/Sun Valley ADMS Review of Area 4 Development Master Plans (Subtask 2.6.4.3)

This memo is submitted in support of Subtask 2.6.4.3 of the Buckeye/Sun Valley Area Drainage Master Study (ADMS) Scope of Work (Contract FCD 2002C027). The Buckeye/Sun Valley ADMS is being performed for the Flood Control District of Maricopa County (District) and the Town of Buckeye. The purpose of the Buckeye/Sun Valley ADMS is to quantify the extent of drainage, flooding, and erosion problems, sources, and hazards in the Buckeye/Sun Valley area, and develop preliminary solutions to mitigate the identified concerns. Arizona Revised Statutes Title 48, Chapter 21, requires the Board of Directors to identify flood control problems and prepare plans that, when implemented, will eliminate or minimize flooding problems. Task 2.6 represents the Geomorphic Evaluation and Landform Stability Assessment portion of the Scope of Work (SOW). The purpose of Task 2.6 is to provide a qualitative assessment of potential erosion and sedimentation hazards of primary washes, lateral and vertical stream instability, and piedmont landform stability within the drainage networks of Area 3 (Buckeye Structures) and Area 4 (North Sun Valley) of the Buckeye/Sun Valley ADMS watershed.

This memo provides a review of all available development master plans for proposed developments north of Wagner Wash and the Granite Reef Aqueduct in Area 4 in fulfillment of Subtask 2.6.4.3. The purpose of the review is to identify any geomorphic problems or inconsistencies associated with development along primary watercourses in this area and identify those areas where additional studies may be required.

The following documents were provided by PBS&J and the District and were reviewed as part of SOW Subtask 2.6.4.3:

- Flood Insurance Study (FIS) for Wagner Wash (FEMA, 1991)
- Festival Ranch Master Drainage Study (Kimley-Horn, 2000)
- Festival Ranch Drainage Plan & Update to Master Drainage Plan (CVL, 2003)
- Sun Valley Preliminary Master Drainage Study (Erie & Associates, 2001)
- Spurlock Ranch Drainage Master Plan (CMX, 2003)

The FIS for Wagner Wash was examined because Wagner Wash provides base level control for many of the washes in Area 4 that drain to it from the north. The primary area of concern is reach located between the two crossings of the Sun Valley Parkway and the reach upstream of the parkway. The profile of Wagner Wash, which is based on 1990 topographic mapping, between the crossings shows a distinct knickzone that extends from the upper crossing to about

3,500 feet downstream. There is a maximum grade change on the profile of about 4 feet over about 660 feet just downstream of the crossing.

A recent field examination of the wash revealed that the wash in this reach is indeed incised. Currently, there is a large, 4-5 foot high boulder drop structure in place across the channel immediately downstream of the upstream parkway crossing, which verifies that the wash has undergone at least 4 feet of incision recently. This incision on Wagner Wash poses a potential problem to tributary washes downstream of the drop structure in that the incision on Wagner Wash can and will induce incision and headcutting in the tributary washes. Tributary washes on the south side of Wagner Wash are already exhibiting evidence of incision and headcutting. If the grade on the northern tributary streams is not controlled, especially along channels that may experience an increased frequency of flow events, incision and channel widening may progress upstream and create severe erosion problems and threaten development along unprotected areas.

A similar situation with the potential for future problems exists upstream of the parkway near the aqueduct where Wagner Wash was previously captured by a stock tank. The tank dam has since been breached and the wash passes through the dam along a steep knickzone with a 4-foot drop over a distance of about 170 feet. The tributary channels in this area also exhibit evidence of active incision and widening.

The drainage basins north of the Granite Reef Aqueduct flow southerly and pond immediately north of the aqueduct as a result of the levees constructed for the aqueduct. There are two existing concrete overflow structures that allow the 100-yr 6-hour flow to cross the aqueduct and drain into Wagner Wash. The ongoing incision of Wagner Wash between the parkway and the aqueduct could be exacerbated by clear water releases from the ponded area upstream of the aqueduct.

For the most part, the drainage plans for the proposed developments in Area 4 call for some form of retention and/or detention and maintaining existing drainage patterns in their natural conditions and locations wherever possible. The use of retention and detention basins is primarily based on the large, infrequent flow events like the 100-year 2-hour storm (retention) or the 100-year 6-hour storm (detention). The downstream channels may require grade control to counter the potential erosion associated with clear water releases for these basins.

However, the review of the drainage plans reveals that there does not appear to be any concern with smaller, more frequent flow events, which could be problematic. The increase of impervious area associated with development means that there will likely be more frequent, flashy runoff events from more frequent, small storms because of the decrease in infiltration of precipitation. This can lead to an increase in erosion potential along unprotected washes. In addition, an increase in the frequency of flow events and even the potential development of intermittent base flows can induce the colonization and growth of riparian vegetation along a channel. In turn, an increase in the amount and density of riparian vegetation can potentially induce narrowing and degradation of the channel over time.

Therefore, it is recommended that any development that includes maintaining washes in their natural condition should incorporate grade control and bank protection, as well as channel maintenance and vegetation control, in the final development plans.

If there are any specific issues that you wish to discuss regarding the drainage master plans for developments proposed for Area 4 north of Wagner Wash, please contact us.

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**Alluvial Fan
Memorandum**

Technical Memorandum

for

ALLUVIAL FAN RESEARCH:
CASE STUDIES AND MITIGATION METHODS

Buckeye Sun Valley ADMS

FINAL DRAFT

Submitted to:

FLOOD CONTROL DISTRICT of MARICOPA COUNTY
Phoenix, Arizona

Prepared by:

Michael Baker Jr., Inc.
Phoenix, Arizona

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INTRODUCTION

Description of Area

The Sun Valley area of the White Tank Mountains is currently the subject of tremendous development activity. The area, approximately 180 square miles in total, is part of the Town of Buckeye, and is bounded by the White Tank Mountains on the west, I-10 to the south, and the Hassayampa River on the east.

Context of Development

Within the Sun Valley area, there are four major projects which have Community Master Plans in for review by the Town of Buckeye. Growth projections for this area indicate that possibly as many as 50,000 acres could be developed with a potential for construction of 150,000 homes during the next twenty years. Because of the extent of current development activity, the District targeted this region as a priority for development of an Area Drainage Master Study and Plan, and began the process with a Phase 1 study in 2003. The study should be complete by September 2005. Preliminary results of the study have identified several active alluvial fans in the area.

Development within areas of active alluvial fans is a particular concern when considering structural solutions such as regional detention basins and channelization. Typically, these measures are not recognized as effective flood mitigation by FEMA unless the structural solution begins at the fan apex and extends throughout the area prone to alluvial fan flooding. Usually, the extents of such a project cross the limits of several developments. The practical implications of this constraint are that such projects cannot be built in phases or segments since the flood protection benefits are only recognized with completion of the entire project.

Historically, storm drainage and the associated flood hazard has been recognized as a critical concern by developers, local governments, and FEMA. Consequently, much time and effort is expended during the development review process to deal with existing and potential flooding problems. Unfortunately, most developers do not have the resources to deal with an alluvial fan problem on a regional basis, and instead try to implement local protection mitigation measures for their specific developments. These might include construction of large diversion channels, massive flood walls, raising pad grades several feet, or a combination of all of these.

The science of alluvial fan processes is still relatively new, and it is difficult for regulatory agencies to judge the effectiveness of alluvial fan mitigation measures. There are many horror stories about the failure of such projects. Furthermore, many of those projects which do not experience catastrophic failures frequently experience recurring major maintenance costs for sedimentation or erosion problems. The cost of this maintenance often adds up to an amount far exceeding the initial capital expense.

Identification of Problems and Data Needs

In order to effectively perform floodplain management under these conditions, regulatory agencies like FEMA and operational organizations such as the District and the Town of Buckeye, who are charged with implementing floodplain management programs in the Buckeye and Sun Valley areas, have two basic options. The first is to identify and delineate floodplains using current accepted procedures for dealing with alluvial fans. One of the impacts of this approach is to significantly increase the cost and time required to get new developments approved and permitted. Flood insurance will be a typical requirement. Some lenders may be reluctant to issue new loans based on their experience with losses resulting from alluvial fan flooding. FEMA may decide that this is the minimum requirement, regardless of whether other structural measures are proposed.

A second and preferred approach, is the so called Total (or Whole) Fan Solution (TFS), which entails some combination of structural alternatives that begin at the fan apex and extend throughout the flood prone area. For instance, a typical TFS project might include construction of a regional off-line detention basin at the fan apex along with an appropriately sized hardened channel that would convey flows through the fan area to some regional drainage outfall. An offline detention basin could reduce the design peak flow for the channel without disrupting the sediment balance, which in turn would reduce or even prevent downstream sedimentation/erosion problems.

Practically, this approach must be a collaborative effort of the affected development interests supported rather than led by the District and the Town of Buckeye. This way, the developers can integrate their ongoing planning activities into the flood mitigation effort. The District and the Town of Buckeye can provide technical direction to assure compliance with regulatory requirements. The developers, who otherwise might have to pay for more expensive flood mitigation structures which, implemented in a piecemeal fashion are of questionable effectiveness, can instead pool their resources and build a regional facility that fits with their development plans and facilitates regulatory approvals. In addition, a regional solution reduces the overall process timeline and cost.

Scope of Research

The District commissioned two tasks in support of this effort. The first task was to research available case studies of other communities who had dealt with an alluvial fan problem using either a structural or non-structural approach. It was hoped that the case studies would include cost data as well as performance history. The case studies are organized into two groups based on the mitigation approach used, whether structural or non-structural. A subjective analysis of the success of the mitigation measure is offered. Only a few of the studies contained any significant cost data.

The second task was to compile a listing of alluvial fan mitigation measures and their suggested application. The intent of this listing was to start the process for developing design guidelines to use with the application of these measures. As part of this process, an outline for development of a TFS proposal is presented.

CASE STUDIES OF MITIGATION MEASURES

Overview

This section presents case studies of mitigation measures for developments on alluvial fans and similar areas. This information will help determine appropriate mitigation measures for development on alluvial fans in the Buckeye/Sun Valley Area. The research includes case studies, working papers, and existing government regulations.

Methods of mitigation have varied depending on the landform stability. There are two broad types of mitigation methods, structural and non-structural methods. Most of the case studies presented, all most all from the arid west region of North America, contain information about structural methods and how they performed during flood events. Some case studies have also been included that present mitigation methods constructed after large storm events occurred. Typically they are presented with minimal subsequent performance data because of the scarcity of recorded storm events.

The primary structural measures used to control flood and debris flows on alluvial fans as documented in these case studies are as follows:

- Debris Barriers and Basins
- Detention Basins for Control of Peak Flows
- Flood-Control Channels
- Diversions and Bypasses
- Floodwalls, Levees and Dikes

The primary non-structural measures are:

- Education
- Monitoring, Warning and Evacuation Systems
- Zoning regulations
- Setback requirements
- Best Design Practice (BDP) Site Layout
- Regulation of Allowable Construction Types

CASE STUDY SUMMARIES

Structural Approaches

Los Angeles County 1938 Flood, California

This flood took place in the Los Angeles County drainage Area. Bank protection methods, small reservoirs, and 16 debris basins were in place to protect against a flood event.

Riprap bank protection failed in numerous places during the flood. The majority of the failures occurred largely on the outside of bends or in the vicinity of an exceptional disturbance. The failures appear to have started at the toe-in of the rock. The maximum velocity is estimated to be in excess of 18 ft/s. Wire and rock mattress protection performed well unless the flowing water got behind or beneath it, then the rock mattress rolled up and was carried away. Gunite slope paving along the Los Angeles River experienced extensive failures. No difficulties were experienced with reinforced concrete open channels except in a section that was unlined. A great number of reinforced concrete closed conduits were plugged with debris.

In 1938 most of the reservoirs were small local projects with small capacity and limited outlets, and they had little effect on large flood peaks. The reservoirs acted as debris structures. The debris basins functioned very satisfactorily within the limits of their capacity. A common phenomenon was noted at a majority of the basins. A pulsating discharge from the basin to the outlet resulted in the formation of a standing wave which proceeded down the channel at a high velocity.

Southern California 1969 Floods

More than 100 persons lost their lives in these floods and property damage totaled more than \$213 million due to the intensive development that had taken place in recent years adjacent to unimproved or partly improved channels.

All the levees in this area were protected with stone revetments on the channel side. The San Gabriel River approach and the riverside levees are both earth bottom channels in this area. There were sloping drop structures with grouted-stone aprons on the structures along the San Gabriel River approach. There were also concrete and grouted stone channels in this area. Other mitigation structures in the area included numerous debris basins and reservoirs.

The major damages sustained by the levee revetments were probably caused by meandering flows and cross stream flows that undermined both grouted and ungrouted revetment. Excessive streambed degradation was noted with some of the levees. Evaluation of the levees showed that insufficient depth of revetment toes was probably the major cause of levee damage. The depth of the toe protection should not be less than the depth of the anticipated scour below the invert. The use of stone protection is discouraged because it was washed away. Analyses made after the floods indicated that the recommendation in Civil Works Engineering Bulletin 52-15 are reliable and conservative. Sediment transport was evaluated using DuBoys' equation and evaluation of flooded reaches indicates that the method is adequate. The use of sloping bridge-pier extensions to reduce debris deposition was judged successful.

The San Gabriel River approach and the riverside levees both performed well. This type of performance of channels with alluvial streambeds is possible where the upstream sediment supply is sufficiently large to replace the material transported out of the improved reach and where the channels do not have excessive base widths that permit meandering. The sloping drop structures in the San Gabriel River approach channel withstood the flood flows satisfactorily except for isolated structural damage. The sloping grouted-stone aprons of the structures did not fail. Highly abrasive action of the flood flows was clearly evidenced by the sheared conditions of the stone projections on the surface of the sloping aprons. Severe damage was sustained by revetments near the stilling basins of the drop structures. It was determined that grouting of the revetments would have prevented much of the damage that occurred.

In the channels that were fully lined with concrete or grouted-stone channels little damage occurred.

Generally, USACE debris basins' accumulation was well below their total capacity. Six basins were filled with mud and debris during the floods; however, even though downstream properties were severely damaged by mud and debris after the debris basins were filled, the damage would have been much greater if the debris basins were not present. It is noted that the greatest amount of sediment and debris was produced from areas extensively burned in fires that took place in 1968.

Problems to the reservoirs included plugged-up outlet works, destroyed water-supply systems, damaged irrigation-outlet systems, undermined spillways, and eroded outlet channels; capacities of the reservoirs were also severely reduced by sediment and debris deposition.

Debris and sediment deposition in concrete channels was not a problem where debris basins were present. The sizing criteria used by the USACE, Los Angeles District, and described in the paper titled "A New Method of Estimating Debris-Storage Requirements for Debris Basins" (Tatum, 1963) were judged satisfactory.

Los Angeles County and the USACE have constructed a series of debris basins 700 yards apart for 50 miles along the base of the mountains, totaling 126 basins. The basins can and have filled after one rainstorm. In a typical year the basins catch about one million cubic yards and the cost to clean them is \$60 million.

Saddleback Diversion Harquahala Valley Watershed, AZ

Saddleback Floodwater Diversion Channel is a 4.73-mile long channel that takes the principal spillway outflow from Saddleback Flood Retarding Structure. The channel also intercepts flow from an 8.6 square mile area across an alluvial fan to protect farming areas to the south. The project is located in Maricopa County, Arizona.

There is a collector channel that runs parallel to the diversion channel and a collector dike runs between these two channels. There were four grouted rock drop structures in the channels to maintain lower velocities. There were 18 side inlets from the collector channel to the diversion channel through the collector dike. The widths of the inlets were sized based on the estimate of

contributing area to the inlet. All but one inlet was protected with grouted rock two feet thick. The side inlets, diversion and collector channels were sized for the 50-year 24-hour storm event.

In 1984 a storm produced outflow of 739 cfs at the Saddleback FRS outlet and 12,355 cfs at the diversion channel outlet. The design discharges are 1,120 cfs and 6,060 cfs respectively.

Runoff from the alluvial fan caused sediment bar development in the collector channels, causing the collector dike to be overtopped along with 15 of the side inlets. The side inlets also experienced damage through their abutments, with flow eroding new "inlets" beside the grouted inlets.

The storm event caused new drainage channels to form on the fan, and this changed the contributing areas to some of the side inlets, as well as contributing sediment to the collector channel. It was determined that the collector channel was not designed with sedimentation considerations.

While the collector channel experienced the above problems, all of the overflowing water was carried by the diversion channel, with the water surface within one foot of the top of the diversion dike. The diversion channel performed well during and after the storm.

The project was repaired with the following changes:

- Side inlets were enlarged or inlets added to increase capacity, with inlets placed in locations where new major washes developed.
- The collector channel was enlarged to provide for sediment.
- It was noted that collector channels should be over sized to account for shifting braided flow on alluvial fans and that freeboard requirements should be increased.

Lowell Creek Diversion, Alaska

The project consists of a dam and emergency spillway that diverts Lowell Creek at the apex of an alluvial fan into a tunnel such that flows are completely removed from the fan. The drainage area upstream of the project is 4.02 square miles. Downstream of the project the City of Seward is located. Flow overtopping the spillway would follow the former course of Lowell Creek through the City. The tunnel is a 10 foot wide horseshoe about 2,000 feet long at a 4.3 percent grade. The entrance drops sharply and accelerates the water to a velocity of about 40 ft/s. The high velocity is to ensure that all debris will pass into and through the tunnel.

The high velocities in the tunnel have caused severe erosion in the concrete and steel rail armored tunnel floor. The tunnel was built in 1940; in 1984 the tunnel floor was repaired at a cost of \$3 million. The sides of the tunnel did not experience much erosion in this time; however, the floor of the tunnel has been degrading since it was repaired in 1984.

It is speculated that the diversion of sediment may have exacerbated or caused landslides that took place in Seward in 1964 at the distal edge of the fan delta during an earthquake.

Several design deficiencies have been identified for this project:

- No provision was made for flood passage downstream of the spillway and a street now occupies the former creek bed.

- There was no emergency plan developed for action to be taken should the tunnel be blocked. The dam was not designed for long-term impoundment and the possibility of a seepage failure exists.
- There was no provision for a monitoring and warning system. Lowell Creek is subject to flash flooding and there is extreme hazard to life and property should the tunnel system fail.

Fourth of July Creek Levee System, Alaska

This project is located on an alluvial fan across Resurrection Bay from the City of Seward. The project consists of a levee system that was constructed to protect land on the fan for development and has reduced the active surface of the fan by about 70%. A storm event greater than the 100 year storm took place and this event flowed at an average of three feet below the levee crests.

The main problem from this storm event was sediment and woody debris that were deposited along the levee. These deposits forced a majority of the flow to impinge on the levee, causing a portion of it to fail. Because the failure of the levee took place late, during the falling limb of the hydrograph, no damage occurred to the areas protected by the levee. On this project the debris deposition caused the flow to migrate laterally and changed the energy gradients in the channel, both of which caused large erosional forces. Larger sized riprap was used to repair the damaged levees.

Gold Creek Channelization Project, Alaska

The original project consisted of 1,700 feet of reinforced concrete channel and downstream energy-dissipation structures for the portion of Gold Creek passing through the City of Juneau, which is located on an alluvial fan.

The project deteriorated over three years due to erosion of the concrete channel by debris. A minimum-sized debris basin (1,000 cubic yards) was constructed in 1962 at the upstream end of the channel to help prevent material from traveling downstream and eroding the channel. It was observed that the debris basin generally filled within one week after it had been cleaned. Due to continued erosion of the channel from debris flow, the debris basin was enlarged to 5,000 cubic yards sometime in the 1980s. The City of Juneau periodically cleans the basin out and repairs the channel bottom when needed. Except for the ongoing maintenance required, the project has performed well. The repairs and modification to the channel for the sediment and debris flows appear to have been based upon observation and field testing.

Wild Rose residential development-1992, Corona, California

This development project was located adjacent to active alluvial fans with significant debris loads. Four alternatives were considered to mitigate the potential hazard, including debris basins, floodplain delineation of hazard zones, debris transport channels, and combinations of these. The selected alternative was debris transport channels which provided the required protection while maintaining the sediment balance to the downstream channel. A major design issue was the bulking factor used to increase the 100-yr design flow. These factors ranged from 1.58 to 1.83.

The project was completed with several miles of high strength, reinforced concrete trapezoidal channels outletting to Temescal Wash. Lessons learned during construction and subsequent operations include the importance of over sizing for extra conveyance capacity and freeboard,

use of thicker concrete lining, minimizing changes in horizontal and vertical alignment to reduce flow disturbance and consequent changes in sediment transport capacity. The overriding lesson learned was the importance of being very conservative in the design.

The Reserve residential development, Palm Desert, California

The objective of this project was to create a 500-acre, 250-unit luxury residential and golf course development on an active alluvial fan. Design issues included desert hydrology of the 46.4 square mile Canyon watershed, alluvial fan hydraulics, sediment and debris loading, flood hazards, and design parameters for proposed channels and levees. The average fan slope is 3%. There were two existing entrenchments and a 93-acre regional debris basin that had to be included within the project design. The boundary of the residential project is actually 12,000 feet downstream of the fan apex.

Addressing both hydraulic and sediment transport issues was proposed and implemented. The structural measures included a construction of a new 3,900 foot long, 18-foot high concrete lined transverse levee and a 5,200 foot long primary conveyance channel, as well as rehabilitation of a 2,100 foot long existing levee. The primary channel was designed as an incised trapezoidal channel 220 feet wide and 12 feet deep with concrete slope lining and 9-foot deep cutoff walls. Landscaping was used to soften the appearance of the primary channel. A physical model was used to test the design concepts prior to construction.

Las Vegas Piedmont, Las Vegas, Nevada

The Las Vegas metropolitan area is located on and adjacent to three active alluvial fans (Red Rock, Tropicana/Flamingo, and Blue Diamond) which create significant flooding hazards for both the existing and proposed new development. Major design issues included the limited outfall conveyance capacity and the difficulty of locating new outfall corridors through existing development.

A USACE project, with Clark County Regional Flood Control District (CCRFC) as the local sponsor, was authorized in 1992 to deal with regional flooding issues. The final project that was developed included a TFS consisting of a series of detention basins, lateral collectors, and outfall channels designed to accommodate the ultimate buildout peak flows for the entire area. The system, which is incorporated in the Clark County Drainage Master Plan, includes 33 miles of collector channels, 5 detention basins, 3 debris basins, and 28 miles of primary (outfall) channels. Construction of portions of the system began in 1986 and the total cost is approximately \$284 million. The CCRFC completed the second update of its Regional Master Plan in 2003, and has made adjustments to the plan to accommodate changing growth patterns. Overall flows have increased as a result of denser urbanization, but the system with some modifications is working satisfactorily. All of the originally planned system has been constructed and is operational. Because there is so much new development extending the boundary of the metropolitan area, the CCRFC has had to expand the scope of the original basin and channel system.

Non-Structural Approaches

Coastal Venezuela, December 1999 Storm

In this storm event, multiple pulses of debris flows occurred with large boulders and tree trunks deposited amidst a sandy matrix on nearly all fans. The average velocity of the debris flows was estimated by measuring the maximum size of boulder transported, and this analysis yielded a velocity of 13 ft/s to more than 45 ft/s. The largest fan in this area is the Caraballeda fan, which was densely developed with residential and commercial buildings.

After the storm event, two-story buildings were found to be buried or completely destroyed and many buildings had partially collapsed. Further down the fan the flows followed the paths of streets and openings between buildings, limiting the amount of damage in this area.

Subsequently, a detailed study yielded the following observations;

- Large apartment house construction was a better fit for the developed area of the fan versus individual one- and two-story residences, since larger apartment houses proved to be somewhat more resistant to damage from debris flows.
- Buildings on the fan should be oriented so that the length is parallel to the direction of flow, thereby minimizing the width of the building exposed to a debris flow.
- If grading techniques are utilized, they should be designed to keep houses above the potential flood elevation and divert drainage away from buildings.
- Laying out streets to generally parallel the downslope direction of the fan will help in storm events because the streets can serve as overflow channels.

Slide Mountain, Nevada

On an alluvial fan surface near Slide Mountain, south of Steamboat, Nevada, a debris flow rushed downhill and pushed aside houses and cars and buried Old Highway 395 nine feet deep in sand, gravel and boulders. The area had received 200% of its normal snow pack and the event took place on a 90 degree day. The entire event took approximately 6 minutes with a velocity estimated at 30 ft/s. The flow was 25 times greater than the estimated 100-year storm event.

In this area, different solutions were studied to protect the community. Routing the main channel from above the active apex around developments and sending debris flows to an adjacent watershed was one possible solution; however, costs proved prohibitive. Part of the selected solution was to install a flood warning system connected to real-time rain-gauge data. Also, door-knob hangers were distributed to inform citizens about the potential hazards. Maintenance of property is a large part of the information that was disseminated, mainly the importance of keeping driveway culverts clear and unobstructed.

Bader Recovery Project, VA

This case is of a single family home in Virginia that was located on an alluvial fan. A low profile berm/ridge system was constructed just upstream of the house in response to previous flooding.

Following completion of the project two short-term events compromised the berm to a point where it was suspected structural failure would occur in another such event. Since the berm did

not prove to be a long-term solution, other options were considered. At the Baders' request, State and Federal teams joined in the evaluation of alternatives. The most cost effective option was to move the Bader house to higher ground elsewhere on their property where it is not at risk of flooding or landslide. The project cost was \$36,625 and is estimated to benefit the family \$61,000.

Douglas County, Nevada

Ten miles south of Carson City the Carson River has repeatedly flooded portions of Minden and Gardnerville. Between 1991 and 1993, three large flash floods flooded a rapidly growing neighborhood on an alluvial fan. The main channel on the upper part of the fan contained most of the flood and the damages to the community were only in the thousands of dollars. These floods led the community to form a citizens task force for flood management in 1993.

The task force discovered through research that two floods during a three-year period had exceeded the predicted 100-year flows. Various structural and non-structural methods were studied to protect the community, which by then included nearly 1,000 homes. One method studied was a diversion dam and channel, but the cost for this option would have been at least two million dollars. The community applied for and received a \$10,000 grant and invited a geomorphologist to analyze the flood hazards in the neighborhood.

The study concluded that the probability of a larger, life threatening flood in the neighborhoods was relatively low. Therefore, the community group decided to apply for a Federal Flood Hazard Mitigation Grant to install an automatic flash flood warning system in the headwaters of three potentially hazardous washes. The system included weather stations with precipitation gauges and radio contact with the county offices and a Reverse 911 system that allows the county to warn residents if a flash flood from the canyon above them is imminent.

REVIEW OF FAN MITIGATION METHODS

Full Fan Protection Methods

Debris and Flood-Detention Basins

Applicability: Located near or upstream of the apex of a fan, flow and debris must be confined upstream of the structure to enable the structure to capture the flow.

Use: Debris and flood detention

Types: Basins designed based on current USACE design standards appear to be adequate in most cases. Basins with an improved channel downstream for safe conveyance of water appear to have fewer maintenance issues.

Design: Debris basins have also been used in conjunction with debris straining structures. The dam should be engineered according to SCS Technical Release No. 60, Bureau of Reclamation's 1987 publication "Design of Small Dams" or other approved methods. Dam should be designed for impact forces. Side slopes of 3:1 or 4:1 and well vegetated or protected by riprap, grouted riprap, or concrete where necessary. Dams may fall under the jurisdiction of the Arizona Department of Water Resources (ADWR); therefore, a dam must meet state design requirements as well.

An emergency spillway should be designed for large events to prevent destruction of the dam. Design criteria for the emergency spillway should be taken from SCS TR-60 and USBR Design of Small Dams references referenced above. A drainage easement needs to be obtained downstream of the emergency spillway the entire length of the outlet from the dam to its terminus in its natural watercourse so that future development does not occur in the path of an emergency spill.

The outlet structure should be designed as a riser pipe/structure and built far enough away from the dam embankment so as not to be plugged by debris deposition.

The basin should be sized for the full volume of debris determined for the alluvial fan in question. One method to determine this volume is to use RUSLE2 to determine the amount of erosion from the fan upstream of the apex. This volume can be used to size the basin, but four feet of freeboard should be included in the design. The methods for estimating debris upstream of the apex of an alluvial fan are for the most part untested. In the Los Angeles area there are regression equations from years of data; however, this is the only area that extensive research has occurred. In using untested methods to size basins for debris flows, the designer is strongly cautioned to be conservative in the analysis.

Erosion protection must be provided at outlet structures. Sizing criteria can be obtained from publications such as the Denver UDFCD manual or Hec-18.

Flow entering into the basin can be via a drop structure and the bottom of the basin can be excavated with a flat slope to cause debris to drop out and velocity to lessen before arriving at the dam structure. Care must be used in designing this feature so as not to create an avulsion and have the stream jump out of the channel and circumvent the debris structure.

A basin and straining structure combination can be designed with a straining structure in the middle of the dam embankment. This will allow water to flow through the embankment while capturing debris; this will not have a noticeable effect on travel times for the flow of water.

A low flow outlet designed to pass lesser rainfall events can be constructed as part of the outlet design, unless detention of smaller rainfall events is required by the county for the development, or it has a beneficial effect to downstream areas.

The detention basin should be designed for impact and dynamic loading. Two acceptable methods are listed here.

Impact load – Hertz contact force equation

Dynamic thrust – momentum equation Hungr et al.

$$F = A * D * V^2 * \sin\beta$$

F – dynamic thrust

A – cross sectional area of flow

D – density of debris

V – velocity of flow

β – angle between the flow direction and face of structure

Maintenance access must be provided to clean out the structure as needed, including a stable all weather access to the bottom. Access to inflow and outlet works of the dam must be provided. A maximum grade on the maintenance access is recommended at 10%.

Flood Control Channels

Applicability: This structure should be located downstream of the apex of the fan and be designed to intercept all conceivable paths of water/debris from upstream of the anticipated development

Use: Removes a large portion of a fan from the floodzone and makes it available for development

Types: Concrete, natural channel with bank protection to prevent lateral migration, incised or with floodwalls and levees

Design: An important aspect of design for a flood control channel on an alluvial fan is to account for any sediment or debris loads

One design that is documented to have worked well is to have an interceptor channel just upstream of the actual diversion channel. Assuming the diversion channel intercepts runoff more or less perpendicular to the direction of flow, the

interceptor would parallel the diversion channel, being separated with a levee or floodwall. There should be reinforced weir inlets to allow clear water to flow from the interceptor channel to the diversion channel. The diversion channel should be sized according to local guidelines (100-year storm event or larger) and freeboard requirements should not be less than three feet due to the extreme hazard present on alluvial fans.

Additional reinforcement protection should be provided at areas of transition in channel geometry.

Maintenance of both channels needs to be taken into consideration and a 10-foot path on each side of the channel structure (both channels) should be constructed for maintenance access.

Sediment yield must be calculated to size the channel for sediment storage. Factors to consider are the distance from apex and type of structure at apex (if any). Debris flows may need to be considered if the channel is close to the apex and there is no debris basin at the apex.

Proper open channel design should be followed with the above special considerations for alluvial fans. County criteria for flow depths, velocities, channel and side slopes, and low flow channels should all be followed.

Floodwalls and Levees

Applicability: Designed to remove large areas of fan from debris/flood hazards

Use: Captures flood flow and debris flow from upstream areas of the fan

Types: Concrete floodwalls, earthen levees, structural or stabilized walls

Design: Sediment/Debris must be accounted for; previous designs have shown that debris will be deposited at irregularities in the sides of channels or levees, or where flow impinges on levees or floodwalls. In some cases this can cause the water to overtop or erode away the levee or floodwall. Protection of faces and toes from erosion is critical for a stable structure.

These structures should be located further down the fan where large sediment or debris loads are not likely, or the structures should be used in conjunction with a debris basin.

Geotechnical recommendations should be followed for constructing the levees. Structural engineering recommendations should be followed for constructing the floodwalls.

Diversions and Bypass Structures

Applicability: Remove large areas of fan from flood hazard area.

Use: Captures flood flow distributed across the fan to divert it to a controlled channel system.

Types: Dam with weir overflow

Dam with outlet structure into channel or pipe

Design:

Underground concrete structures (not for debris flow areas) with pipe outlet
For capturing distributed flow the structure may and probably will be a dam that has a long embankment.

Design the structure based on hydrology of the contributing area and in conjunction with local regulations. Design additional storage within the diversion structure for sediment and debris flows.

The diversion structure could be used to send flow to more than one channel/location on the fan.

May be used to keep current small channels flowing via multiple outlets from the diversion structure.

Area can be used for other amenities – park, golf course, etc.

LOCALIZED PROTECTION MEASURES

Debris Barriers

Applicability: Widespread erosion potential areas – such as after a wildfire. Places where stability of the watershed is in extreme question such as in land or rockslide prone areas

Use: Not a flood control measure. Designed to block large materials and floating debris (rocks, trees, logs, etc.) from proceeding downstream; also serves to slow the material down.

Types: Debris Fences, Debris Rack, Straining Structure, Debris Barrier Walls, Crib Barriers, Retaining Walls

Design: Can be designed to be permanently in place or part of an emergency response plan
Debris Fences – vertical beams which can be constructed from railroad rails, I-beams or pre-cast reinforced concrete beams. These should be anchored in a foundation perpendicular to the expected debris flow, the fences should be designed to yield before breaking, thereby still slowing the flow down and not producing a surge flow. Fences must be properly sized and reinforced for the high speeds at which the debris laden flows will move and also designed for impact loads. Debris must be removed from behind the fences after debris flood events. Fences can be placed across channel upstream of the apex to filter out debris. Vertical beams have been shown to retain more coarse grained material; horizontal beams cause organic smaller grained material to be captured or settle out.

Debris Barrier Walls – constructed across canyon mouths after fires. Used for heavy debris flows. Design for the high speeds that are expected with debris laden flows, also design for impact loads.

Crib Barriers – constructed like small check dams across a channel. Crib Barriers are usually constructed of concrete. The barriers are constructed in series and require periodic cleanout or allow to fill in, become vegetated and form flatter slopes and more stable toes of sidewalls. Barriers must be designed structurally as dams or concrete crib barriers. May have a cast-in-place reinforced spillway section to control overtopping flow.

Retaining walls – good protection for single lot structures. May be placed at angles other than 90 degrees to direction of flow. Should be structurally designed as steel-reinforced, poured-in-place concrete structures or other stable structures designed to withstand the forces that will be encountered.

Drop Structures/Check Dams

Applicability: Located in sediment transport zone upstream of apex or downstream of apex in flood channel

Use: slow down flood and debris flows, trap debris, control channel degradation

Types: Reinforced concrete slot walls, gabion or concrete weirs

Design: These dams are used to impede flow and cause debris to drop out.

These dams do not need to be cleaned out. After the dams become filled they act as drop structures, allowing a shallower slope for the channel, which will cause sediment and debris to settle out after the dams are filled.

The dams must be able to withstand the dynamic and point impact forces, sliding, overturning, uplift pressures and foundation abutment loadings. These structures are typically constructed of concrete or reinforced concrete with a weir to pass runoff from flood events.

Incorporating drainage holes into the face of the structure allows passage of water from entrapped material behind the dam in the event of a slurry or debris flow.

A hard basin drop or scourhole should be designed on the downstream side of the structure to prevent erosion of the downstream toe.

Best Design Practice (BDP) Site Plans to convey flow

Applicability: Any development site located on an alluvial fan

Use: A Best Design Practice for any development on an alluvial fan

Types: Various site plans can be produced, following the basic principles stated below

Design: Main streets should parallel the direction a catastrophic event would flow (dam failure, etc.)

Buildings oriented with short side perpendicular and long side parallel to direction of flow

Open space placed in areas of highest hazard risk

Raised fill areas where possible – fill should be armored

Floodwalls that can be incorporated into design are encouraged (fencing/walls with structural brick/concrete at bottom)

Reinforcement of building openings on uphill side of building will help strengthen structure against debris impact.

COST AND BENEFITS DATA

In general, cost data for alluvial fan incidents and projects is limited and not readily available. Of the thirteen case studies reviewed in this report, some cost data was available for only five. In addition, the data was not consistently reported. Costs were reported for damages, capital construction costs, maintenance, and benefits, but none of the case studies included data for all these categories. Consequently only very general trends and conclusions can be inferred.

Damages ranged from minimal to millions of dollars. The case with minimal damages occurred in the Douglas County, Nevada study, in which an existing residential development on an alluvial fan experienced minor flooding. In this case the primary channel contained most of the flood flows. The other case that reported costs for damages was the 1969 Southern California flooding, which reported loss of life and more than \$213 million in property damage. Although only a few of the studies reported dollar amounts, most of the case studies indicated significant damage or potential for such damage to occur. This is primarily due to the nature and extent of development which had occurred or is underway on fans.

Three of the five studies with some cost data provided capital construction costs. Again, costs ranged from a few thousand dollars to hundreds of millions. The most extreme case appears to be the Las Vegas Basin USACE project, which was reported to cost more than \$284 million. This project is a regional flood control project which extends across the entire Las Vegas metropolitan area. Physical infrastructure includes 33 miles of hardened collector channels, 28 miles of primary drainage outfall channel, five regional detention basins, and three debris basins.

The other two cases reporting construction costs were both in the range of \$10,000 to \$40,000. These included a house relocation in the Bader Recovery project and a flood warning system for Douglas County. Interestingly, a TFS proposed for the Douglas County site was estimated to cost \$2,000,000, but this was not considered cost effective. Several other projects indicated that the final solution involved substantial construction costs, but these were not explicitly stated. A general trend that can be inferred is that TFSs will be large in scope and cost. In particular, two of the more recent case studies noted specifically the need to be very conservative in design, both with respect to system capacity and structural durability.

Non-structural solutions were implemented in two of the case studies. These included a flood warning system and a house relocation. The flood warning system was installed in lieu of a more costly TFS primarily because the benefits, determined by value of the properties needing protection, could not justify the cost of the TFS. It is very important to understand that flood warning systems are not a flood control measure. They do nothing to reduce flooding, flood potential, or property damage. Rather, these systems only serve to mitigate some of the more serious impacts of flooding, namely loss of life.

Maintenance costs were reported for two of the five cases. The range of reported values was \$3,000,000 for repair of a concrete diversion tunnel floor suffering significant deterioration, to \$60,000,000 for cleanout of a debris basin system (multiple basins) after a single storm. Again, most of the structural projects noted a substantial maintenance component related to repair of erosion or removal of sediment and debris. Non-structural solutions seemed to require maintenance as well but not nearly to the same extent as structural solutions. Although

nonstructural solutions are typically low cost and low maintenance, they have limited benefit for avoiding property damage from flooding and more typically function as one of several components in a flood mitigation effort.

Only one case reported benefit-cost data. This was the Bader Recovery project, which estimated benefits at \$61,000 versus the estimated cost of \$36,000. Benefits typically are related to the value of the development (existing) or land (future development) impacted by the fan. Consequently, for a case such as the Las Vegas Basin project, it is quite conceivable that benefits can be in the range of billions of dollars.

Obviously, one measure of benefit is whether an informed stakeholder will finance the mitigation. By this criterion, the initial economic benefit must be substantial, based on the ability and willingness of numerous developers to invest the substantial capital required to design, build, and permit these kinds of projects. However, one of the clear lessons of these case studies is that on-going operations and maintenance costs are typically as much if not substantially more than the initial capital costs.

Development across the west is expanding at historically high rates and TFS projects are becoming more common. It is therefore crucial that communities impacted by or responsible for the long term costs of these projects develop an understanding of what the total lifecycle costs can be.

CONCLUSIONS AND RECOMMENDATIONS

Of the 13 case studies presented here, most were sites located in the western U.S. Severe flooding was involved in 8 of the 13, and debris flows, erosion and sedimentation were listed as problems in six, five, and three of the studies respectively. The level of damage was high in five of the cases, of which two included fairly high density development.

The success rates of various types of mitigation varied significantly, and clearly depends on many external factors. Debris basins performed at satisfactory or partially satisfactory levels, mostly dependant on how much effort went into regular maintenance. Channelization failed more often than not, usually because of sedimentation and loss of capacity, and most of the levees or bank protection projects described in these studies were deemed successful. Understanding and working with the behavior of both water and sediment/debris flows on fans appears to be a critical factor in successful mitigation. Following are some of the specific lessons learned from this review.

- Peak design flows must include bulking factors where sediment volumes are an issue.
- Oversizing of channels and debris/detention basins is another factor common to successful mitigation.
- In addition to building “excess” capacity, it is important to consider details such as vertical and horizontal alignment shifts for channelization. These should be minimized or transitioned very carefully to reduce disruptions to the flow conveyance and channel capacity.
- Structural features such as channel linings, spillway weirs, and grade control drop structures should be designed with a substantial factor of safety to account for the extreme damage potential of fan flows.
- Feasibility analyses of projects should include both technical engineering factors and a realistic cost-benefits analysis. Technical and engineering factors should include items such as the level of flood protection provided and the risk of failure for different storm events along with the potential consequences associated with that failure. The cost-benefit analysis of the project should be evaluated based on total projected lifetime costs including maintenance and operations along with initial capital costs.

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Public Involvement Plan



BUCKEYE/SUN VALLEY AREA DRAINAGE MASTER STUDY

Public Involvement Plan

August 2003

2nd Draft

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Introduction

This Public Involvement Plan has been developed in conjunction with the Buckeye/Sun Valley Area Drainage Master Study. Specific milestones of the public involvement process for the project have been integrated into this Plan. The intent of this plan is to ensure opportunities for public access to project information and identify opportunities for public comments and suggestions that can be used by staff in the planning and decision-making processes.

The Public Involvement Plan addresses: (1) the number and types of public meetings and outreaches; (2) the use and frequency of communication devices such as fliers, brochures and news releases; (3) the development of mailing lists and lists of key constituencies; and (4) the methods of gaining public input about the aspects of the study.

Project Overview and History

This is an Area Drainage Master Study (ADMS) for the Buckeye/Sun Valley Area. The watershed for the Buckeye/Sun Valley Area is generally bounded by Gates Road to the north, the White Tanks Mountains and approximately the Dean Road alignment to the east, the Gila River to the south, and the Hassayampa River to the west. The total watershed area is approximately 280 square miles.

The project area has been divided into four geographic regions in order to facilitate technical analyses and public and stakeholder coordination. As part of the ADMS, the study team will (1) identify area flooding, drainage, erosion, and sediment problems in the study area, (2) evaluate existing floodplain delineations and delineate additional floodplains, (3) identify a range of implementable solutions, and possibly (5) create preliminary development guidelines for the area.

Community Profile

- Buckeye is a largely agricultural community located 30 minutes west of Phoenix. Located at the confluence of the Gila and Hassayampa Rivers, Buckeye prides itself on a quality lifestyle and family oriented environment. Throughout three generations, the citizens of Buckeye have endured both floods and drought, yet have managed to transform the desert into a green and productive valley.
- The Buckeye area is among the world's largest producers of Pima cotton. Buckeye gins produce cotton for shipment worldwide. A renewable supply of water is supplied by the Roosevelt and Buckeye irrigation canals, thereby contributing to the area's continued agricultural prosperity.
- In addition to its agricultural base, leading employers in Buckeye include: Wal-Mart (bulk storage and packaging); Schult Homes (manufactured housing); and the Palo Verde Nuclear Generating Station (the largest nuclear energy generating facility in the United States).
- The town also is located in the Maricopa County Westside Enterprise Zone, offering tax credits (up to \$5,000 per employee) and other incentives for companies locating or expanding into the zone.
- The City of Buckeye has almost doubled in population since 1980. The U.S. Bureau of the Census lists the population of the City of Buckeye at 6,537 as of March 2001. Total population numbers around 12,000.
- Buckeye is served by Interstate 10 and the Southern Pacific Railroad, giving it excellent access to prime transportation corridors. Air transit is accomplished through the neighboring Phoenix-Goodyear Municipal Airport, as well as Phoenix's Sky Harbor International Airport, which is located approximately 15-20 minutes away.
- Buckeye has three elementary schools, one high school and one middle school.
- The City of Buckeye is served by the following utilities:
 - Arizona Public Service
 - Qwest Communications Inc.
 - Cox Communications
 - Southwest Gas Corp.
- Buckeye facilities include a community center, two libraries, one museum, a 550-seat auditorium, several parks, tennis courts, and a rodeo area.

- Buckeye Town council meets on the first and third Tuesday of each month at 7 p.m.
- The 1995 census depicts Buckeye as a poor, rural community of the same economic caliber of Guadalupe and Gila Bend, with the wealthier folks in the county islands outside the town. About one-third Hispanic, but the town provides most of its written materials in English only.
- The future land use for much of the project area is anticipated to be developed into large lot residential property and master planned communities. Current estimates predict that within 40 years, population totals will near 500,000.
- Big growth means high demand for resources without the cash to pay for them. Streets, sewer and water get first dibs.

History of Area Public Involvement

- The Flood Control District is currently conducting the El Rio Watercourse Master Plan which covers areas of Avondale, Buckeye and Goodyear. Turnout at public meetings has been average.
- The White Tanks ADMP also covers portions of Buckeye and has been ongoing since 1995 (?)
- The Lower Hassayampa WCMP is tentatively schedule to start in summer of 2004.

Project Key Issues and Messages

- Currently any overtopping of water is flowing into agricultural fields - as the area is developed, that overflow will need to be contained
- Working ahead of development
- Public safety

Key Public and Stakeholder Issues

- Understanding the process and timeline of the project
- Floodplain delineations
- Rules of development /Development guidelines

Study Issues

- Large project area
- Delineations could be controversial
- Distributary flows, alluvial fans
- Keep Supervisors very involved
- 3 facilities in Buckeye - FRS 1, 2 & 3. FRS 1 is in worst condition.
- **Goal:** implementation and approval of study and rules of development by Board and cities

Public Involvement Activities

Methods on how to keep the public informed about and involved in the project will include the following:

- Identifying key stakeholders.
- Assessing the level of public interest through interviews with community leaders and other interested members of the community.
- Holding public meetings/open houses at key intervals during the project to keep the community informed.
- Notification of floodplain delineations - mailer and 2 legal ads
- Providing further updates and public meeting announcements via newsletters/brochures at appropriate intervals. Mailings will likely be 11x17 4-color.
- Small, informal meetings
- Powerpoint should be used for presentations at public meetings.
- Ask people at the beginning "what are problems" what would you like to see - send out survey with first mailing.
- Work one-on-one with large land holders, developers, stakeholders
- The project is scoped for two public meetings, one informational flier prior to each public meeting, and three additional brochures/newsletters to provide additional updates. In addition, display ads will be placed prior to each public meeting.
- Securing adequate local and regional media coverage through press releases, feature stories, media interviews and potentially a media tour.
- Preparing fact sheets for stakeholders

Public Meeting vs. Open House

Public Meeting: Presentation format and public question and answer session

Best Uses:

1. Controversial project
2. Lots of public interest
3. Project introduction
4. Public has primarily general project questions

Open House: Ordered exhibit boards with floating experts

Best Uses:

1. Little project interest
2. Small attendance
3. Public have specific questions

Proposed Topic/Format of Each Public Meeting

Public Meeting #1 – Because this is the first meeting, it is important that a presentation be given followed by a question and answer period. A PowerPoint presentation should be prepared as well as exhibit boards. A Spanish interpreter must be available.

Topics: Introduction of the Buckeye/Sun Valley ADMS. Define the need, necessity and benefits of the project. Delineation introduction. Educate the public on the historical floods in the area. Flooding 101 information. (Tentatively scheduled for late Sept./early Oct. 2003)

Public Meeting #2 - Maps of the floodplain delineations will be on display and representatives from the Flood Control District and engineering consultants will be available at the meeting to discuss the study and to answer any questions. The project manager/consultant should always be prepared to give a short, verbal update to the group if attendance exceeds expectations. A Spanish interpreter must be available.

Topic: Results of delineations. Project update. (Tentatively scheduled for Jan./Feb. 2004)

Public Meeting #3 - At this time, a 3rd public meeting is an option. However, if Rules of Development are agreed upon and sent to area residents, I think that a meeting to review them is important. A PowerPoint presentation would be best for this. Exhibit boards are essential at this stage. A Spanish interpreter must be available.

Topic: Rules of Development. Results of data collection. Next Steps. (Tentatively scheduled for Dec. 2004))

Project Schedule and Timeline: Phase I

Public involvement activities are scheduled according to project milestones:

-the following schedule assumes public meetings in late Sept./early Oct. 2003

Activity	Date
Develop Public Involvement Plan	July 2003
Implement Public Involvement Plan	July 2003 – Dec. 2004
Fact Sheet for Stakeholders	August 2003
Stakeholder kickoff meeting	September 2003
Gather information, create photo library of project area	Aug. – Oct. 2003
Inventory exhibits and graphic needs	To be done 6 weeks prior to public mtgs

Prepare PowerPoint presentation	Completed 1 week prior to public mtgs.
Prepare Exhibits Boards	Draft boards 5 weeks out of public mtg. Final drafts 3 weeks out of public mtg. Mounted and laminated 1 week in advance of public mtg.
Translate Exhibit Boards to Spanish	Send for translation as soon as available Mounted and laminated 1 week out
Identify speaking points for Board of Supervisors for meetings	1-2 weeks prior to public mtg. (will also need to meet with Supervisor for briefing before public meeting)
Newsletter/brochure produced	First draft due 8 weeks from public mtg. Second draft due 6 weeks from public mtg. Final draft due 4 weeks from public mtg. Printed and mailed 2.5 weeks from public mtg.
Send out brochure for Spanish translation	
Buckeye Sun Valley Web site (hosted on FCD site)	First draft – Sept. 1 On FCD site by Sept. 14th Continuous updates
Press release – Public meeting, project update	Faxed two weeks from date of public mtgs.
Spanish press release	same
Legal and display ads in papers announcing public meeting	Rough drafts – 4 weeks out Should run one and two weeks prior to mtg.
Legal ads will also be ran separately to announce start of floodplain delineation	Should run 2 weeks prior to start of delineations
Public meetings	Two dates
Press release – meeting follow-up	Following mtgs.
Spanish press release	same

Key Stakeholders

Maricopa County Board of Supervisors
Flood Control Advisory Board
Maricopa County Department of Transportation
Arizona Department of Transportation
Maricopa County Planning and Development
Arizona State Land Department
Maricopa County Parks and Recreation
Town of Buckeye - Planning and Engineering
Roosevelt Irrigation District (RIC)
Buckeye Irrigation Company (BIC)

Additional (Optional) Stakeholders

West Maricopa Combine
Arlington Canal Company
Central Arizona Project(CAP)
Bureau of Reclamation
U.S. Fish and Wildlife Service
Arizona Game & Fish
U.S. Army Corp of Engineers
U.S. Department of Agriculture
Western Area Power Authority
Palo Verde Power Plant (APS & SRP)
Bureau of Land Management (BLM)
Arizona Department of Water Resources (ADWR)
Arizona Department of Environmental Quality (ADEQ)
Union Pacific Railroad

Possible Meeting Locations

Buckeye Chamber of Commerce

508 W Monroe St.

623-386-2727

capacity - 90

\$10/hour

Buckeye Community Center/Town Hall

623-386-4691

capacity - up to 280

\$10-18/hour plus \$20 deposit

Buckeye Elementary School

210 S 6th St.

Area Media

Arizona Republic NW - includes Southwest Valley community section

- General phone: 602-444-6935
- Display ads: account rep. Frank Mayo - 602-444-8430
- Fax: 623-412-9577
- Published Wednesday, Friday and Saturday
- News deadline is one week prior to publication date
- West Valley government and growth reporters: Marty Sauerzopf (602-444-6926) and Shaun McKinnon (602-444-6921)
- County reporter - Christina Leonard (602) 444-4845

West Valley View

- General phone: 623-535-8439
- Fax: 623-935-2103
- Published weekly on Weekday
- News deadline is one week prior to publication
- Editor: Jim Painter
- Not a favorite of Town officials in Buckeye
- Circulation: approx. 40,000

Desert Sun

- General phone: 623-386-7077
- Fax: 623-386-7019
- Published weekly on Wednesday
- News deadline is noon Friday prior
- Editor: Cynthia Howard
- Writers: July Siebens and Nancy Brandt
- Covers Buckeye the best
- Circulation: 12,000

Buckeye Valley News

- General phone: 623-386-4426
- Fax: 623-386-4427
- Published weekly on Tuesdays
- News deadline is noon on Friday prior
- Editor: Sharon Butler

Buckeye Chamber Newsletter

S.W. Valley Monthly Newsletter

El Norte

Prensa Hispana

Projected Costs

Ads for public meetings:

AZ Republic: typical ad size 2 column x 5 1/2 inches – approx. \$ 750

West Valley View: 1/4 page ad is 4 7/8 x 7 15/16 - \$438 plus 2% tax

1/6 page ad is 4 7/8 x 5 1/4 - \$286 plus 2% tax

Buckeye Valley News: 1/4 page ad is 5 x 4 - \$96 plus tax

Desert Sun: 1/4 page is 5 x 8 - \$203

Mailing Cost:

Mailing list is 3928 residents plus 50 key stakeholders = 3978

\$.34 for a 3-panel folded brochure with a sticker closure = \$335.92 (988 x \$.34)

\$.29 if brochure is placed in envelope = \$286.52 (988 x \$.29) **However, the envelopes are approx. \$.10 each which is an additional \$98.80

Printing Costs:

In house we do not get charged for paper or envelopes, those costs are built into reprographics annual budget. The charge numbers we give them are for labor.

Spanish Translation:

\$.22/word for press releases and brochures

If Joe is not available for public meetings, there are a number of translators that the county has government contracts with. I have worked with Yolanda Serna of "Let's Talk Translation Services". She was great. Her fees are \$45 – 55/hour depending on the distance she has to travel. She is located in Buckeye!

Facilities:

See possible meeting facilities section on page 11 and their various costs

Refreshments for public meetings:

Can purchase soda, water and cookies for as little as \$50 per public meeting.

Door hangers: (optional)

A two-color 4 1/4 x 11 door hanger costs approximately \$475 to print (based on 2500 copies)

A four-color 4 1/4 x 11 door hanger costs approximately \$867 to print 2500 (based on 2500 copies)

Typical distribution costs for 2500 door hangers is approximately \$341 and will cost extra if they need to be placed in a bag.

(We received an advertisement for 2500 door hangers printed free with purchase of the companies distribution service. The cost of the distribution is \$375. However, the price is for two-color (red and black) door hangers.)

Projected Budget Totals: Phase I

Mailing (1)	\$1360
Facility Charges	\$ 250
Advertising	\$ 2000
Refreshments	\$ 150
<u>Spanish Translation</u>	<u>\$ 500</u>
Total:	\$4260

Optional:

Outside Printing	\$850
Distribution Door Hangars (1)	\$900/ distribution

Labor charges to Project Control Number:

Reprographics – Printing
Shon Wu - Printing, Mounting and Laminating
Melissa Lempke – Public Involvement/Media Relations

RSVP	Salutation	First Name	Last Name	Company	Address	City	State	Zip	Phone Number
yes	Mr.	Alan	Jones	Lennar Communities	1150 W. Grove Parkway, Suite 109	Tempe	AZ	85243	480-345-0077
yes	Mr.	Scott	Switzer	Lennar Communities	1150 W. Grove Parkway, Suite 109	Tempe	AZ	85243	480-345-0077
yes	Mr.	Brian	Rosenbaum	Lennar Communities	1150 W. Grove Parkway, Suite 109	Tempe	AZ	85243	480-345-0077
	Mr.	Mark	Bitteker	Lennar Communities	1150 W. Grove Parkway, Suite 109	Tempe	AZ	85243	480-345-0077
yes	Mr.	Eli	Eid	CVL	4550 N. 12th Street	Phoenix	AZ	85014	602-264-6831
yes	Mr.	Charlie	Enochs	Pulte Homes	3401 W. Anthem Way	Anthem	AZ	85086	623-742-6006
	Mr.	Kimo	Seymour	Makai Development Services	9399 S. Priest Dr.	Tempe	AZ	85284	480-777-7757
yes	Mr.	Scott	Larson	RBF Consulting	16605 N. 28th Ave., #100	Phoenix	AZ	85053	602-467-2200
yes	Mr.	Paul	Sclafani	RBF Consulting	16605 N. 28th Ave., #100	Phoenix	AZ	85053	602-467-2200
yes	Mr.	Kevin	Kamersell	CMX	7740 N. 16th Street, Suite 100	Phoenix	AZ	85020	602-567-1910
yes	Ms.	Jami	Schulman	Communities Southwest	7720 N. 16th Street, Suite 310	Phoenix	AZ	85020	602-265-1952
	Mr.	Bob	Spiers	Stardust Companies	6730 N Scottsdale Rd, Suite 230	Scottsdale	AZ	85253	480-607-5800
yes	Mr.	Rick	Hurula	Stardust Companies	6730 N Scottsdale Rd, Suite 230	Scottsdale	AZ	85253	480-607-5800
	Ms.	Maggie	Gallooly	Fennemore Craig	3003 N. Central Ave., Suite 2600	Phoenix	AZ	85012	602-916-5468
no	Mr.	Dempsey	Helms	AZ State Land Dept.	1616 W. Adams	Phoenix	AZ	85007	602-542-2681
yes	Mr.	Joe	Blanton	Town of Buckeye	100 E. Apache Rd., Suite A	Buckeye	AZ	85326	623-386-4691
yes	Mr.	Carroll	Reynolds	Town of Buckeye	100 E. Apache Rd., Suite A	Buckeye	AZ	85326	623-386-4691
	Mr.	David	George	David Evans & Associates	2141 E. Highland Ave., Suite 200	Phoenix	AZ	85016	602-678-5151
yes	Mr.	Ryan	Weed	CVL	4550 N. 12th Street	Phoenix	AZ	85014	602-264-6831
yes	Mr.	Ted	Lehman	J.E. Fuller	6101 S. Rural Rd., Ste. 110	Tempe	AZ	85283	480-752-2124
yes	Mr.	George	Cannon	Communities Southwest	7720 N. 16th Street, Suite 310	Phoenix	AZ	85020	602-265-1952
yes	Mr.	Woody	Scoutten	W.C. Scoutten, Inc.	1646 N. Litchfield Rd., 235	Goodyear	AZ	85338	623-547-4662
yes	Mr.	Ott	Otozawa-Chatupron	AZ State Land Dept.	1616 W. Adams	Phoenix	AZ	85007	602-542-2681
yes	Mr.	Chuck	Williams	C.L. Williams Consulting, Inc.	4270 W. Maverick Ln., Ste. 103	Lakeside	AZ	85929	928-368-2248
yes	Ms.	Pat	Deschamps	J.E. Fuller	6101 S. Rural Rd., Ste. 110	Tempe	AZ	85283	480-752-2124
yes	Ms.	Valerie	Swick	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-2929
yes	Mr.	Doug	Williams	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Mr.	Greg	Jones	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Ms.	Melissa	Lempke	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Ms.	Kathryn	Gross	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Ms.	Lynn	Thomas	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Mr.	Amir	Motamedi	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Mr.	Russ	Miracle	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Ms.	Julie	Cox	Flood Control District of Maricopa County	2801 W. Durango St.	Phoenix	AZ	85009	602-506-1501
yes	Ms.	Robin	Bain	PBS&J					
yes	Mr.	Burke	Lokey	PBS&J					
yes	Mr.	Scott	Peters	Environmental Planning Group					
yes	Mr.	Steve	Jackson	Engineering Alliance					

Project Meeting Minutes

Project: BUCKEYE SUN VALLEY ADMS
Special Stakeholders Committee Meeting

Date/Time: February 17, 2004
Meeting Began: 2:00 PM

Location: MCFCD conference room

Attendees:

Burke Lokey	PBS&J	Steve Jackson	Engineering Alliance
Robin Bain	PBS&J	Glenn High	Engineering Alliance
Valerie Swick	FCDMC	Melissa Lempke	FCDMC
Doug Williams	FDCMC		

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Special Stakeholders Meeting, held at the FCDMC on February 17, 2004. Please refer any corrections or clarifications to Steve Jackson at Engineering Alliance, Inc. If no comments are received, then this memorandum will become a record of the meeting.

SUMMARY OF MEETING NOTES

Item 1. Welcome and Introductions: The meeting began with short self-introductions. Valerie Swick led the discussion stating the purpose of this special meeting. Valerie and Doug decided prior to the meeting that an additional scope of work will need to be added to the existing MCFCD ADMS project (Stakeholders Section) due to new concerns of 4 or 5 major developers that will be impacted by the alluvial fans in the area north of I-10.

Item 2. Issue: As presented by Valerie Swick of the Flood Control District.
The infrastructure the developers plan to build on their own will do little to restore fan property into developable land, and may be at cross-purposes with other developer solutions. It will generally cost developers a lot of money. The idea is to move the developers into a strategy to fund a centralized solution, the Total Active Fan Solution, so that the District can allow development on as much of their properties as possible.

It was discussed and suggested by Doug Williams that PBSJ form a special Stakeholder team (Consisting of Burke, Robin and an expert on alluvial fans) to contact and briefly educate the developers of potential issues within the next two weeks. Doug mentioned three developers; CMX, Lennar and Stardust and asked

PBS&J to contact them and all other impacted developers. The team will initially meet individually with developers and in approximately 4 to 6 weeks will conduct a special Stakeholders meeting with the entire group of impacted developers for the purpose of forming a united effort in remedying the issues at hand for the entire area impacted by the alluvial fans.

- Items 3.** Doug stated that Buckeye is currently working on an impact focus. We need to make sure that Buckeye is on board with the Flood Control District and understands the impact this will have on other developing areas. He also suggested PBS&J gets permission to present these issues to the Buckeye City Council. Valerie is to meet with Joe Blanton next week and will plan to discuss this issue and the importance of Buckeyes support.
- Item 4.** Valerie suggested that a total fan solution was best. Research needs to be done on what's worked and what has not in the past and for PBS&J to make necessary contacts in researching other past solutions in other areas with similar issues.
- Item 5.** Valerie asked PBS&J to submit an additional Scope of work, dollars and man-hours to accomplish the additional work.

Action Items:

- A. The team of Robin, Burke and an Alluvial Fan Expert (to be named later) are to schedule and meet with individual developers within the next 2-3 weeks.
- B. Once all individual meetings are completed, a special stakeholder group meeting with developers will be set up. The target date is set for the end of March. Steve will assist Burke and Robin in hosting the meeting.

Meeting Adjourned: 4:45 PM

April 14, 2004

ATTENDEES

Valerie Swick - FCD

Kathryn Gross - FCD

Brett Howey - FCD

Burke Lokey - PBS&J

Wen Chen - PBS&J

Woody Scoutten - Town of Buckeye

Carroll Reynolds - Town of Buckeye

Kevin Kammerzell - CMX

Ryan Weed - CVL

Terri George - DEA

George Cannon - Communities S.W.

Brian Rosenbaum - Lennar Community

Bob Spiers - Stardust

Dave Inoshita - Pulte

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Special Meeting, held at the FCDMC on April 14, 2004. The purpose of this meeting was to discuss several issues related to development issues related to alluvial fans within the Sun Valley area. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of the meeting.

SUMMARY OF MEETING NOTES

Item 1. Spokesperson for the Steering Committee

There was discussion on whether a group leader or spokesman was needed. The responsibilities of this person were to provide a single point of contact and to facilitate meetings of the group. PBS&J and the District will continue to provide support. Woody Scoutten was selected and agreed to serve as the spokesperson for the Steering Committee.

Item 2. Master calendar of development schedules

Burke Lokey suggested that since timelines were such a critical part of any potential regional solution, compiling a "Master Schedule" would be helpful. The following information was shared and will be compiled into an exhibit to be shared with all members of the group.

Stardust with DEA is planning large communities on both sides of Sun Valley Parkway. Drainage conditions and possible solutions are different on each side.

They have been working on Tartesso for four years, and have recently started work on a large commercial center. They expect to break ground within 2 to 5 years.

Lennar with CVL is developing Elianto, formerly known as Tartesso North. Phase 1 of the Master Plan is expected to break ground in the first quarter of 2005. They are

currently working on major revisions to the Master Plan and hope to submit within 60 days.

Community SW with CMX is currently working on master planning of the Sun Valley South development. They are also at least 2 to 5 years away from breaking ground on initial phases of that project.

Item 3. Process for Workable and Acceptable Alternatives

There was a general consensus from the group that a regional drainage solution would be preferable especially for mitigation of alluvial fan hazards. From the perspective of the developers, there are numerous issues to resolve before an "acceptable" regional solution could be implemented. All of the projects started at different times and are in different stages. The corporate structure of each developer is different and their timelines are based on different assumptions and conditions.

Valerie Swick discussed the District ADMS process and what was included in the scope of the Buckeye Sun Valley ADMS. The Scope of Work for the Buckeye ADMS project does not include conceptual drainage plans for Area 3 and the geomorphic study is only scoped to proceed through Stage II, which is not adequate to propose a detailed guideline for sediment transport/hazard mitigation.

Woody Scoutten wanted to know what kinds of analyses, mapping, exhibits and so forth the District could do for Area 3 through this project. Valerie stated that if it became obvious that there were specific needs that really should be addressed by the District, then she would go back to her management with a request to authorize those services.

More stringent requirements for sediment management may be required for developers in the future, because the District is starting work on the Buckeye Flood Retarding Structures Rehabilitation project. This project as described by Brett Howey will likely extend over the next 3 years. The District's focus will be on existing structural deficiencies requiring immediate attention, and they will also look at potential long term solutions meeting the needs of the Town of Buckeye and other stakeholders. As a general rule, the District would be concerned about any actions that would create additional maintenance requirements, such as an increase in sediment loading.

It was noted that all the developers had recognized and tried to address these issues and constraints as part of their overall development plans. In the current versions of their drainage master plans, they have proposed drainage corridors, main flow channels, and detention/retention basins to alleviate the increases in peak discharges due to development. Stardust has delineated the proposed channel corridors in their project, and Lennar stated they proposed 65-acre and 55-acre detention basins as well as designated channel corridors. However, there are still many issues pending including coordination of primary channel corridors between developments,

SUN VALLEY STAKEHOLDER STEERING COMMITTEE

maintenance responsibilities, placement and size along with the associated effects of any basins.

The Town of Buckeye is willing to accept maintenance of the proposed flow channels as long as an adequate financing arrangement can be worked out.

The District is also concerned about the active and conditionally active alluvial fans are apt to change the proposed flow patterns, cause instability of the flow channel, and convey substantial sediment downstream ultimately to the FRS.

Kevin Kammerzell suggested that one pressing need was a definitive statement of design criteria including permissible channel widths and velocities, allowable flow metering from basins, sediment transport capacities and so forth.

Bob Spiers suggested that the developers arrange to meet and see if they could work out a cooperative solution that would be acceptable to the two (possibly three) major stakeholders in Area 3 – Stardust, Lennar, (and Pulte). It was agreed that they would plan on meeting, specifically to address corridor locations as well as other possible alternatives, and then we could schedule another group meeting. This meeting was tentatively scheduled for May 12, 1 pm at FCD.

Item 4. Model updating

The latest PBS&J Area 3 hydrology model is currently in review and will be made available to the developers and their engineers. It includes updated Green and Ampt parameters and fixed some routing problems. In addition, the hydrology prepared for the individual developments is acknowledged to contain greater detail for the specific developments. It will be reviewed and incorporated into the PBS&J model where feasible to provide the most accurate model.

Action Items

PBS&J will research flood hazard solutions for alluvial fan by investigating successful examples in California, New Mexico, and Nevada, among others.

Woody and Carroll agreed to consult with the Town attorney to investigate the possibility of a special district.

All developers agreed to meet, share their development plans, and work out some conceptual alternatives that they could accept before a general meeting in 4 weeks. The general meeting was scheduled for 1 pm, May 12.

Next Meeting: May 12, 2004 1-3pm

Total time: 110 minutes

PROGRESS MEETING – Sun Valley Stakeholders Group

ATTENDEES

Valerie Swick: FCD
Brett Howey: FCD
Kathryn Gross: FCD
Bob Stevens: FCD
Greg Jones: FCD
Burke Lokey: PBS&J

George Cannon: CSW
Bob Spiers: Stardust
Teri George: DEA
Doug Wen: CVL

The following is a summary of the items discussed at the Buckeye Sun Valley ADMS Sun Valley Stakeholders Meeting held at the FCDMC offices on July 8, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Valerie Swick began with a statement regarding the need for the stakeholder group to get focused and start producing results in order to justify the effort being expended. It is important not to waste the momentum generated during the initial meetings.

Bob Spiers stated that the stakeholders group needed to articulate specific objectives. He felt there were three that were obviously important. There are

- Development of a consolidated, regional HEC-1 model that works for all parties.
- Preparation of a base map on updated aerial, which would show primary wash corridors and the associated design flows.
- Regional design criteria/guidelines for basins and channels
- Process to formally deal with long term maintenance issues and responsibilities

The consolidated HEC-1 model could be the Buckeye Sun Valley ADMS model with some method for coordinating between that and the individual development HEC-1 models which generally have more vertical detail within the vicinity of the specific development.

Burke Lokey asked that the group be more specific about what was needed or wanted on the base map. The consensus was that the map should include major or primary wash corridors with widths, gross Qs, and should be displayed on an aerial photo background.

It was agreed that the Q's that would be used for this effort would be those developed in the regional Buckeye Sun Valley ADMS model.

There would be three sets of maps as follows:

1. Existing Condition Wash Corridors
2. Proposed (Future Condition) Wash Corridors (no regional basins)

3. Proposed Wash Corridors w/ Regional Basins

The next objective – development of regional design criteria and guidelines, was generally considered to be focused on providing a consistent and uniform approach to the design of drainage facilities throughout the area.

Finally, it was agreed that the issue of long term maintenance and how it would be funded was a significant item that would have to be addressed in conjunction with the Town and the District, but that it could be deferred for now. Valerie noted that this would require some analysis of both normal operating costs for channel and basin maintenance as well as some form of a contingency funding mechanism for unusually severe events. In addition, it was noted that water quality issues would become an issue at some point specifically with sediment concerns.

The proposed timeline would be to prepare this plan as the regional drainage plan over the next two years, which would include development of the drainage facilities in cooperation with the Corps of Engineers perhaps using some sort of mitigation banking program. It was suggested that the Town of Buckeye might be the appropriate partner/sponsor for some or all of the environmental compliance efforts.

Burke Lokey agreed to prepare an exhibit showing a first cut at primary washes for purposes of developing a consensus. This would be placed on the TeamAccess website by Friday, July 23rd. All of the stakeholders will be added to the TeamAccess website.

Next meeting

August 5, 2004 10:00 AM at CMX offices - technical discussion concerning primary wash corridors

PROGRESS MEETING -- Sun Valley Stakeholders Group**ATTENDEES**

Gregory Jones – FCD
Valerie Swick – FCD
Kathryn Gross – FCD
Wen Chen – PBS&J
Nicolas Jauregui – Pulte
Price Nosky – Pulte
Bob Speirs – Stardust
Kris Harman – Stardust
Brain Rosenbaum – Lennar

Jack Moody – WRG
George Cannon – CSW
Jani Schulman – CSW
Ryan Weed – CVL
Doug Both – CVL
Douglas Nguyen – CVL
Terri George – DEA
Kevin Kammerzell – CMX

The following is a summary of the items covered or discussed in detail at the Sun Valley Stakeholder Progress Meeting held at CMX on August 5, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of the meeting.

SUMMARY OF MEETING NOTES

Discussion today was a continuation of the effort to develop and implement a regional drainage solution as outlined in the last stakeholder meeting, and mainly focused on flow paths and flow rates associated with alluvial fan apex #36 through 39 located in Sun Valley. A map showing proposed regional flow paths was developed and provided to participants. The map was marked up during the discussion. After editing, a finished version of the map will be included as part of these meeting minutes.

1. Apex # 39

Apex # 39 is located in sub-basin F2. Runoff from Apex #39 flows west and is joined by an upper non-apex tributary in F2 towards sub-basin F3. CMX has proposed to place a levee between the tributary junction and divert the apex flow to a tributary located in sub-basin H1. The apex flow was determined to be 2,700 cfs, and the final discharge to east side of Sun Valley Parkway was determined to be 3,200 cfs through the tributary in H1.

The runoff will likely overtop Sun Valley Parkway and continue flowing south since the culverts underneath the Parkway are undersized and the capacity of the ditch along east side of the Parkway is less than 1,000 cfs. Currently MCDOT is conducting a capacity study for all the culverts along Sun Valley Parkway.

2. Apex #38

Apex #38 is located in sub-basin K2. The discharge from this apex to the Parkway is 1,800 cfs, 1,200 cfs, and 3,000 cfs from PBS&J, DEA, and CMX respectively. The consultants agreed to use 2,000 cfs for the apex discharge. A separate discussion with PBS&J of the HEC-1 model results at the apex was proposed by CMX. CMX suggested PBS&J add a concentration point at the apex.

3. Apex #37

Apex #37 is located in sub-basin L2. PBS&J didn't have a flow specified at the apex. However, discharge from upstream of the apex was determined to be 2,600 cfs, which was in agreement with results from other consultants. The discharge for all the tributaries concentrated at the east side of the Parkway from PBS&J was 4,200 cfs in L2. DEA conducted a more detailed study to determine the flow rate for each tributary and associated culverts in the sub-basin. The apex discharge at the Parkway was determined to be 1,600 cfs and the culvert was determined to have adequate capacity to convey the apex flow.

CVL indicated the apex flow path was slightly different from the one PBS&J marked at the first 3,000 ft. DEA indicated the apex flow would flow to south after it passes the culverts underneath the Parkway.

It was determined this apex would not be controlled.

4. Apex #36

Apex #36 is located in sub-basin M2. Apex peak flows determined by CVL, DEA, and PBS&J ranges from 3,400 to 3,700 cfs. The apex runoff flows southwest, then splits into two main flows in Elianto and Tartesso, and finally joins and flows south towards the channel along the Parkway. CVL proposed to eliminate the split, and make the lower southern tributary local. Floodplain has been delineated for this apex flow already.

ACTION ITEMS

PBS&J will make a new copy of the Sun Valley Terrain Map to Bob Speirs by Friday (August 6, 2004), and Bob will mark the agreed flow paths and flow rates for the apexes discussed today. PBS&J will create a new shape file to include the above results available on TeamAccess by next Thursday (August 12, 2004).

Closing Remarks

Next Meeting

August 12, 2004 10:00 am

Total Time 150 minutes

Key Stakeholder Meeting Report

Project: Buckeye/Sun Valley Area Master Drainage Study
Maricopa County Flood Control District

Date: October 25, 2004 – 1:00 p.m. to 3:00 p.m.

Location: FCD Office @ 2801 W. Durango St.; Phoenix, AZ 85003

Key Stakeholders Present:

<u>Name</u>	<u>Organization</u>
Rebecca Davidson	Arizona Game & Fish Dept. (AGFD)
Chuck Paradzick	Arizona Game & Fish Dept. (AGFD)
David Gunn	Central Arizona Project (CAP)
Bill Jenkins	Arizona Department of Water Resources (ADWR)
V. Ottozawa Chatuppron	Arizona State Land Department (ASLD)
Gary Norris	Maricopa County Planning Department
Michael Martinez	U.S. Fish and Wildlife Service (USFWS)
Karyn Moldenhauer	Arizona Department of Water Quality (ADEQ)
David M. Johnson	U.S. Bureau of Reclamation (USBR)
Tim Oliver	Maricopa County Department of Transportation
Kris Graham Chavez	U.S. Department of Agriculture – NCRS
Randy Bulter	Arizona Public Service (APS)
Carter Gable	Arlington Canal Co.
Carroll Reynolds	Town of Buckeye
Bryon L. Lake	U.S. Army Corps of Engineers
J. John Mihlik	West Maricopa Combine, Inc.

Copies of the attached invitation letter from Project Manager Valerie Swick were sent to approximately 30 stakeholders identified by District and Project staff (list attached.) A copy of the sign-in sheet is also attached. At sign in, stakeholders were provided with a handout prepared by the district that described the study.

Meeting Minutes

The meeting began with a brief introduction and statement of purpose by Stakeholder Coordinator Sue Lewin, who then introduced Project Manager Valerie Swick. Valerie had all Project staff and key stakeholders introduce themselves, and then she gave an overview of the Buckeye/Sun Valley ADMS using a PowerPoint presentation. This was followed by a question and answer session that lasted approximately one hour. Stakeholder questions and concerns and responses provided by staff were recorded on flipcharts. Following are the comments that were recorded by Project staff:

Q1. Re: Area 3: Is the toolbox only a guideline?

A. We are working with Buckeye developers on a plan that everyone can live with. Buckeye will be responsible for managing alluvial fans. **Concerns:** Many developers do piecemeal development. Need to look at problem as a whole system. Strongly recommends adopting a regional plan and adopting development guidelines.

Q2. What's the timeline?

A. Developers would like the study results as soon as possible, and we are working as fast as we can. We are working on a Stage III plan, identifying where water comes from – then we can identify areas to preserve habitats and prevent flooding. Our goal is to have some plan within six months. **Concerns:** Arizona Game & Fish would like to be involved in identifying wildlife corridors because the study area backs up to White Tank Mountains. Chuck Paradzick (AZ Game & Fish) likes idea of having broad scope plan, giving forethought to wildlife corridors.

Q3. Are there any Key Stakeholders missing from this meeting?

A. Arizona Department of Transportation was invited but is not represented today. We need to coordinate with the Az Geological Survey where they have identified active and inactive alluvial fans. We are working closely with Town of Buckeye to develop a regional plan that is implementable. West Maricopa Combine was also invited (Mr. J. John Mihlik of West Maricopa Combine arrived after this discussion.)

Q4. What happens if new hydrology is different from existing regarding the Hassayampa River?

A. Brett Howey noted that the Buckeye FRS #1 Dam Rehab project will look at impacts of putting more water in Hassayampa. We may do a model of the entire watershed.

Q5. At what stage is the Hassayampa Water Course Master Plan Study?

A. They are just starting. John Hathaway & Greg Jones are the contacts. They are in the process of data collection now. The first public meeting was held in October.

Q6. Game & Fish wants to work with the team and ADOT in looking at wildlife transportation corridors.

Q7. With respect to the FRS #1 rehab project, is the water going to be taken South or straight to the Hassayampa? (Carter Gable) What will happen in regards to the Salt Cedar?

A. At this point all water will go to Hassayampa, but it is still being studied as part of Buckeye FRS #1. No answers yet on what we will be able to do with Salt Cedar.

Q8. CAP was built years ago using different hydrology. If hydrology changes, how do you address that?

A. Right now hydrology has not been changed. We have not yet identified any discrepancies. New hydrology may be done in future. **Concern** is that if new hydrology is done, peak discharges may be higher than design flows, so the level of flood protection provided by the CAP dikes is reduced. How will this be taken into account?

Q9. Landowners – Have we coordinated with T. Gladin, Mike Johnson?

A. We will be coordinating this project with the Lower Hassayampa WCMP.

Q10. How can you ignore what happens with the watershed west of the Hassayampa?

A. This is not being ignored. It will be taken into account as part of the Lower Hassayampa WCMP. The WCMP will take existing hydrology from this study to help them with their plan.

Q11. If the water doesn't all go to the Hassayampa, what are your other ideas for how it will be handled?

A. We may use natural washes as connectors to channels. We may develop detention areas. We haven't yet determined what will work best.

Follow-up to Question Q11 – Looks like it didn't work in the past when they tried to take water over I-10. (Although turns out it did work).

Q12. AZ Game & Fish wants to be involved in how wildlife corridors will be identified. Also wants to be involved when we coordinate with ADOT.

A. We will set up meeting with AZ Game & Fish to follow up on their interest/concerns.

If there are any disagreements with the information contained herein, please contact Sue Lewin at slewin@engall.com. Thank you.

Respectfully Submitted,

Sue Lewin
Engineering Alliance, Inc.

Attachments: Key Stakeholder Meeting Invitation Letter
Key Stakeholder Mailing List
Meeting Sign-in Sheet

Project Administration Report

**(Meeting Minutes and Review
Comments)**

Buckeye/Sun Valley Area Drainage Master Study Project Administration Report

October 2005



Prepared for

2801 W. Durango Street
Phoenix, Arizona 85009-6399

Prepared by



7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020-5250

The Project Administration Report for the Buckeye/Sun Valley Area Drainage Master Study includes the following:

- Comment/Responses for Deliverables and Submittals
- Meeting Minutes

Comments/Responses for Deliverables and Submittals

1. Agricultural Pilot Study Hydrology Report; letter dated March 29, 2005 (MCFCD)
2. Preliminary Sub-basin Delineation Comments; letter dated July 6, 2004
3. Area 1 Hydraulics Study Review Comments; dated July 6, 2004
4. Buckeye/Sun Valley ADMS – Area 2 Hydrology (March 2004 Submittal); letter dated March 30, 2004 (MCFCD)
5. BSV Area 2 Floodplain Delineation Review: October 2004 Submittal; letter dated February 11, 2005 (MCFCD)
6. Area 2 Hydraulics and Floodplain Delineations Study Review Comments; dated February 11, 2005 (MCFCD)
7. Comments on Buckeye/Sun Valley ADMS Area 2 Draft Floodplain Delineation Report; letter dated June 27, 2005 (MCFCD)
8. Buckeye/Sun Valley ADMS Review Comments for Volume IV-A: Area 2 Floodplain Delineation Report, 5/18/05; letter dated July 18, 2005 (MCFCD)
9. Area 3 Hydrology Study Review Comments; dated February 17, 2004 (MCFCD)
10. Buckeye/Sun Valley ADMS – Task 2.6.4.3 Area Four Review of Development Master Plans February 2005 Submittal; letter dated May 5, 2005 (MCFCD)
11. Buckeye Flood Retention Structures H&H Study; letter dated December 20, 2004 (MCFCD)
12. ENG – Technical Review of Buckeye Flood Retention Structure (FRS) #1 Hydrology & Hydraulics; letter dated November 30, 2004 (MCFCD)
13. Hydrology & Hydraulics Study Review (MCFCD)
14. Buckeye Flood Retaining Structures PMF H&H (PBS&J, 08/04), Addendum of Buckeye FRS PMF Report to ADWR (PBS&J, 09/04); letter dated December 3, 2004 (MCFCD)
15. Area 3 Technical Data Notebook Responses to NRCS/ADWR Review – PBS&J
16. ADWR NRCS Comments – Baker
17. Buckeye/Sun Valley ADMS Area 3 Stage 1 Piedmont Assessment Landform Delineation Review: November 2004 Submittal; letter dated March 21, 2005 (MCFCD)
18. Buckeye/Sun Valley ADMS Area 3 Stage 1 and 2 Piedmont Landform Identification and Stability Delineation Technical Memorandum Review: November 2004 Submittal; letter dated April 8, 2005 (MCFCD)
19. Buckeye/Sun Valley ADMS Area 3 Stage 2 Piedmont Stability Delineation Review: November 2004 Submittal; letter dated April 8, 2005 (MCFCD)
20. Buckeye/Sun Valley ADMS – Task 2.6.4 Primary Wash Assessment Report Review November 2004 Submittal; letter April 20, 2005 (MCFCD)
21. Buckeye/Sun Valley ADMS – Task 2.6.5 Delineation of Erosion Hazard Zones Areas 2 and 3 Report Review December 2004 Submittal; letter dated April 29, 2005 (MCFCD)

Meeting Minutes

1. Dated June 19, 2003 (Kick-Off Meeting)
2. Dated August 6, 2003
3. Dated September 3, 2003
4. Dated October 1, 2003
5. Dated October 22, 2003
6. Dated November 5, 2003
7. Dated December 4, 2003
8. Dated February 4, 2004
9. Dated February 19, 2004
10. Dated March 3, 2004
11. Dated April 7, 2004
12. Dated May 12, 2004
13. Dated June 2, 2004
14. Dated June 16, 2004
15. Dated July 7, 2004
16. Dated August 4, 2004
17. Dated September 1, 2004
18. Dated October 6, 2004
19. Dated January 12, 2005
20. Dated February 2, 2005
21. Dated February 11, 2005
22. Dated March 2, 2005
23. Dated April 6, 2005
24. Dated May 11, 2005
25. Dated June 8, 2005



Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: March 29, 2005
To: Valerie Swick, Project Manager
Planning and Project Management Division
From: Julie Cox, Hydrologist
Engineering Division
Subject: Agricultural Pilot Study Hydrology Report

I have reviewed and replaced the pages provided by the consultant on February 22, 2005. The replacement pages incorporate changes requested at the February 15, 2005 meeting at FCDMC.

Next, I performed sensitivity analyses by running HEC-1 models for various DTHETA values listed in Table 4.3 of the report. All scenarios were run for Basin 92, a 1 square mile sub-basin in the Buckeye/Sun Valley ADMS Area 1 base model. Then I compared both peak flow and volume for (1) the weighted average DTHETA for Agricultural Fields in the Buckeye/Sun Valley Area and (2) the normal DTHETA in the Hydrology Manual (Sabol et al 1995). Results are summarized in the table below.

SOIL TYPE	FCD	WEIGHTED		WEIGHTED		% DIFFERENCE PEAK/VOLUME	
	NORMAL	PEAK	VOL	DTHETA	PEAK		VOL
	DTHETA	(cfs)	(ac-ft)	DTHETA	(cfs)	(ac-ft)	
Loamy Sand & Sand	0.3	477	85	0.22	501	89	4.8/4.5
Sandy Loam	0.25	491	87	0.19	512	91	4.1/4.4
Silt	0.15	527	95	0.13	536	97	1.7/2.1
Sandy Clay	0.1	551	101	0.08	562	103	2.0/2.0

For each soil type listed, I compared the weighted average DTHETA (calculated by Entellus) to the FCD Normal DTHETA (listed in the Hydrology Manual). The difference in peak flows ranged from 1.7 to 4.8%. The difference in volumes ranged from 2.0 to 4.5%. Because of the relatively small percent difference in both peaks and volumes, I recommend that the FCD Normal DTHETA be used for agricultural areas in Maricopa County. The amount of work required to change the database in WMS and DDMSW, as well as the Hydrology Manual would be extensive for a maximum difference of only 4.8%.

In addition, I ran a wet DTHETA scenario and a dry DTHETA scenario as a quality control check. The dry DTHETA (0.35) produced a peak flow of 464 cfs with a volume of 82 ac-ft. The wet DTHETA scenario (0.0) produced a peak flow of 624 cfs with a volume of 127 ac-ft. These results appear reasonable.



Flood Control District

of Maricopa County

INTEROFFICE MEMORANDUM

Date: July 6, 2004
To: Valerie Swick, Project Manager
From: Julie Cox, Hydrologist
Subject: Preliminary Sub-basin Delineation Comments

I received the CD on June 21, 2004 and the Area 1 Watershed Map on June 29, 2004. My comments are listed below. I would be glad to meet with the consultants to discuss my recommendations.

Sub-basin Boundaries

1. Consider splitting sub-basins 56, 57, 58, and 67 since the railroad is a hydraulic barrier.
2. Several sub-basin boundaries appear to be shifted slightly to the left, causing several flow path lengths to be outside of their sub-basin boundaries, i.e. sub-basins 101, 102, 103, and 104.
3. Smooth the southern boundary of Area 1.

Flow Lengths

4. Flow lengths for sub-basins 18, 53, and 67 were modified from the Buckeye Area FDS (McLaughlin Kmetty 1992). Was this because the original lengths did not represent the longest lengths along the main channel? Were Lca and lag time recalculated based on the new lengths?
5. Submit electronic and hard copies of files used to measure flow lengths so I can check the measurements. Show L, Lca, and the centroid for each sub-basin.
6. Flow lengths are obscured for sub-basins 45, 46, 96, and 105. Modify so the lengths are legible.
7. Flow lengths for sub-basins 90, 100, 103, and 104 are too angular. Suggest smoothing.
8. It appears that the flow length for sub-basin 99 should follow the roads.
9. It appears that the flow length for sub-basin 89 should follow Hazen to Oglesby then south.

Concentration Points

10. Concentration points F2, H7, L2, M1, M2, N1, N3, O1, O3, O7, P1, and P4 are obscured. Modify so the concentration points are legible.
11. Label concentration point M2.
12. Consider combining concentration points I2A and I2.
13. Consider combining concentration points G1 and G2.
14. For CP O9, it appears that placement of the concentration point at the SW corner of sub-basin 94 may be more appropriate.
15. For CP O13, it appears that placement of the concentration point further south in sub-basin 105 may be more appropriate.
16. For CP N6, it appears that placement of the concentration point at the SE corner of sub-basin 92 may be more appropriate.
17. For CP F9, it appears that placement of the concentration point at the SW corner of sub-basin 59 may be more appropriate.
18. For CP F6, could CP be moved west to Parker Lane?
19. For CP H7, could CP be moved to SW corner of sub-basin 62?

General Comments

20. Make contour elevations more legible; make 10 ft contours more visible.
21. Specify S-graph type for each sub-basin Kn value.
22. Change label for ST85 to MC85 (2 locations).
23. Change label for "Rail Rd" to "Union Pacific Railroad".
24. Change label for "Buckeye" to "Buckeye Irrigation District Canal".
25. Change label for "Roosevelt Irrigation District" to "Roosevelt Irrigation District Canal".
26. Several labels are reversed. Remove reversed labels including Johnson Rd, Bruner Rd, Wilson Ave, St85 Hwy, Rooks Rd, and Apache Rd.

**FLOOD CONTROL DISTRICT of MARICOPA COUNTY
PLANNING & PROJECT MANAGEMENT**

STUDY REVIEW COMMENTS

<i>SUBMITTAL:</i>	Area 1 Hydraulics	<i>PROJECT NAME:</i>	Buckeye Sun Valley ADMS
<i>RETURN DATE:</i>	July 6, 2004	<i>PROJECT NO.:</i>	FCD 2002C027
<i>REVIEWED BY:</i>	Julie Cox	<i>PCN:</i>	211.01.20
<i>DISCIPLINE/OFFICE:</i>	Engineering Division	<i>DESIGNER/CONSULTANT:</i>	PBS&J
<i>FCD FAX NUMBER:</i>	602-506-4601	<i>FCD PROJECT MANAGER:</i>	Valerie Swick

ACTION CODES:

A= WILL COMPLY

***C= FCD TEAM TO EVALUATE**

B= CONSULTANT/DESIGNER TO EVALUATE

***D= PROJECT TEAM RECOMMENDS NO FURTHER ACTION**

**** REQUIRES A WRITTEN EXPLANATION AND FINAL DISPOSITION BY CONSULTANT/DESIGNER***

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
1	Sub-basin Boundaries	Comments are fully followed	A	
2	Sub-basin Boundaries	Comments are fully followed	A	
3	Sub-basin Boundaries	Comments are fully followed	A	
4	Flow Lengths	Comments are fully followed	A	
5	Flow Lengths	Comments are fully followed	A	
6	Flow Lengths	Comments are fully followed	A	
7	Flow Lengths	Comments are fully followed	A	
8	Flow Lengths	Comments are fully followed	A	
9	Flow Lengths	Comments are fully followed	A	
10	Conc. Points	Comments are fully followed	A	
11	Conc. Points	Comments are fully followed	A	
12	Conc. Points	Comments are fully followed	A	
13	Conc. Points	Comments are fully followed	A	
14	Conc. Points	Comments are fully followed	A	
15	Conc. Points	Comments are fully followed	A	
16	Conc. Points	Comments are fully followed	A	
17	Conc. Points	Comments are fully followed	A	
18	Conc. Points	Comments are fully followed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO	SECTION	COMMENT	DISPOSITION	
			INIT	FINAL
19	Conc. Points	Comments are fully followed	A	
20	General Comments	Comments are fully followed	A	
21	General Comments	Comments are fully followed	A	
22	General Comments	Comments are fully followed	A	
23	General Comments	Comments are fully followed	A	
24	General Comments	Comments are fully followed	A	
25	General Comments	Comments are fully followed	A	
26	General Comments	Comments are fully followed	A	

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Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: March 30, 2004

To: Valerie Swick, Project Manager
Planning and Project Management Division

From: Julie Cox, Hydrologist
Engineering Division

Subject: Buckeye/Sun Valley ADMS - Area 2 Hydrology (March 2004 Submittal)

I have reviewed the hydrology submittal. My comments are listed below and reference specific maps, draft report text, HEC-1 models, and WMS files. I will be glad to meet with you and/or the consultants to discuss my recommendations. Feel free to stop by or call me at 506-8401 with any questions you might have.

Area 2 – Watershed Workmap

1. Provide watershed map with sub-basin boundaries and concentration points shown. Include aerial photography and topography as background. Label contours.

Area 2 - Existing Conditions Hydrologic Schematic Map

1. Legend – Bold the Routing Channel ID.
2. Title Block – Change “Suire 310” to “Suite 310”.
3. Map – Label the Roosevelt Irrigation District Canal.
4. Map – Label the “unknown” streets or remove the “unknown” labels.

Area 2 - Land Use Map

1. Legend – Remove “LUCODE”.
2. Legend – Add “A1” and “Sub-basin ID”.
3. Legend – Remove all 3-digit numbers.
4. Title Block – Change “Suire 310” to “Suite 310”.
5. Map – Remove all 3-digit numbers.
6. Map – Label the Roosevelt Irrigation District Canal.
7. Map – Label Interstate 10.

Area 2 - Soil Map

1. Legend – Remove “6512029 Soil LID”.
2. Legend – Add “PT Soil Type”.
3. Legend – Add “A1” and “Sub-basin ID”.
4. Title Block – Change “Suire 310” to “Suite 310”.
5. Map – Label Interstate 10.

Area 2 - Draft Text for Hydrology Report

1. Page 1 – Change “Flood Plain” to “floodplain”.
2. Page 1 – Change “hydrologic” to “sub-basin”.
3. Page 2 (2 locations) – Reference the Hydrology Manual as follows: Drainage Design Manual for Maricopa County: Volume 1 Hydrology (FCDMC, 1995).
4. Page 3 – For the water land use, change RTIMP to 100%.
5. Page 3, Table 2 – Check and advise if the VACANT land use is equivalent to MAG’s OPEN land use.
6. Page 3, Table 2 – The % vegetation cover seems low for the VACANT land use. Check and modify as necessary.
7. Page 3, Table 2 – The % vegetation cover seems high for the TRANSPORTATION land use. Check and modify as necessary.
8. Page 3, Table 3 – The XKSAT seems low for the soil type “LEV”. Check and modify as necessary.
9. Provide regional equation envelope curves with the results plotted to verify all of the analyses. Graphs should include USGS, Boughton, and Malvick envelope curves. Include in the Hydrology Report.
10. Include table for Unit Discharge (cfs/sq mi) in the Hydrology Report.

Area 2 – 100-yr 6-hr HEC-1 model (File name: 100y6h.out)

1. The run date and time should be specified (see block at top left on first page).
2. For each of the 6-hr distributions, add KM records that specify the areal reduction factors.
3. Sub-basin parameters for L, Lca, S, and LAG appear to have been reversed for sub-basins E1 and E2. Check and modify input as necessary.
4. The unit discharge (cfs/sq mi) seems high for sub-basins B1 and D1. Verify the unit discharges and provide explanation why they are high.

Area 2 – 100-yr 24-hr HEC-1 model (File name: 100y24h.out)

1. The run date and time should be specified (see block at top left on first page).
2. Add a KM record that specifies the areal reduction factor (.094) for the 10 sq mi area.
3. The first entry on the second JD record should be 3.854, not 3.897 as listed. Check and modify as necessary.
4. It is not necessary to include a JD record for the 20 sq mi area, since the total area of Area 2 is less than 10 sq mi.
5. It is not necessary to repeat the PC and IN records after each JD record. Please remove PC and IN records after the first set of JD records
6. Sub-basin parameters for L, Lca, S, and LAG appear to have been reversed for sub-basins E1 and E2. Check and modify input as necessary.
7. The unit discharge (cfs/sq mi) seems high for sub-basins B1 and D1. Verify the unit discharges and provide explanation why they are high.

**FLOOD CONTROL DISTRICT of MARICOPA COUNTY
PLANNING & PROJECT MANAGEMENT**

STUDY REVIEW COMMENTS

SUBMITTAL:	Area 2 Hydrology	PROJECT NAME:	Buckeye Sun Valley ADMS
RETURN DATE:	March 30, 2004	PROJECT NO.:	FCD 2002C027
REVIEWED BY:	Julie Cox	PCN:	211.01.20
DISCIPLINE/ OFFICE:	Engineering Division	DESIGNER/ CONSULTANT:	PBS&J
FCD FAX NUMBER:		FCD PROJECT MANAGER:	Valerie Swick

ACTION CODES:

A= WILL COMPLY

***C= FCD TEAM TO EVALUATE**

B= CONSULTANT/DESIGNER TO EVALUATE

***D= PROJECT TEAM RECOMMENDS NO FURTHER ACTION**

*** REQUIRES A WRITTEN EXPLANATION AND FINAL DISPOSITION BY CONSULTANT/DESIGNER**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
1	Watershed Workmap	We will follow the FCD consultant guidelines for generating all workmaps.	A	
1	Ex. Cond. Schematic Map	Routing channel ID will be bolded.	A	
2	Ex. Cond. Schematic Map	Misspelled word corrected	A	
3	Ex. Cond. Schematic Map	The RID canal will be labeled in future maps.	A	
4	Ex. Cond. Schematic Map	Streets labels "unknown" have been removed	A	
1	LU Map	LUCODE in the Legend has been removed	A	
2	LU Map	Sub-Basin ID legend item has been added	A	
3	LU Map	LUCODE numbers were removed from legend	A	
4	LU Map	Misspelled word corrected	A	
5	LU Map	LUCODEs on map have been removed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
6	LU Map	Canal will be labeled.	A	
7	LU Map	I-10 will be labeled.	A	
1	Soil Map	Will comply	A	
2	Soil Map	Will comply	A	
3	Soil Map	Sub-basin ID has now been added to the legend.	A	
4	Soil Map	Misspelled word corrected	A	
5	Soil Map	I-10 will be labeled in all future maps.	A	
1	Draft Hydrology Report	Changed	A	
2	Draft Hydrology Report	Changed	A	
3	Draft Hydrology Report	The change has been made for referencing the hydrology manual.	A	
4	Draft Hydrology Report	Changed	A	
5	Draft Hydrology Report	The vacant land use is not equivalent to MAG's open land use. MAG's open land use is reserved for areas with more vegetation and higher saturation. The county has at least 3 different open space land use types which includes general, active, and passive open space. Each has a significantly higher % vegetation value. Area 2 does not have the vegetation as is defined in the open space land uses.	D	
6	Draft Hydrology Report	Vacant space covers most of Area 2 which is mostly natural desert with little vegetation. Twenty-five percent seems reasonable for this area after field visits and a review of aerial photos.	C	
7	Draft Hydrology Report	This value comes from the information provided by the FCDMC. The FCDMC has assigned this land use a percent vegetation value of 75%. However, the area included in Area 2 is for I-10. I-10 does not have this much vegetation. The value can be adjusted, however the percentage of area that this LU covers is minimal and will not impact the results by more than 1%	C	
8	Draft Hydrology Report	The area with the soil type "LEV" in area 2 is the Buckeye FRS #1. It is reasonable to have an XKSAT value of 0 where all water runs off the levee or in this case the FRS. The side slopes of the FRS is approximately 2:1 and 3:1 on the upstream and downstream side respectively.	C	

Comment: We need more explanation here. It sounds like the intent of the classification is the same but the specific values are different. Do the ranges overlap at all?

Comment: The better way to do this is to run a grid of transects and actually measure the % veg via a prescribed, standardized method. What happens if they override us on this and we wind up changing the number? Do the flows go up or down? If down, then our way is more conservative and we can make a stronger argument.

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
9	Draft Hydrology Report	A plot has been generated with graphs of USGS, Boughton, and Malvick envelope curves extracted from DDMSW and compared to the Area 2 results. This plot will be included in the Area 2 hydrology report.	A	
10	Draft Hydrology Report	We will include the unit discharge values in the hydrology report.	A	
1	100-y 6-h HEC-1	The version of HEC-1 that WMS uses and the capabilities of WMS does not allow this option. In order to comply, the HEC-1 files generated by WMS will have to be manually edited to include the run date and time. It seems that WMS uses HEC-1 version 1991 and not the latest 1998.	A	
2	100-y 6-h HEC-1	WMS automatically places a comment line listing the resulting reduced rainfall depth. For example, the first JD card is as shown: JD 3.29 0.01 Then the next shows: JD 3.27 0.5 If you divide 3.27/3.29 you get 99.39%, which is the percentage listed in the Drainage Design Manual for Maricopa County for a 0.5 sq-mi sub-basin as shown in the JD card. In order to list an actual percentage in a KM card, a manual edit of the HEC-1 file would have to occur after WMS generates the HEC-1 file.	A	
3	100-y 6-h HEC-1	The parameters were reversed and have been corrected.	A	
4	100-y 6-h HEC-1	The sub-basins are relatively small compared to the others. The values are within the range of the peak discharge/drainage area relations for Maricopa County. Relatively small sub-basins will tend to have a higher peak flow value. The higher peak flows come from many factors like less aerial reduction, shorter T_p , smaller lag times, etc.	C	
1	100-y 24-h HEC-1	The version of HEC-1 that WMS uses and the capabilities of WMS does not allow this option. In order to comply, the HEC-1 files generated by WMS will have to be manually edited to include the run date and time. It seems that WMS uses HEC-1 version 1991 and not the latest 1998.	A	
2	100-y 24-h HEC-1	WMS automatically places a comment line listing the resulting reduced rainfall depth. See comments above for the 6-hour section.	A	
3	100-y 24-h HEC-1	The area total depth is 4.102 inches. The reduction factor for 10 sq-miles is 95% according to Table 2.2 of the Drainage Design Manual of Maricopa County. After recalculating the value it seems to be OK ($4.102 \times 0.95 = 3.897$). We have the 2001 Drainage Design Manual. Please let us know if there is an apparent discrepancy.	D	
4	100-y 24-h HEC-1	The JD record will be removed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
5	100-y 24-h HEC-1	WMS automatically enters this information. In order to remove the information it would require manually editing the HEC-1 file. I ran a test and saw no changes in results with and without the repeating JD cards.	D	
6	100-y 24-h HEC-1	The parameters were reversed and have been corrected.	A	
7	100-y 24-h HEC-1	The sub-basins are relatively small compared to the others. The values are within the range of the peak discharge/drainage area relations for Maricopa County. Relatively small sub-basins will tend to have a higher peak flow value. The higher peak flows come from many factors like less aerial reduction, shorter Tp, smaller lag times, etc.	C	

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Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: February 11, 2005

To: Valerie Swick, Project Manager

From: Kathryn Gross, Hydrologist *KAG*

Subject: BSV Area 2 Floodplain Delineation Review: October 2004 Submittal

I have reviewed the above submittal and have the following comments.

General Concerns

1. Please revise the River name by removing "Lower" from "Lower Hassayampa."
2. For all models please be sure to provide comments regarding the source of the discharge used for each flow change location in the cross-section comment area. This should also be discussed in the TDN as well.
3. For all models, please update the hydraulic base line as station 10000.
4. For all models if revisions are made, please make sure the floodplain and floodway limits are updated and match the water surface and encroachment stations reported by the modeling.

Hassayampa Tributary 4E2

1. The parameters used for the modeling appear to be reasonable.
2. Please remove the upstream boundary condition selected. Presently, critical depth is selected. An upstream boundary condition does not need to be identified for a sub-critical run. Please leave it blank.
3. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
4. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points.

5. Floodplain Delineation. The delineation matches the reported stationing and appears reasonable.
6. Floodway Delineation. No increases greater than a foot. No negative surcharges. Floodway delineation matches the reported stationing and appears reasonable.

Hassayampa Tributary 4E

Reach 3

1. The parameters used for the modeling appear to be reasonable.
2. Please remove the upstream boundary condition selected. Presently, critical depth is selected. An upstream boundary condition does not need to be identified for a sub-critical run. Please leave it blank.
3. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
4. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points.
5. Floodway modeling. In comparing the encroachment results between Method 4 and Method 1, it appears that for several of the cross-sections Method 1 encroachments were moved to the end of the cross-section on at least one side even when the Method 4 encroachment run would show a possible encroachment to at least the bank station without meeting one foot of rise. Please look into why some of these 0 encroachments are occurring.
6. Floodplain modeling. Please add a levee to separate the main channel from the parallel tributary for cross-sections 2.998- 3.072 and cross-section 2.508.
7. There are negative surcharges reported at cross-sections 3.560, 3.485, and 2.287. All result in floodway elevations less than the floodplain elevation. Expand the encroachment limits to remove the surcharge.
8. For the following cross-sections please reposition the right encroachment station so that an additional braided channel is included in the floodway.
 - 2.810 – shift right encroachment to approximately station 410.
 - 2.772 – shift right encroachment to approximately station 360.
 - 2.735 – shift right encroachment to approximately station 550.

Reach 2

9. The parameters used for the modeling appear to be reasonable.
10. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
11. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points or if balanced water surface between tributaries was used.
12. Floodway modeling. In comparing the encroachment results between Method 4 and Method 1, it appears that for several of the cross-sections Method 1 encroachments were moved to the end of the cross-section on at least one side even when the Method 4 encroachment run would show a possible encroachment to at least the bank station without meeting one foot of rise. Why are the locations where the floodplain is inside the bank stations not set to 0 in method 4? Please look into why some of these 0 encroachments are occurring.
13. The floodplain limits appear reasonable.
14. With the above exceptions, the floodway limits appear reasonable.

Reach 1

15. The parameters used for the modeling appear to be reasonable.
16. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
17. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points or if balanced water surface between tributaries was used.
18. Hydraulic baseline. Hydraulic baseline continues into the Hassayampa River floodplain. If the true bulk of the flow follows the baseline then the floodplain/floodway delineation for this tributary should continue down the presently identified baseline until it connects with Tributary 3E. If the bulk of the flow will actually continue to the river at the present location then remove the remaining portion of the baseline and re-connect the baseline to the Hassayampa River baseline at this location.
19. Delineation between the tributary and the Hassayampa River needs to be refined. Please include limit of study notes and consider shading the existing delineation.
20. Delineation between cross-section 1.153 and 1.238 extends beyond the cross-section locations. Please correct.
21. Floodplain limits appear reasonable.

22. Overall, the floodway limit appears reasonable.

Hassayampa Tributary 4E1

Reach 2

1. The parameters used for the modeling appear to be reasonable.
2. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
3. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points or if balanced water surface between tributaries was used.
4. Floodplain delineation. For cross-section .332, the cross-section does not contain the entire floodplain limits. Please tie the cross-section into higher ground.
5. Floodway delineation. Negative surcharge occurs on cross-sections .647 and .322. Expand the encroachment limits to remove the surcharge.
6. Overall, the floodplain delineation appears reasonable.
7. Overall the floodway delineation appears reasonable.

Reach 1

8. The parameters used for the modeling appear to be reasonable.
9. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
10. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points or if balanced water surface between tributaries was used.
11. Cross-sections .065 and .125 do not contain the floodplain limits and are extended. This will need to be addressed in the TDN most likely as a special problem. Another option would be to consider extending the cross-sections and including them in Trib 4E Reach 1.
12. Floodplain Delineation appears reasonable.
13. Floodway Delineation appears reasonable.

Hassayampa Tributary 3E

1. Please correct the River name in this RAS model it presently is labeled as 1E instead of 3E.
2. The parameters used for the modeling appear to be reasonable.
3. Please remove the upstream boundary condition selected. Presently, critical depth is selected. An upstream boundary condition does not need to be identified for a sub-critical run. Please leave it blank.
4. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
5. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points.
6. Modeling of in-line weir at cross-section 1.359 appears reasonable.
7. Floodway modeling. In comparing the encroachment results between Method 4 and Method 1, it appears that for several of the cross-sections Method 1 encroachments were moved to the end of the cross-section on at least one side even when the Method 4 encroachment run would show a possible encroachment to at least the bank station without meeting one foot of rise. Why are the locations where the floodplain is inside the bank stations not set to 0 in method 4? Please look into why some of these 0 encroachments are occurring.
8. Floodplain Delineation. Please provide a levee or trim the cross-section to prevent the flows from accessing the incoming tributary for cross-sections 1.023, .985, and .948. The water surface delineation stations and the mapped location should then match.
9. The following cross-sections have encroachment stations that do not match the limits delineated: 1.515, 1.023, and .298. Please correct.

Hassayampa Tributary 1E

Reach 1

1. The parameters used for the modeling appear to be reasonable.
2. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
3. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points.

4. Cross-section .883 is extended. Either expand the cross-section further to the west or add as a special problem in the Special Problems section of the TDN.
5. Some cross-sections have had their length trimmed in the RAS model but have their full length shown on the work maps. Please add a note to these cross-sections in the RAS model that states that the RAS data reflects the trimmed cross-section. This will not be as critical a problem once the correct cross-section stationing is applied.
6. Floodway modeling. There are negative surcharges for cross-sections 3.614, 1.488, 1.450, .732, and .695. All result in floodway elevations less than the floodplain elevation. Expand the encroachment limits to remove the surcharge.
7. Need to label the cross-sections upstream and downstream of the culverts on the work maps at cross-section 1.323 and 2.438.
8. Ineffective flow concerns. For cross-sections .845 - .695 and .342-.190, the depths within the ineffective flow zones are quite significant. Please re-evaluate the ineffective flow designations.
9. Floodplain stationing discrepancy at cross-section 3.046. Water surface limit is given at 845 while the drawn limits are to station 650.
10. Floodplain stationing discrepancy at cross-section 2.018. Water surface limit is given at 1196 while the drawn limits are to station 1030.
11. Floodplain stationing discrepancy at cross-section 1.980. Water surface limits are given at 1169 and 1787 while the drawn limits are to stations 1000 and 1750.
12. Floodway Stationing discrepancy at cross-section 2.018. Encroached station is given at 1151 while the drawn limits are to station 1190.
13. Floodway Stationing problem. The right floodway encroachment needs to be adjusted to the top of the "levee" for cross-sections .959 - .807.

Reach 2

14. The parameters used for the modeling appear to be reasonable.
15. Please remove the upstream boundary condition selected. Presently, critical depth is selected. An upstream boundary condition does not need to be identified for a sub-critical run. Please leave it blank.
16. The cross-section ground data needs to be revised so that the stationing is based on the thalweg being located at station 10000.
17. Discharges. Please include comments at specific cross-sections describing either the HEC-1 ID for the discharge or explain how the discharge was arrived at for locations between HEC-1 concentration points.

18. Cross-section 4.646 has a levee to contain flows in the left portion of the overbank. Consider slightly extending the cross-section. FEMA may question this in their review.
19. Cross-section 5.668 need to add a levee to keep flows out of adjacent tributary. Presently, a small portion of the flow is in the far right portion of the cross-section that results in the water surface station being located at station 673 instead of around 320.
20. Floodway modeling. In comparing the encroachment results between Method 4 and Method 1, it appears that for several of the cross-sections Method 1 encroachments were moved to the end of the cross-section on at least one side even when the Method 4 encroachment run would show a possible encroachment to at least the bank station without meeting one foot of rise. Why are the locations where the floodplain is inside the bank stations not set to 0 in method 4? Please look into why some of these 0 encroachments are occurring.
21. There are negative surcharges reported at cross-sections 4.911, 4.334, and 4.506. All result in floodway elevations less than the floodplain elevation. Expand the encroachment limits to remove the surcharge.
22. Floodway Delineation. Please verify the delineated encroachment limits for cross-sections 5.024 and 4.721. They appear to be delineated slightly off of the reported station in the modeling results.

Floodplain Work Map Comments

1. A marked up set of sheets is included with these review comments. Please address all comments listed below and on each individual sheet.
2. For all sheets, there do not appear to be any spot elevations given in the mapping at this time. Please include the spot elevation layer developed for the mapping on the next submittal. Correct any label overlaps that may occur when the new layer is added.
3. For all sheets, please include the conversion factor to NAVD 1929 under the NGVD 1988 ? note.
4. Cover Sheet. Please label the individual rivers and reaches on the sheet index map. Since the mapper will not seal these maps, it may be beneficial to add a note here or on the individual sheets stating to look at the sealed maps generated under the mapping contract. Remove "Lower" and add "River" from "Flood Delineation Study of the Lower Hassayampa East Tributaries". Do the same in the Title block of each sheet 1 through 12.
5. Sheet 1 of 12
 - Please switch the cross-section water surface elevation and discharge information to the other side of the cross-sections for the portion of the 4E cross-sections from 1.965 to 1.452. Presenting the information in a table with IDs is another alternative.
 - Please re-verify the discharges and water surface elevations shown on the map with the modeling results. Presently, there are discrepancies in elevations on cross-

sections 0.201, and 0.447; and discrepancies in discharge on cross-sections 0.281 through 0.132.

6. Sheet 2 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

7. Sheet 3 of 12

- Please correct the floodway water surface elevation given on the map for cross-section 3.560. The label reads 1028.53 while the output reports 1028.83.
- Please review all other delineation comments noted on the sheet.

8. Sheet 4 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet, if any.
- Consider showing the existing Hassayampa delineation shaded.

9. Sheet 5 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

10. Sheet 6 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

11. Sheet 7 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

12. Sheet 8 of 12

- Correct the overlapping labels at cross-section 2.662. Please review delineation comments noted on the sheet.

13. Sheet 9 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

14. Sheet 10 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

15. Sheet 11 of 12

- No labeling or information concerns. Please review delineation comments noted on the sheet.

**FLOOD CONTROL DISTRICT of MARICOPA COUNTY
PLANNING & PROJECT MANAGEMENT**

STUDY REVIEW COMMENTS

SUBMITTAL	Area 2 Hydraulics and Floodplain Delineations	PROJECT NAME:	Buckeye Sun Valley ADMS
RETURNS DATE:	February 11, 2005	PROJECT NO.:	FCD 2002C027
REVIEWED BY:	Kathryn Gross	PCN:	211.01.20
DISCIPLINE/OFFICE:	Engineering Division	DESIGNER/CONSULTANT:	PBS&J
FCD FAX NUMBER:	602-506-4601	FCD PROJECT MANAGER:	Valerie Swick

ACTION CODES:

A= WILL COMPLY
***C= FCD TEAM TO EVALUATE**

B= CONSULTANT/DESIGNER TO EVALUATE
***D= PROJECT TEAM RECOMMENDS NO FURTHER ACTION**

**** REQUIRES A WRITTEN EXPLANATION AND FINAL DISPOSITION BY CONSULTANT/DESIGNER***

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
1	General Comments	Comments are fully followed	A	
2	General Comments	Comments are fully followed	A	
3	General Comments	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
4	General Comments	Comments are fully followed	A	
1	HT 4E2	Comments are fully followed	A	
2	HT 4E2	Comments are fully followed	A	
3	HT 4E2	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
4	HT 4E2	Comments are fully followed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
5	HT 4E2	Comments are fully followed	A	
6	HT 4E2	Comments are fully followed	A	
1	HT 4E, Reach 3	Comments are fully followed	A	
2	HT 4E, Reach 3	Comments are fully followed	A	
3	HT 4E, Reach 3	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
4	HT 4E, Reach 3	Comments are fully followed	A	
5	HT 4E, Reach 3	Comments are fully followed	A	
6	HT 4E, Reach 3	Comments are fully followed	A	
7	HT 4E, Reach 3	Per conversations with Baker (Jake Lesue and Wen Chen), it was indicated that guidance was provided by the FCD that a maximum negative surcharge of 0.4' was acceptable. All negative surcharges were below 0.4' in the hydraulic models. Please advise if otherwise.	C	
8	HT 4E, Reach 3	Comments are fully followed	A	
9	HT 4E, Reach 2	Comments are fully followed	A	
10	HT 4E, Reach 2	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
11	HT 4E, Reach 2	Comments are fully followed	A	
12	HT 4E, Reach 2	Comments are fully followed	A	
13	HT 4E, Reach 2	Comments are fully followed	A	
14	HT 4E, Reach 2	Comments are fully followed	A	
15	HT 4E, Reach 1	Comments are fully followed	A	
16	HT 4E, Reach 1	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
17	HT 4E, Reach 1	Comments are fully followed	A	
18	HT 4E, Reach 1	During low flow periods, 4E Reach 1 follows the presently identified baseline. For the 1%-annual-chance-flood, the 4E Reach 1 baseline will connect with the Hassayampa River. Please advise on how to proceed.	C	
19	HT 4E, Reach 1	Comments are fully followed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO	SECTION	COMMENT	DISPOSITION	
			INIT	FINAL
20	HT 4E, Reach 1	Comments are fully followed	A	
21	HT 4E, Reach 1	Comments are fully followed	A	
22	HT 4E, Reach 1	Comments are fully followed	A	
1	HT 4E1, Reach 2	Comments are fully followed	A	
2	HT 4E1, Reach 2	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
3	HT 4E1, Reach 2	Comments are fully followed	A	
4	HT 4E1, Reach 2	Comments are fully followed	A	
5	HT 4E1, Reach 2	Per conversations with Baker (Jake Lesue and Wen Chen), it was indicated that guidance was provided by the FCD that a maximum negative surcharge of 0.4' was acceptable. All negative surcharges were below 0.4' in the hydraulic models. Please advise if otherwise.	C	
6	HT 4E1, Reach 2	Comments are fully followed	A	
7	HT 4E1, Reach 2	Comments are fully followed	A	
8	HT 4E1, Reach 1	Comments are fully followed	A	
9	HT 4E1, Reach 1	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
10	HT 4E1, Reach 1	Comments are fully followed	A	
11	HT 4E1, Reach 1	Comments are fully followed	A	
12	HT 4E1, Reach 1	Comments are fully followed	A	
13	HT 4E1, Reach 1	Comments are fully followed	A	
1	HT 3E	Comments are fully followed	A	
2	HT 3E	Comments are fully followed	A	
3	HT 3E	Comments are fully followed	A	
4	HT 3E	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
5	HT 3E	Comments are fully followed	A	
6	HT 3E	Comments are fully followed	A	
7	HT 3E	Comments are fully followed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
8	HT 3E	Comments are fully followed	A	
9	HT 3E	Comments are fully followed	A	
1	HT 1E, Reach 1	Comments are fully followed	A	
2	HT 1E, Reach 1	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
3	HT 1E, Reach 1	Comments are fully followed	A	
4	HT 1E, Reach 1	Comments are fully followed	A	
5	HT 1E, Reach 1	Comments are fully followed	A	
6	HT 1E, Reach 1	Per conversations with Baker (Jake Lesue and Wen Chen), it was indicated that guidance was provided by the FCD that a maximum negative surcharge of 0.4' was acceptable. All negative surcharges were below 0.4' in the hydraulic models. Please advise if otherwise.	C	
7	HT 1E, Reach 1	Comments are fully followed	A	
8	HT 1E, Reach 1	Comments are fully followed	A	
9	HT 1E, Reach 1	Comments are fully followed	A	
10	HT 1E, Reach 1	Comments are fully followed	A	
11	HT 1E, Reach 1	Comments are fully followed	A	
12	HT 1E, Reach 1	Comments are fully followed	A	
13	HT 1E, Reach 1	Comments are fully followed	A	
14	HT 1E, Reach 2	Comments are fully followed	A	
15	HT 1E, Reach 2	Comments are fully followed	A	
16	HT 1E, Reach 2	The baseline stationing was established as part of the automated floodplain mapping techniques utilized in the hydraulic modeling. Revising the baseline stationing for all cross sections will be time consuming. We would like to discuss the requirement for the baseline stationing with the FCD but will revise the stationing if FCD prefers.	C	
17	HT 1E, Reach 2	Comments are fully followed	A	
18	HT 1E, Reach 2	Comments are fully followed	A	
19	HT 1E, Reach 2	Comments are fully followed	A	
20	HT 1E, Reach 2	Comments are fully followed	A	
21	HT 1E, Reach 2	Per conversations with Baker (Jake Lesue and Wen Chen), it was indicated that guidance was provided by the FCD that a maximum negative surcharge of 0.4' was acceptable. All negative surcharges were below 0.4' in the hydraulic models. Please advise if otherwise.	C	
22	HT 1E, Reach 2	Comments are fully followed	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINAL
1	Work Map	Comments are fully followed	A	
2	Work Map	Comments are fully followed	A	
3	Work Map	Since the CORPSCON program was used for the datum conversion, each point along the reach was assigned its own conversion factor. Appendix B of the Guidelines and Specifications for Flood Hazard Mapping Partners gives the methodology for converting to NAVD 88. It may be possible to assign an average datum conversion, but the procedure should be discussed with the FCD.	C	
4	Work Map	Comments are fully followed	A	
5	Work Map	Comments are fully followed	A	
6	Work Map	Comments are fully followed	A	
7	Work Map	Comments are fully followed	A	
8	Work Map	Comments are fully followed	A	
9	Work Map	Comments are fully followed	A	
10	Work Map	Comments are fully followed	A	
11	Work Map	Comments are fully followed	A	
12	Work Map	Comments are fully followed	A	
13	Work Map	Comments are fully followed	A	
14	Work Map	Comments are fully followed	A	
15	Work Map	Comments are fully followed	A	



Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: June 27, 2005

To: Valerie Swick, Project Manager
Regulatory Division

From: Julie Cox, Senior Hydrologist
Engineering Division

Subject: Comments on Buckeye/Sun Valley ADMS Area 2 Draft Floodplain Delineation Report

I have reviewed the hydrology portions of the May 24, 2005 submittal. My comments are listed below. Please stop by or call me at 506-8401 with any questions.

Technical Comments

1. Provide Watershed Map with sub-basin boundaries and concentration points shown. Include aerial photography and topography as background. Label sub-basins, concentration points, roads, canals, contours, townships, and ranges. There was an Area 2 Watershed Map submitted to FCDMC July 20, 2004. It was labeled Figure 4-6. This map is acceptable with just a few of the changes listed above.
2. Provide documentation for retention volumes in the future condition HEC-1 models.
3. The ID records in the HEC-1 models indicate the source of land use data was FCDMC GIS data (mag_landuse 2000 and mag_genplan 2000). I thought this data was correlated with land use codes from the Town of Buckeye. Provide documentation in the report.

Editorial Comments

4. Figures 4-1, 4-2, 4-5A, and 4-5B. Add contour interval = 10 ft below the scale.
5. Figure 4-1. I think the scale bar should read 1" = 2000', 2" = 4000', and 3" = 6000'. Check and change if necessary.
6. Figure 4-3. I think the scale bar should read 1" = 2000', 2" = 4000', and 3" = 6000'. Check and change if necessary.
7. Figure 4-3. Change labels to read Buckeye Irrigation District Canal and Roosevelt Irrigation District Canal.
8. Figures 4-3, 4-4A, and 4-4B. Increase font size for townships and ranges (see other figures for examples).
9. Figure 4-4A. Change labels to read Buckeye Irrigation District Canal and Roosevelt Irrigation District Canal.
10. Figure 4-4B. Change labels to read Buckeye Irrigation District Canal and Roosevelt Irrigation District Canal.

11. Figure 4-4B. The vertical dashed line between ranges 5W and 6W is crooked. Please straighten. Add label for T1S R6W. Move labels for range 6W. I suggest using arrows pointed to the west of the vertical dashed line between ranges 5W and 6W.
12. Figure 4-4B. Change land use for Interstate 10 from "Active Open Space" to "Transportation".
13. Figure 4-5A. Change labels to read Buckeye Irrigation District Canal and Roosevelt Irrigation District Canal.
14. Figure 4-5B. Change labels to read Buckeye Irrigation District Canal and Roosevelt Irrigation District Canal.
15. Figure 4-5B. The horizontal dashed line between townships 1N and 2N is crooked. Please straighten. Move label T2N R6W to the north of the horizontal dashed line.
16. The FEMA Riverine Hydrology & Hydraulics Form indicates there was no existing hydrologic analysis. The Buckeye Area FDS (MKE 1992) is the effective model.
17. Draft Report, Page 3. Include Ms. Kathryn Gross and Mr. Richard Harris, Project Managers, in Section 1.5. They completed the floodplain reviews.
18. Draft Report, Page 39. Change "modified plus" to "modified puls".
19. Draft Report, Page 43. Remove the "7" that appears after "Table 4-7".
20. Draft Report, Appendix D, Table D.3-2. The second cross section should be labeled 2E-3E instead of 1E-2E.



Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: July 18, 2005
To: Valerie Swick, Project Manager
From: Mike Duncan, Flood Delineation Group
Subject: Buckeye/Sun Valley ADMS

Review Comments for Volume IV-A: Area 2 Floodplain Delineation Report, 5/18/05

1. After page, in FEMA form MT-2 Form 1 Page 2 of 2, Community Official's Name and Title should be:

Timothy S. Phillips, P.E., Acting Chief Engineer and General Manager

and Community Name should be:

Unincorporated Maricopa County

2. A second MT-2 Form 1 Page 2 of 2 is needed for the Town of Buckeye. The Community Official's Name and Title should be left blank, and the Community Name should be:

Town of Buckeye

3. On page 52, it is stated that "Appendix E1.1 lists n-value components and final n-value coefficients," but neither appear in the appendix.

4. On page 53, Figure 5-17 should be presented at a size of 11 inch by 17 inch, rather than 4 inch by 6 inch.

5. On page 69, at Table 7.1, please add the drainage area for the last discharge.

6. At back of notebook, Figures 7-12 through 7-14, Annotated FIRM's, need to have the new floodplain boundaries added. These boundaries can be plotted or hand-drawn. Red ink, or another contrasting color, should be used.

7. A CD with the hydrologic and hydraulic models needs to be added to the Volume.

8. For all of the floodplain work maps, when a floodway boundary is at the same location as the floodplain boundary, the dashed floodway line should be shown, rather than the solid floodplain line.
9. For all of the floodplain work maps, the note for the vertical datum conversion factor should be changed to something like this:

NGVD29 = NAVD88 - 2.08 feet

10. At the volume cover sheet and at sheets ii, v, vi, etc., the DRAFT notes need to be removed.
11. At each floodplain work map, the DRAFT needs to be replaced with the P.E. stamp.
12. We need dxf files of the floodplain and floodway boundaries, for the submittal of this study to FEMA.
13. We need CADD-Deliverable files, in accordance with the Distict's CADD Data Delivery Specifications, Rev. 1.0, January 2000. These will allow the study data to be added to our database.

**FLOOD CONTROL DISTRICT of MARICOPA COUNTY
PLANNING & PROJECT MANAGEMENT**

STUDY REVIEW COMMENTS

SUBMITTAL	Area 3 Hydrology	PROJECT NAME	Buckeye Sun Valley ADMS
RETURN DATE	February 17, 2004	PROJECT NO.	FCD 2002C027
PREPARED BY	Julie Cox	PCN	211.01.20
DISCIPLINE OFFICE	Engineering Division	DESIGNER CONSULTANT	PBS&J
FCD PROJECT NUMBER	602-506-4601	FCD PROJECT MANAGER	Valerie Swick

ACTION CODES:

A= WILL COMPLY

***C= FCD TEAM TO EVALUATE**

B= CONSULTANT/DESIGNER TO EVALUATE

***D= PROJECT TEAM RECOMMENDS NO FURTHER ACTION**

**** REQUIRES A WRITTEN EXPLANATION AND FINAL DISPOSITION BY CONSULTANT/DESIGNER***

ITEM NO.	ISSUE	COMMENT	DISPOSITION	FINAL
1	General Discussion	In the future, transmittal letter will be addressed, and items included will be listed in the submittal.	A	
2	General Discussion	Every map, drafts will be maintained self-consistency and satisfied with FCD drawing/map requirements.	A	
3	General Discussion	Every Table/Figure in the draft report will include Title, No., and also be included in the TOC – Tables and Figures	A	
4	General Discussion	The author is National Weather Service (NWS), corrected.	A	
5	General Discussion	We used FCDMC digitized isopluvial maps in WMS. However, we will include paper copy of isopluvial maps in the final reports.	B	
1	Watershed Map	Comments will be fully followed in watershed maps	A	
1	Watershed Work Maps	All figures in Appendix D will be provided in the final reports.	A	
2	Watershed Work Maps	The Buckeye Structures and floodways on the watershed work maps will be labeled.	A	
1	PMP Values	As advised, the new PMP calculations were submitted to the District (Mr. Joe Rumman) on Feb. 27, 2004.	A	
1	HEC-1 Models	Comments are fully followed.	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INITIAL	FINAL
2	HEC-1 Models	Comments are fully followed	A	
3	HEC-1 Models	Comments are fully followed	A	
4	HEC-1 Models	Future conditions hydrology models are re-checked and modified as advised.	A	
5	HEC-1 Models	The redundancy was automatically generated by the FCDMC module in WMS. Repeated PC records are removed.	B	
6	HEC-1 Models	The FCDMC module in WMS gave the point precipitation values. It agrees with the isopluvial maps in the Hydrology Manual (FCDMC, 1995).	B	
7	HEC-1 Models	Level pool routings were conducted for stage-storage relationships for the structures as advised. But the purpose of doing so is to compare with unsteady model results. The model and results are included in Volume IV-C: Area 3 Hydraulic Report.	C	
8	HEC-1 Models	Same response as No. 7 in "HEC-1 Model"	B	
9	HEC-1 Models	Re-checked and modified.	B	
10	HEC-1 Models	Split flows might likely occur at the mentioned sub-basin boundaries. However, based upon our field investigation and research on previous study (Alpha, 1996), the flow diversions are very minimal. Analysis and justification were provided in the report, see section 4.3.1.4.	C	
11	HEC-1 Models	Velocities are checked based on the routing channel slopes. The velocities are 8 fps and 10 fps for C1-C2 and F1-F2, respectively.	C	
12	HEC-1 Models	The unit peak discharges are among the envelope curves, and the results are all in agreement with USGS LP3 curve for Arizona. The same trend was found in other studies, for example, the Hydrology Study for Bonita Dam, Maricopa County, Arizona (Zhao, 2003).	C	
13	HEC-1 Models	The reason is because XKSAT of E2 is low (0.256 in/hr) in Green & Ampt calculation as compared to average 0.35 for other basins	C	
14	HEC-1 Models	The results are verified. Half of the basins with a size over 1 sq-mi, the ratio of 10-year 24-hour to the 100-year 24-hour peak flows is around 0.25-0.4. Ratio for smaller basins tends to be 0.35-0.50.	B	
1	Future Conditions	Comments are fully followed.	A	
2	Future Conditions	Comments are fully followed.	A	
3	Future Conditions	Comments are fully followed.	A	
4	Future Conditions	Comments are fully followed.	A	

**REVIEW COMMENTS
(CONTINUED)**

ITEM NO.	SECTION	COMMENT	DISPOSITION	
			INIT.	FINA.
5	Future Conditions	Comments are fully followed.	A	
6	Future Conditions	According to the future Buckeye land use map, several areas are not planned to be developed. For those area, no change is made in HEC-1 models.	B	
1	Verification/Calibration	Comments are fully followed.	A	
2	Verification/Calibration	Comments are fully followed.	A	
3	Verification/Calibration	Comments are fully followed.	A	



Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: May 5, 2005
To: Valerie Swick, Project Manager
From: Kathryn Gross, Hydrologist *KAG*
Subject: Buckeye-Sun Valley ADMS – Task 2.6.4.3 Area Four Review of Development Master Plans February 2005 Submittal

I have reviewed the above memo. The memo addresses the concerns with the washes within Area 4 and brings to light concerns regarding how proposed developments are planning on handling the washes and discharges and makes some recommendations for the developments.

The information provided in the memo meets the requirements of the scope task and is accepted.

I have no more comments at this time.



Natural Resources Conservation Service
230 North First Avenue, Suite 509
Phoenix, Arizona 85003-1708
(602) 280-8301
FAX (602) 280-8785

DEC 20 2004

Brett Howey
Project Manager
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

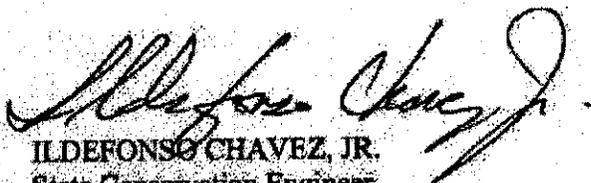
RE: Buckeye Flood Retention Structures H&H Study

Dear Mr. Howey:

Enclosed please find comments from our office for the PBS&J report and supporting documentation. Please work with John Harrington and Ron Hemmer, as appropriate, to resolve these comments.

Thank you for the opportunity to respond.

Sincerely


ILDEFONSO CHAVEZ, JR.
State Conservation Engineer.

Enclosure:
H&H Study Review, NWMC, Little Rock, AR

cc:
Donald E. Paulus, ASTC/Programs, NRCS
Tom Reakly, Manager, Structures Branch, FCDMC

FLOOD CONTROL DISTRICT RECEIVED	
DEC 21 '04	
CH & SM	FINANCE
RC	LANDS
AGS	C&M
EE	F&PM
EW	FS



Natural Resources Conservation Service
National Water Management Center
101 East Capitol Avenue, Suite B100
Little Rock, AR 72201-3811

Subject: ENG - Technical Review of Buckeye Flood
Retention Structure (FRS) #1 Hydrology & Hydraulics

Michael J. ...
Date: November 30, 2004

To: Michael Somerville, State Conservationist
Natural Resources Conservation Service
3003 N. Central Avenue, Suite B800
Phoenix, AZ 85012-2946

File Code: 210-13-15-5

Attached are review comments for the hydrology and hydraulics study for the Buckeye FRS structure prepared for the Flood Control District of Maricopa County. We appreciate the opportunity to provide a review of this plan.

Please contact James Moore at 501-210-8922 or by email james.moore@ar.usda.gov if you need further assistance.

Keith E. Admire
KEITH E. ADMIRE
Director, NWMC

Attachment

Cc: w/attachment

Donald E. Paulus, ASTC Programs, NRCS, Phoenix, AZ

~~Walter Chavez, Jr., Acting State Conservation Engineer, NRCS, Phoenix, AZ~~

Hydrology and Hydraulics Study Review

Job: Buckeye Flood Retarding Structures
Location: Maricopa County, Arizona
Authority: PL-566

Purpose: The purpose of this review is to examine the draft hydrology and hydraulics draft study for the Buckeye Flood Retarding Structures. The study was prepared by PBS&J for the Flood Control District of Maricopa County.

Scope of Review: The following documents were submitted or requested to conduct the review.

1. CD with PBS&J report and supporting documentation. ✓
2. Addendum of Buckeye FRS PMF Report to ADWR. ✓
3. Table 3 from the Buckeye Watershed Work Plan. ✓
4. Preliminary 2004 surveys from the Flood Control District of Maricopa County. ✓

General Comments: The consultant performed a through analysis of the watershed area. The report discusses the variation of results by different methods and assumptions. The unsteady model demonstrates the effects of roads/restrictions located in the flood pool of the structures. Changes from the Addendum and comments should be incorporated in the final report. Observations and comments to consider are as follows:

1. The total drainage area in the report was larger than the drainage area in Table 3. The drainage area was slightly larger for Sites 1 and 2 and slightly smaller for Site 3. No changes recommended. ✓
2. The storage capacities in the report for the flood water retarding structures varied from the storage capacities shown in Table 3. No changes recommended. ✓
3. The design rainfalls and corresponding runoff volumes in the report varied from the rainfall and runoff volumes in Table 3. The worksheets from Hydrometeorological Report No. 49 (HMR-49) document the PMP rainfall amounts used in the analysis. The runoff volumes varied due to change in rainfall amounts and the Green-Ampt procedure used to determine the rainfall losses. No changes recommended. ✓
4. The flood water retarding structures were design to include aerated sediment storage. The sediment rates for the watershed should be estimated. The required sediment storage should be determined for the design life of the structures. NRCS requires the storage routings start at the sediment storage elevation or the water surface after a 10-day drawdown. The three sites meet the 10-day drawdown requirement. Therefore, the level-pool routings should begin at the estimated sediment storage elevation.
5. The rainfall distribution on the PMP worksheets used a mix of the HMR-49 distributions identified as HMR No. 5 and BM1110-2-1411 in Table 4.7.

Recommend correcting the time sequence of the incremental PMP and using the HMR No. 5 distribution.

6. The rainfall distributions used in the HEC-1 analysis do not match the distributions from HMR-49 or PMP worksheets. The maximum one-hour rainfall can significantly affect the peak discharges of the basins. The distribution in the HEC-1 analysis resulted in 6.85 inches of rainfall in the maximum one-hour compared to 6.3 inches from HMR-49 for Site 1. The distribution in the HEC-1 analysis resulted in 9.51 inches of rainfall in the maximum one-hour compared to 10.5 inches from HMR-49 for Site 2. The distribution in the HEC-1 analysis resulted in 8.95 inches of rainfall in the maximum one-hour compared to 9.7 inches from HMR-49 for Site 1. Recommend considering a distribution closer to the distribution of HMR No. 5 in Table 4.7 of HMR-49.
7. Each of the principal spillways have significant fall from the inlet to the outlet. Tail-water has minor effects on the discharge of the principal spillway (PS). The PS discharge does not have significant effects on the maximum water surface of the downstream reservoir. The weir flow equation may over-estimate the auxiliary spillway discharge.
8. The floodway overtopping should be used for the existing conditions analysis. If the Flood Control District proposes to increase the capacity of the floodway to contain the PMF, the future condition analysis could consider no overtopping of the floodway.
9. Section 5.3.2 discusses the expansion and contraction coefficients at culvert locations. The HECRAS model used the same coefficients for the cross-sections and culverts. Recommend changing the expansion and contraction coefficients for the culvert crossings.
10. Many of the cross-sections encountered varying terrain. Some of the data points away from the main channel were adjusted to remove the presence of the gullies. The adjusted data reduced the potential flow/storage areas from the unsteady flow model. What effects would the additional area of the cross-sections have on the unsteady flow model?

Comments Site 1:

1. The outlets for sub-basins Q and R drain into the floodway. For the Level Pool Routing, the hydrographs for sub-basins Q and R should be routed through the floodway to the reservoir before combining with the remaining hydrographs.
2. The "n-value" for the Principal Spillway pipe used in the HECRAS unsteady flow model was 0.0012. Recommend correcting to 0.012 in the final analysis.
3. The "n-value" for the Sun Valley Parkway culverts used in the HECRAS unsteady flow model was 0.0013. Recommend correcting to 0.013 in the final analysis.
4. HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?

Comments Site 2:

1. The dam crest elevation shown in Table 3 is 1120.0 feet. The design crest elevation from the Flood Control District survey before datum adjustment is 1117.0 feet.
2. The auxiliary spillway bottom width shown in Table 3 is 300 feet. The auxiliary spillway bottom width from the Flood Control District survey is 350 feet.
3. HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?

Comments Site 3:

1. The dam crest elevation shown in Table 3 is 1172.0 feet. The design crest elevation from the Flood Control District survey is 1170.0 feet.
2. The auxiliary spillway bottom width shown in Table 3 is 600 feet. The auxiliary spillway bottom width from the Flood Control District survey is 400 feet.

Reviewed By:

James Moore, P.E.

James Moore, PE

Civil Engineer,

National Water Management Center

ARIZONA DEPARTMENT OF WATER RESOURCES
OFFICE OF WATER ENGINEERING
Dam Safety and Flood Warning

REVIEW MEMORANDUM

Dam: **Buckeye FRS No. 1 Dam (07.42)**
 Buckeye FRS No. 2 Dam (07.44)
 Buckeye FRS No. 3 Dam (07.45)

Report: **Buckeye Flood Retaining Structures PMF H&H (PBS&J, 08/04)**
 Addendum of Buckeye FRS PMF Report to ADWR (PBS&J, 09/04)

Reviewer: **Michael Johnson, Ph.D., P.E.**

Date: **December 3, 2004**

Comments

1. Section 4.2.6.1 – Rainfall Losses: The 72-hr general PMF should assume saturated antecedent moisture conditions. However, this change would not be expected to result in the 72-hr PMF becoming critical.
2. Section 4.2.6.3 – Lag Time: The USBR Hydrology Manual (Cudworth, 1989) suggests assigning K_n values for the PMF at the low end of reasonable values of the watershed conditions present. I have seen other studies reduce the 100-yr K_n by 20 percent. The K_n values for the current study should be reduced in some rational way for the PMF events.
3. Section 5.1 – Method Description: Table 5-1 gives pertinent elevation data in the NGVD29 datum. Because the modeling uses a different datum, these elevations should also be given in NAVD88.
4. Section 5.5.3 – Dam Crest and Emergency Spillway: The three emergency spillways are not traditional broad-crested weirs and therefore selection of an appropriate weir coefficient is difficult. The weir coefficients used in the current study are probably conservatively low. Higher rating curves (or weir coefficients) could likely be justified by developing steady-state HEC-RAS models with close cross-section spacing (to approximate rapidly-varied flow conditions). Models for this purpose would be expected to extend far enough downstream of the crest to accurately predict flow depths in the outflow channel and far enough upstream to predict head losses in the approach channel.
5. Section 5.5.3 – Dam Crest and Emergency Spillway: Overtopping of the roadways and FRS's can accurately be modeled using the weir equation. Trapezoidal-shaped weirs typically have discharge coefficients ranging 2.7 to 3.1. The 1978 FHWA document Hydraulics of Bridge Waterways provides a chart for estimating values.

6. Table 5-9 – Summary of Level-Pool Routing: The max WSEL for the FRS #3 72-hr PMF is incorrectly shown as “1191.97.”
7. The report should be revised to include the content of the addendum.

Discussion

1. Further analysis and documentation of overtopping at Miller Road would be required in order for the Department to assume it washes out for purpose of evaluating the safe flood capacity of FRS No. 2. Information that would need to be provided includes:
 - a. As-built cross-section of Miller Road,
 - b. Characterization of erosion rate for road embankment soils,
 - c. Depth, flow velocities, and duration of overtopping including tailwater submergence, and
 - d. Time required for failure of the road embankment.

If the Department were to assume that Miller Road washes out, then the FCDMC and the Department would need to monitor for and be aware of any future road improvements that would make washout less likely.

2. A segment of FRS No. 2 is still predicted to overtop in the event of washout of Miller Road (i.e. to a maximum depth of 0.2 ft as reported in Table 5-3). Would restoring the crest in this segment to the design elevation prevent the overtopping?

B.6 Responses to NRCS/ADWR Review

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
NRCS - James Moore, PE					
1	General Comments	1	The total drainage area in the report was larger than the drainage area in Table 3. The drainage area was slightly larger for Sites 1 and 2 and slightly smaller for Site 3. No changes recommended.	A	No change made
2	General Comments	2	The storage capacities in the report for the flood water retarding structures varied from the storage capacities shown in Table 3. No changes recommended.	B	No change made
3	General Comments	3	The design rainfalls and corresponding runoff volumes in the report varied from the rainfall and runoff volumes in Table 3. The worksheets from Hydrometeorological Report No. 49 (HMR-49) document the PMP rainfall amounts used in the analysis. The runoff volumes varied due to change in rainfall amounts and the Green-Ampt procedure used to determine the rainfall losses. No changes recommended.	A	No change made
4	General Comments	4	The flood water retarding structures were design to include aerated sediment storage. The sediment rates for the watershed should be estimated. The required sediment storage should be determined for the design life of the structures. NRCS requires the storage routings start at the sediment storage elevation or the water surface after a 10-day drawdown. The three sites meet the 10-day drawdown requirement. Therefore, the level-pool routings should begin at the estimated sediment storage elevation.	D	The ADMS will include an estimate of watershed sediment yield; however, it is not reasonable to assume that sediment will accumulate to the normal floodpool elevation. Data from the Flood Control District of Maricopa County (FCD) Operations and Dam Safety Monitoring Programs indicates minimal sediments have accumulated within the FRS floodpool after 30 year's operation. Therefore, both the unsteady model and the level-pool routing models were developed using the ground terrain data.

Buckeye/Sun Valley ADMS – Area 3 Technical Data Notebook

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
5	General Comments	5	The rainfall distribution on the PMP worksheets used a mix of the HMR-49 distributions identified as HMR No. 5 and EM1110-2-1411 in Table 4.7. Recommend correcting the time sequence of the incremental PMP and using the HMR No. 5 distribution.	D	The PMP worksheets were mainly used to calculate the rainfall depths in a 6- and 72-hour PMP. The PMP rainfall distribution patterns followed Dames & Moore (1990) as coded in the HEC-1 models. See more details in Comment #6.
6	General Comments	6	The rainfall distributions used in the HEC-1 analysis do not match the distributions from HMR-49 or PMP worksheets. The maximum one-hour rainfall can significantly affect the peak discharges of the basins. The distribution in the HEC-1 analysis resulted in 6.85 inches or rainfall in the maximum one-hour compared to 6.3 inches from HMR-49 for Site 1. The distribution in the HEC-1 analysis resulted in 9.51 inches or rainfall in the maximum one-hour compared to 10.5 inches from HMR-49 for Site 2. The distribution in the HEC-1 analysis resulted in 8.95 inches or rainfall in the maximum one-hour compared to 9.7 inches from HMR-49 for Site 1. Recommend considering a distribution closer to the distribution of HMR No. 5 in Table 4.7 of HMR-49.	D	The HEC-1 computer models require the PMP distribution to be in 5-min intervals due to relatively small time of concentration of the sub-basins. HMR-49 lists only the 6-hour PMP distribution for 1-hour intervals. To transform the 1-hr into a 5-min interval distribution, the method as developed in "Phase I Report: Project Calculations - Hydrologic Analysis - Buckeye Floodwater Retarding Structures #1, #2, and #3" by Dames & Moore (1990) was followed. Basically the method used EM1110-2-1411 distribution pattern.
7	General Comments	7	Each of the principal spillways have significant fall from the inlet to the outlet. Tail-water has minor effects on the discharge of the principal spillway (PS). The PS discharge does not have significant effects on the maximum water surface of the downstream reservoir. The weir flow equation may over-estimate the auxiliary spillway discharge.	A/B/C	Agree that tail-water has minimal effect on the "PS" discharge, which in turn has little effect on the maximum water surface elevation. The auxiliary spillway discharges for the three FRSS were calculated using weir equation applied according to the FCD standard procedures. The discharge coefficients were adapted from Table 2.4 in the "Phase I report: Hydrologic Analysis - Buckeye Floodwater Retarding Structures #1, #2, and #3" by Dames & Moore (1990).

Buckeye/Sun Valley ADMS – Area 3 Technical Data Notebook

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
8	General Comments	8	The floodway overtopping should be used for the existing conditions analysis. If the Flood Control District proposes to increase the capacity of the floodway to contain the PMF, the future condition analysis could consider no overtopping of the floodway.	A	Several scenarios were modeled, including one with floodway overtopping. Floodway overtopping was not identified in any previous studies because the floodway overtopping was caused by backwater effect which is only available in the unsteady model.
9	General Comments	9	Section 5.3.2 discusses the expansion and contraction coefficients at culvert locations. The HECRAS model used the same coefficients for the cross-sections and culverts. Recommend changing the expansion and contraction coefficients for the culvert crossings.	A	Contraction and expansion coefficients for uniform conditions used 0.1 and 0.3, respectively; entrance and exit loss coefficients used 0.5 and 1.0 for culverts, respectively. Changes were made to the report to be consistent with the models.
10	General Comments	10	Many of the cross-sections encountered varying terrain. Some of the data points away from the main channel were adjusted to remove the presence of the gullies. The adjusted data reduced the potential flow/storage areas from the unsteady flow model. What effects would the additional area of the cross-sections have on the unsteady flow model?	B/C	Initially, existing terrain data was used to develop the unsteady models. However, this terrain data with gullies et al created multiple different critical depths within a single cross section, which either caused the model to become unstable or led to incorrect interpolations of the water surface profile. The gullies were removed because of the above reasons. It is anticipated that for the PMF event, removal of the gullies will not create observable difference to the final model results (although some conveyance and storage losses will result).
11	Comments Site 1	1	The outlets for sub-basins Q and R drain into the floodway. For the Level Pool Routing, the hydrographs for sub-basins Q and R should be routed through the floodway to the reservoir before combining with the remaining hydrographs.	D	Agree to the comment, however, the level pool routing is a simplistic method. It is reasonable to combine all the concentration points routing through the reservoir given by the size of sub-basin Q and R, and the distance to the floodpool.
12	Comments Site 1	2	The "n-value" for the Principal Spillway pipe used in the HECRAS unsteady flow model was 0.0012. Recommend correcting to 0.012 in the final analysis.	A	Changes made to the models. At the PMF event, no observable changes to the final results.

Buckeye/Sun Valley ADMS – Area 3 Technical Data Notebook

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
13	Comments Site 1	3	The "n-value" for the Sun Valley Parkway culverts used in the HECRAS unsteady flow model was 0.0013. Recommend correcting to 0.013 in the final analysis.	A	Changes made to the models. At the PMF event, no observable changes to the final results.
14	Comments Site 1	4	HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?	B/C	There are ineffective areas created due to numerous existing gullies. These areas were removed them in consideration of model instability. However, it is envisioned that the ineffective flow areas will have little noticeable impact on the PMF results.
15	Comments Site 2	1	The dam crest elevation shown in Table 3 is 1120.0 feet. The design crest elevation from the Flood Control District survey before datum adjustment is 1117.0 feet.	D	All data presented in the model are based on NAVD 88. The crest elevation is consistent with current information provided by FCD.
16	Comments Site 2	2	The auxiliary spillway bottom width shown in Table 3 is 300 feet. The auxiliary spillway bottom width from the Flood Control District survey is 350 feet.	D	The model used 350 feet for the auxiliary spillway. The spillway width is consistent with current information provided by FCD
17	Comments Site 2	3	HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?	B/C	There are ineffective areas created due to numerous existing gullies. These areas were removed in consideration of model instability. However, it is envisioned that the ineffective flow areas will have little noticeable impact on the PMF results.
18	Comments Site 3	1	The dam crest elevation shown in Table 3 is 1172.0 feet. The design crest elevation from the Flood Control District survey is 1170.0 feet.	D	The model used 1170.0 feet for the crest. The crest elevation is consistent with current information provided by FCD.
19	Comments Site 3	2	HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?	B/C	There are ineffective areas created due to numerous existing gullies. These areas were removed in consideration of model instability. However, it is envisioned that the ineffective flow areas will have little noticeable impact on the PMF results.

Buckeye/Sun Valley ADMS – Area 3 Technical Data Notebook

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
ADWR - Mike Johnson, Ph.D., P.E.					
20	Comments	1	Section 4.2.6.1 – Rainfall Losses: The 72-hr general PMF should assume saturated antecedent moisture conditions. However, this change would not be expected to result in the 72-hr PMF becoming critical.	A	No change made
21	Comments	2	Section 4.2.6.3 – Lag Time: The USBR Hydrology Manual (Cudworth, 1989) suggests assigning Kn values for the PMF at the low end of reasonable values of the watershed conditions present. I have seen other studies reduce the 100-yr Kn by 20 percent. The Kn values for the current study should be reduced in some rational way for the PMF events.	B/C	We agree that the Kn value decreases as the storm becomes more severe and we documented this finding in the report as well. However, there is no guideline for a quantitative change of the Kn value in response to storm return frequencies. Therefore, the Kn values used in the model were based on field investigation and engineering judgments. This will be re-evaluated as part of the FRS1 Dam Rehabilitation Modeling effort currently underway as part of a separate contract.
22	Comments	3	Section 5.1 – Method Description: Table 5-1 gives pertinent elevation data in the NGVD29 datum. Because the modeling uses a different datum, these elevations should also be given in NAVD88.	A	The NGVD29 data in Table 5.1 were extracted from the original design TDN (1974). For a complete comparison, an additional column indicating the value in the NAVD88 datum will be added.

Buckeye/Sun Valley ADMS – Area 3 Technical Data Notebook

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
23	Comments	4	Section 5.5.3 – Dam Crest and Emergency Spillway: The three emergency spillways are not traditional broad-crested weirs and therefore selection of an appropriate weir coefficient is difficult. The weir coefficients used in the current study are probably conservatively low. Higher rating curves (or weir coefficients) could likely be justified by developing steady- state HEC-RAS models with close cross-section spacing (to approximate rapidly-varied flow conditions). Models for this purpose would be expected to extend far enough downstream of the crest to accurately predict flow depths in the outflow channel and far enough upstream to predict head losses in the approach channel.	B/C	The Emergency spillways discharge coefficients were adapted from Table 2.4 in "Phase I report: Hydrologic Analysis - Buckeye Floodwater Retarding Structures #1, #2, and #3" by Dames & Moore (1990). Discharge coefficients for the dam crests on overtopping were calculated using Hager's equation from "Lateral outflow over side weirs" (Hager, William H., 1987) as directed by FCD. The suggested approach may have some merit and will be discussed with FCD for possible inclusion in the Buckeye 1 Rehabilitation Study currently underway as part of a separate contract.
24	Comments	5	Section 5.5.3 – Dam Crest and Emergency Spillway: Overtopping of the roadways and FRS's can accurately be modeled using the weir equation. Trapezoidal-shaped weirs typically have discharge coefficients ranging 2.7 to 3.1. The 1978 FHWA document Hydraulics of Bridge Waterways provides a chart for estimating values.	D	The model used 2.6 as default in HEC-RAS. The roadway does not normally maintain a trapezoidal-shaped.
25	Comments	6	Table 5-9 – Summary of Level-Pool Routing: The max WSEL for the FRS #3 72-hr PMF is incorrectly shown as "1191.97."	A	The max WSEL for FRS#3 should be 1171.97. The typo will be corrected.
26	Comments	7	The report should be revised to include the content of the addendum.	A	Agreed

OVER-ALL NO.	DWG, SHT, PAGE NO.	ITEM NO.	COMMENT	RESPONSE	COMMENTS
27	Discussion	1	Further analysis and documentation of overtopping at Miller Road would be required in order for the Department to assume it washes out for purpose of evaluating the safe flood capacity of FRS No. 2. Information that would need to be provided includes: a. As-built cross-section of Miller Road, b. Characterization of erosion rate for road embankment soils, c. Depth, flow velocities, and duration of overtopping including tailwater submergence, and d. Time required for failure of the road embankment. If the Department were to assume that Miller Road washes out, then the FCDMC and the Department would need to monitor for and be aware of any future road improvements that would make washout less likely.	B/C	Miller Road is a dirt road and would be vulnerable to washing out in a PMF event. To further investigate this issue, the sub-tasks identified by ADWR must be completed. Those tasks are outside of the current study scope. We will discuss this issue with FCD. The purpose of our model was to identify problems and provide the basis for future mitigation actions.
28	Discussion	2	A segment of FRS No. 2 is still predicted to overtop in the event of washout of Miller Road (i.e. to a maximum depth of 0.2 ft as reported in Table 5-3). Would restoring the crest in this segment to the design elevation prevent the overtopping?	B/C	According to our model, to prevent the overtopping with Miller Rd. in place, the dam crests of FRS No. 2 and Floodway No. 3 must be raised an additional 0.71 ft and 1.86 ft respectively. Without Miller Rd., an additional 0.2 ft and 1.40 ft must be added to the upstream of the FRS No. 2 dam crest and Floodway No. 3, respectively.

A – Will Comply

B – Consultant to Evaluate

C – Review Agency to Evaluate

D – Will Not Comply

OVER-ALL NO.	ITEM NO.	DWG, SHT, PAGE NO.	COMMENT	RESPONSE	COMMENTS
NRCS - James Moore, PE					
1	1	General Comments	The total drainage area in the report was larger than the drainage area in Table 3. The drainage area was slightly larger for Sites 1 and 2 and slightly smaller for Site 3. No changes recommended.	A	No change made
2	2	General Comments	The storage capacities in the report for the flood water retarding structures varied from the storage capacities shown in Table 3. No changes recommended.	B	No change made
3	3	General Comments	The design rainfalls and corresponding runoff volumes in the report varied from the rainfall and runoff volumes in Table 3. The worksheets from Hydrometeorological Report No. 49 (HMR-49) document the PMP rainfall amounts used in the analysis. The runoff volumes varied due to change in rainfall amounts and the Green-Ampt procedure used to determine the rainfall losses. No changes recommended.	A	No change made
4	4	General Comments	The flood water retarding structures were design to include aerated sediment storage. The sediment rates for the watershed should be estimated. The required sediment storage should be determined for the design life of the structures. NRCS requires the storage routings start at the sediment storage elevation or the water surface after a 10-day drawdown. The three sites meet the 10-day drawdown requirement. Therefore, the level-pool routings should begin at the estimated sediment storage elevation.	D	The ADMS will include an estimate of watershed sediment yield, but it however, it is not reasonable to assume that all of this sediment will actually migrate all the way accumulate to the normal floodpool elevation. Data from the Flood Control District of Maricopa County (FCD) Operations and Dam Safety Monitoring Programs indicates minimal sediments have accumulated within the FRS floodpool after 30 year's operation. Therefore, both the unsteady model and the level-pool routing models were developed using the ground terrain data. Should we include a copy of the FCD data on sediment with the report?
5	5	General Comments	The rainfall distribution on the PMP worksheets used a mix of the HMR-49 distributions identified as HMR No. 5 and EM1110-2-1411 in Table 4.7. Recommend correcting the time sequence of the incremental PMP and using the HMR No. 5 distribution.	D	The PMP worksheets were mainly used to calculate the rainfall depths in a 6- and 72-hour PMP. The PMP rainfall distribution patterns followed Dames & Moore (1990) as coded in the HEC-1 models. See more details in Comment #6.
6	6	General Comments	The rainfall distributions used in the HEC-1 analysis do not match the distributions from HMR-49 or PMP worksheets. The maximum one-hour rainfall can significantly affect the peak discharges of the basins. The distribution in the HEC-1 analysis resulted in 6.85 inches or rainfall in the maximum one-hour compared to 6.3 inches from HMR-49 for Site 1. The distribution in the HEC-1 analysis resulted in 9.51 inches or rainfall in the maximum one-hour compared to 10.5 inches from HMR-49 for Site 2. The distribution in the HEC-1 analysis resulted in 8.95 inches or rainfall in the maximum one-hour compared to 9.7 inches from HMR-49 for Site 1. Recommend considering a distribution closer to the distribution of HMR No. 5 in Table 4.7 of HMR-49.	D	Due to the relatively small time of concentration of the subbasins, ?? the HEC-1 computer models require the PMP distribution to be in 5-min intervals. HMR-49 lists only the 6-hour PMP distribution for 1-hour intervals. To transform the 1-hr into a 5-min interval distribution, the method in-as developed in "Phase I Report: Project Calculations - Hydrologic Analysis - Buckeye Floodwater Retarding Structures #1, #2, and #3" by Dames & Moore (1990) was followed. Basically the method used EM1110-2-1411 distribution pattern. Do they have the 1990 DAM report for reference??

A-Will Comply
B-Consultant to Evaluate
C-Review Agency to Evaluate
D-Will Not Comply

OVER-ALL NO.	ITEM NO.	DWG, SHT, PAGE NO.	COMMENT	RESPONSE	COMMENTS
7	7	General Comments	Each of the principal spillways have significant fall from the inlet to the outlet. Tail-water has minor effects on the discharge of the principal spillway (PS). The PS discharge does not have significant effects on the maximum water surface of the downstream reservoir. The weir flow equation may over-estimate the auxiliary spillway discharge.	A/B/C	Agree that tail-water has minimal effect on the "PS" discharge, which in turn has little effect on the maximum water surface elevation. The auxiliary spillway discharges for the three FRSs were calculated using weir equation applied according to the FCD standard procedures. The discharge coefficients were taken adopted from Table 2.4 in the "Phase I report: Hydrologic Analysis - Buckeye Floodwater Retarding Structures #1, #2, and #3" by Dames & Moore (1990). Are these values reasonable for the type of weir?
8	8	General Comments	The floodway overtopping should be used for the existing conditions analysis. If the Flood Control District proposes to increase the capacity of the floodway to contain the PMF, the future condition analysis could consider no overtopping of the floodway.	A	Several scenarios were modeled, including one with floodway overtopping. Floodway overtopping was not identified in any previous studies because the floodway overtopping was caused-computed by the backwater effect which is only available in the unsteady flow model. Expand
9	9	General Comments	Section 5.3.2 discusses the expansion and contraction coefficients at culvert locations. The HECRAS model used the same coefficients for the cross-sections and culverts. Recommend changing the expansion and contraction coefficients for the culvert crossings.	A	This will be revised and incorporated in the FRS1 Dam Rehabilitation Modeling effort currently underway as part of another contract. It is anticipated that for the PMF event, the coefficient change will have little or no impact to the final results.
10	10	General Comments	Many of the cross-sections encountered varying terrain. Some of the data points away from the main channel were adjusted to remove the presence of the gullies. The adjusted data reduced the potential flow/storage areas from the unsteady flow model. What effects would the additional area of the cross-sections have on the unsteady flow model?	B/C	Initially, existing terrain data was used to develop the unsteady models. However, this terrain data with gullies et al created multiple different critical depths within a single cross section, which either caused the model to become unstable or led to incorrect interpolations of the water surface profile. The gullies were removed because of the above reasons. It is anticipated that for the PMF event, removal of the gullies will not create observable difference to the final model results (although some conveyance and storage losses will result).
11	1	Comments Site 1	The outlets for sub-basins Q and R drain into the floodway. For the Level Pool Routing, the hydrographs for sub-basins Q and R should routed through the floodway to the reservoir before combining with the remaining hydrographs.	A	This will be revised and incorporated in the FRS1 Dam Rehabilitation Modeling effort currently underway as part of another contract. It is expected that for a PMF event, the change will have little or no impact on the final results.
12	2	Comments Site 1	The "n-value" for the Principal Spillway pipe used in the HECRAS unsteady flow model was 0.0012. Recommend correcting to 0.012 in the final analysis.	A	This will be revised and incorporated in the FRS1 Dam Rehabilitation Modeling effort currently underway as part of another contract.
13	3	Comments Site 1	The "n-value" for the Sun Valley Parkway culverts used in the HECRAS unsteady flow model was 0.0013. Recommend correcting to 0.013 in the final analysis.	A	This will be revised and incorporated in the FRS1 Dam Rehabilitation Modeling effort currently underway as part of another contract.
14	4	Comments Site 1	HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?	B/C	There are ineffective areas created due to numerous existing gullies. We These areas were removed them-in consideration of model instability. However, it is envisioned that the ineffective flow areas will have little noticeable impact on the PMF results. Discuss ineffective flow areas at bridges, how does unsteady flow model deal with this

A-Will Comply
 B-Consultant to Evaluate
 C-Review Agency to Evaluate
 D-Will Not Comply

OVER-ALL NO.	ITEM NO.	DWG, SHT, PAGE NO.	COMMENT	RESPONSE	COMMENTS
15	1	Comments Site 2	The dam crest elevation shown in Table 3 is 1120.0 feet. The design crest elevation from the Flood Control District survey before datum adjustment is 1117.0 feet.	D	All data presented in the model are based on NAVD 88. The crest elevation is consistent with current information provided by FCD. Suggest expanding on what that info is.
16	2	Comments Site 2	The auxiliary spillway bottom width shown in Table 3 is 300 feet. The auxiliary spillway bottom width from the Flood Control District survey is 350 feet.	D	The model used 350 feet for the auxiliary spillway. The spillway width is consistent with current information provided by FCD. Suggest expanding on what that info is.
17	3	Comments Site 2	HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?	B/C	There are ineffective areas created due to numerous existing gullies. We- These areas were removed them in consideration of model instability. However, it is envisioned that the ineffective flow areas will have little noticeable impact on the PMF results. <i>Discuss ineffective flow areas at bridges, how does unsteady flow model deal with this.</i>
18	1	Comments Site 3	The dam crest elevation shown in Table 3 is 1172.0 feet. The design crest elevation from the Flood Control District survey is 1170.0 feet.	D	The model used 1170.0 feet for the crest. The crest elevation is consistent with current information provided by FCD. Suggest expanding on what that info is.
19	2	Comments Site 3	HECRAS utilizes ineffective flow areas to model crossings. The unsteady flow model did not include ineffective flow areas at the crossings. What effects would the ineffective flow areas have on the model results?	B/C	There are ineffective areas created due to numerous existing gullies. We- These areas were removed them in consideration of model instability. However, it is envisioned that the ineffective flow areas will have little noticeable impact on the PMF results. <i>Discuss ineffective flow areas at bridges, how does unsteady flow model deal with this.</i>
ADWR - Mike Johnson, Ph.D., P.E.					
20	1	Comments	Section 4.2.6.1 - Rainfall Losses: The 72-hr general PMF should assume saturated antecedent moisture conditions. However, this change would not be expected to result in the 72-hr PMF becoming critical.	A	No change made.
21	2	Comments	Section 4.2.6.3 - Lag Time: The USBR Hydrology Manual (Cudworth, 1989) suggests assigning Kn values for the PMF at the low end of reasonable values of the watershed conditions present. I have seen other studies reduce the 100-yr Kn by 20 percent. The Kn values for the current study should be reduced in some rational way for the PMF events.	B/C	We agree that the Kn value decreases as the storm becomes more severe and we documented this finding in the report as well. However, there is no guideline for a quantitative change of the Kn value in response to storm return frequencies. Therefore, the Kn values used in the model were based on field investigation and engineering judgments. This will be re-evaluated as part of the FRS1 Dam Rehabilitation Modeling effort currently underway as part of a separate contract.
22	3	Comments	Section 5.1 - Method Description: Table 5-1 gives pertinent elevation data in the NGVD29 datum. Because the modeling uses a different datum, these elevations should also be given in NAVD88.	A	The NGVD29 data in Table 5.1 were extracted from the original design TDN (1974). For a complete comparison, an additional column indicating the value in the NAVD88 datum will be added. This will be accomplished in the FRS #1 Dam Rehabilitation Project currently underway as part of a separate contract.

A-Will Comply
 B-Consultant to Evaluate
 C-Review Agency to Evaluate
 D-Will Not Comply

OVER-ALL NO.	ITEM NO.	DWG, SHT, PAGE NO.	COMMENT	RESPONSE	COMMENTS
23	4	Comments	Section 5.5.3 – Dam Crest and Emergency Spillway: The three emergency spillways are not traditional broad-crested weirs and therefore selection of an appropriate weir coefficient is difficult. The weir coefficients used in the current study are probably conservatively low. Higher rating curves (or weir coefficients) could likely be justified by developing steady- state HEC-RAS models with close cross-section spacing (to approximate rapidly-varied flow conditions). Models for this purpose would be expected to extend far enough downstream of the crest to accurately predict flow depths in the outflow channel and far enough upstream to predict head losses in the approach channel.	B/C	The Emergency spillways discharge coefficients were adapted from Table 2.4 in "Phase I report: Hydrologic Analysis - Buckeye Floodwater Retarding Structures #1, #2, and #3" by Dames & Moore (1990). Discharge coefficients for the dam crests on overtopping were calculated using Hager's equation from "Lateral outflow over side weirs" (Hager, William H., 1987) as directed by FCD. The suggested approach may have some merit and will be discussed with FCD for possible inclusion in the Buckeye FRS1 Rehabilitation Study currently underway as part of a separate contract.
24	5	Comments	Section 5.5.3 – Dam Crest and Emergency Spillway: Overtopping of the roadways and FRS's can accurately be modeled using the weir equation. Trapezoidal-shaped weirs typically have discharge coefficients ranging 2.7 to 3.1. The 1978 FHWA document Hydraulics of Bridge Waterways provides a chart for estimating values.	D	The model used 2.6 as default in HEC-RAS. The roadway does not normally maintain a trapezoidal-shaped.
25	6	Comments	Table 5-9 – Summary of Level-Pool Routing: The max WSEL for the FRS #3 72-hr PMF is incorrectly shown as "1191.97."	A	It should be 1171.97. The typo will be corrected.
26	7	Comments	The report should be revised to include the content of the addendum.	A	Agreed
27	1	Discussion	Further analysis and documentation of overtopping at Miller Road would be required in order for the Department to assume it washes out for purpose of evaluating the safe flood capacity of FRS No. 2. Information that would need to be provided includes: a. As-built cross-section of Miller Road, b. Characterization of erosion rate for road embankment soils, c. Depth, flow velocities, and duration of overtopping including tailwater submergence, and d. Time required for failure of the road embankment. If the Department were to assume that Miller Road washes out, then the FCDMC and the Department would need to monitor for and be aware of any future road improvements that would make washout less likely.	B/C	Miller Road is a dirt road and is would be vulnerable to washing out in a PMF event. To further investigate this issue, the sub-tasks identified by ADWR must be completed. Those tasks are outside of the current study scope. We will discuss this issue with FCD. The purpose of our model was to identify problems and provide the basis for future mitigation actions.
28	2	Discussion	A segment of FRS No. 2 is still predicted to overtop in the event of washout of Miller Road (i.e. to a maximum depth of 0.2 ft as reported in Table 5-3). Would restoring the crest in this segment to the design elevation prevent the overtopping?	B/C	According to our model, to prevent the overtopping with Miller Rd. in place, the dam crests of FRS No. 2 and Floodway No. 3, respectively; must be raised an additional 0.71 ft and 1.86 ft., respectively. Without Miller Rd., an additional 0.2 ft and 1.40 ft must be added to the upstream of the FRS No. 2 dam crest and Floodway No. 3, respectively.



Flood Control District

of Maricopa County

INTEROFFICE MEMORANDUM

Date: March 21, 2005

To: Valerie Swick, Project Manager

From: Kathryn Gross, Project Geomorphologist

Subject: Buckeye/Sun Valley ADMS Area 3 Stage 1 Piedmont Assessment Landform Delineation Review: November 2004 submittal

The following are my comments regarding the re-submittal of the landform identification of the piedmont assessment. My review is based on an overview of the delineation and the responses from Ayres on the October 24, 2004 comments. The identification numbers listed below are the location numbers listed in the shape file that was submitted by the District as part of the October 24, 2004 response package.

1. For locations 5, 6, 7, 10, 11, 14, 15, 17, 18, 21, 22, 23, 24, and 26 District concerns have been addressed and are accepted.
2. For location 1, typically relict fans should not have a distributary pattern. Shallow channels occur on the western portion of this area that are not characteristic of a relict fan. I would like to discuss this location further with the consultant.
3. For location 2, Can the channel on the south be included in the alluvial fan designation? The channel will provide the water to the alluvial fan.
4. For location 3, although the flood hazard and geology show a low hazard and older surface this is due primarily to mapping scale. The present channels clearly represent a higher hazard and younger surface and connect the upstream and downstream alluvial fan landform designations. That was the connection I wanted established.
5. For location 8, the reason why this extension was requested to identify that there is a split out of the alluvial fan as a "head ups" for individuals who may use the data.
6. For location 9, I am interested in classifying the channel locations on either side of the relict portion in the middle as alluvial fan. The split location is potentially a small inset alluvial fan that discharges into two entrenched channels.
7. For location 12, it is understood that the channel is located on the relict fan but it appears that the alluvial fan may have "pirated" this channel and area based on the 1953 photographs. If the active fan has used relict fan area/channels they should be considered part of the whole system. Drainage pattern is not as well established as other areas of the

piedmont. As this is occurring downstream of the more active portion of the alluvial fan that and that the drainage pattern is not as well established as other areas of the piedmont I still feel inactive fan (alluvial fan for Stage 1) is a more appropriate classification.

8. For location 13, although I am still concerned that flows crossed this area/channels from the 1950's flood and that it is located immediately downstream of an active area, the surface is somewhat older and a little more entrenched; therefore, I concur with Ayres' decision.
9. For location 15, the reason why this extension was requested to identify that there is a split out of the alluvial fan as a "head ups" for individuals who may use the data.
10. For location 16, why was only the southern channel added to the alluvial fan category? Could the northern channel limits be added as well?
11. For location 18, the reason why this extension was requested to identify that there is a split out of the alluvial fan as a "head ups" for individuals who may use the data.
12. For location 19 and 20, it is understood that the channel is located on the relict fan but the fan "pirated" this channel based on the 1953 photographs. If the active fan has used the relict fan channel, it should be considered part of the whole system.
13. For location 25, I agree with the modifications but am wondering why the southwestern-most channel was not included. It appears that the southwest channel has similar characteristics when compared to the other channel that was added.
14. No response was submitted specifically addressing Comment #3 of the October 24, 2004 memo. Comment #3 was somewhat discussed in the delineation comments where a specific comment concerned the geology. Since there were no significant changes to the relict fan delineations it is assumed that Ayres has taken the comment into consideration and has determined based on their engineering/geologic experience that Relict Fan is the category they choose to use. The Piedmont Assessment Manual presently includes the M2 geologic unit in both the Relict and Inactive Alluvial Fan categories. Although the District still feels that Inactive Fan may be more appropriate for certain M2 surfaces within the study area, we will accept Ayres' decision.

I have no more comments at this time.



Flood Control District

of Maricopa County

INTEROFFICE MEMORANDUM

Date: April 8, 2005
To: Valerie Swick, Project Manager
From: Kathryn Gross, Project Geomorphologist
Subject: Buckeye/Sun Valley ADMS Area 3 Stage 1 and 2 Piedmont Landform Identification and Stability Delineation Technical Memorandum Review: November 2004 submittal

The following are my comments regarding the November 2004 submittal of the Technical Memorandums.

Stage 1 – Piedmont Landform Identification Technical Memo

1. Objective: Page 1, 2nd sentence from end of paragraph. Please remove this sentence (“Potential issues....”). This sentence references a section that has been removed from the discussion.
2. Landform Verification Sites: Page 6, first paragraph. Within this paragraph the text states that the reasoning behind the verification is to assess the usability and accuracy of the methodologies. Some portions of this paragraph need to be rephrased.
 - The text states that the methods have not been used to conduct official landform delineation and stability assessments. This sentence needs to be revised to solely state that assessments have not taken place on areas of this size. The District has performed full piedmont analyses on other piedmont surfaces prior to this study.
 - The text states that the verification is used to determine usability of the methodology. The purpose of the verification was not specifically performed to determine the usability of the methodology. Its intent was to fully evaluate and document specific representative sites of each type of landform found on the piedmont so that detailed documentation could be provided on at least each type of landform and that the information on each landform could essentially be expected to be similar on each landform type found within the watershed. It was a means of documenting the data for the representative sites instead of documenting the data for each specific landform identified.
 - The text states that the verification sites were chosen due to “discrepancies or contradictions in the characteristics that generally define the landform...” The original intent was to choose representative sites to fully document the characteristics

associated with each landform type. This comment is for informational purposes only. No action is necessary from Ayres. The text for this portion should remain unchanged.

3. If possible please include a summary of the results of the landform identification.

Stage 2 - Landform Stability Delineation Technical Memo

1. Objective: Page 1, 2nd to last sentence. Please remove this sentence ("Problems associated with..."). This sentence references a section that has been removed from the discussion.
2. Landform Stability Assessment: Page 9, first sentence. The text states that 11 areas were identified as being unstable landforms. Please consider replacing "unstable landforms" with "active alluvial fans." The conditionally unstable areas are also shown on the exhibits and discussed in a later section. The discussion in this section refers only to active fan locations.
3. Landform Stability Assessment BSV Site 7: Page 17, end of second paragraph. Please correct the typo: "Vegetation is scattered..... bushes with a numerous saguaros...." Should be corrected to "...with numerous saguaros...."
4. Please consider adding a summary section of the results of the landform stability assessment.

I have no more comments at this time.



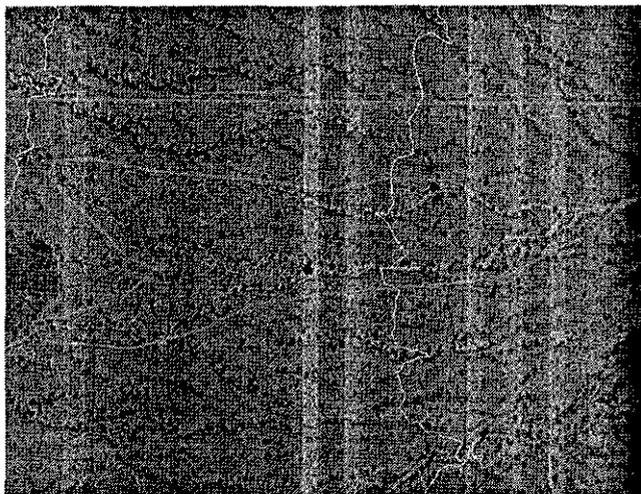
Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: April 8, 2005
To: Valerie Swick, Project Manager
From: Kathryn Gross, Project Geomorphologist
Subject: Buckeye/Sun Valley ADMS Area 3 Stage 2 Piedmont Stability Delineation Review:
November 2004 submittal

The following are my comments regarding the re-submittal of the landform identification of the piedmont assessment. My review is based on an overview of the delineation and the responses from Ayres on the October 24, 2004 comments. The identification numbers listed below are the location numbers listed in the shape file that was submitted by the District as part of the October 24, 2004 response package.

1. For locations 1, 2, 4-12, 14-22, 24, 26-51, and 53, District concerns have been addressed and are accepted.
2. For location 3, I am still concerned that this location may be an active fan, but per our discussion with the Ayres on March 24, 2004, I agree that it is beyond scope of the current contract to determine whether the instability is due to natural active fan processes or due to deposition issues with the downstream stock tank.
3. For location 13, can accept the non-fan designation but why is the split location itself not mapped into the same hazard classification?
4. For location 23, it appears that this area contains two small active alluvial fans that are located and depositing on low portions of the relict fan surface in the area. There is evidence of sediment ramping up onto vegetation, wide, shallow flow channels. Some channels connect to incised tributary drainages. Please determine if these smaller potentially active fans can be mapped as such for the study. See image below.



5. For location 25, the characteristics of the area appear to support an active fan designation. Location 26 was re-classified as a fan and the two locations are very similar.
6. For location 52, why was only one channel extended down. Why not all the channels?
7. The original active fan 13 has been removed. District concurs.
8. The original active fan 16 has been removed. District concurs.

I have no more comments at this time. Comments regarding the technical memorandums will be forthcoming in a separate memo.



Flood Control District

of Maricopa County

INTEROFFICE MEMORANDUM

Date: April 20, 2005
To: Valerie Swick, Project Manager
From: Kathryn Gross, Hydrologist
Subject: Buckeye-Sun Valley ADMS – Task 2.6.4 Primary Wash Assessment Report Review
November 2004 Submittal

I have reviewed the report and have the following comments.

Report Layout

1. Section 3 is entitled "Methodology" but very little methodology is discussed here. Section 4 entitled "Existing Conditions Assessment of Primary Washes" provides more detailed methodology discussions and results of the analysis for each of the primary washes. Is there a better approach to the organization of this data? Perhaps Section 3 should be a "methods summary" where portions of the specific methods (field recon., aerial interp.) described in Section 4.1 and 4.2 are added. Section 3.2 could then be included with the field reconnaissance method discussion. And specific things that need to be kept in mind can be discussed as a subsection such as the caliche discussion and potentially an additional discussion on channel stability (see below comment). Section 4 could then be more of a results and discussion section.
2. Could a Summary Section be added?

Report Content

1. Section 4, first paragraph last sentence. The last sentence refers to a caliche discussion at the end of the section. I believe this caliche discussion was moved to Section 3. Please remove the sentence from this paragraph.
2. Additional exhibits. Would it be possible to include exhibits showing the locations of the knick points, headcuts, and culvert locations that are identified in tables 4.2, 4.3, and 4.4? If exhibits are not possible can we get the points digitally as a shape file?
3. Expansion of the stability discussion. Is it possible to expand the discussion on stability beyond what is presented on Page 3 in the fourth paragraph of section 4.1 and Table 4.1? It is understood that the paragraphs below the one identified above do go into detail as to what

criteria were used to determine hazard classifications along certain primary washes but could some of those discussions be pulled out to a general summary level as well? Other information desired would be discussions on identification of stable and unstable flow splits at the split location: why some locations are mapped as conditionally unstable and others are not. Could discussions on the concept of inset alluvial fan versus wide but confined distributary channel patterns be presented as well?

4. Appendices contain all necessary data and are presented in a clear format.
5. Please provide the digital primary wash locations with the final submittal.

Other Comments

1. Section 4 title. Please correct the spelling of "Existing" in the Section Title.
2. Section 4.1, page 3 third paragraph second to last sentence. The last portion of this sentence needs rewording.
3. Section 4.2.1, page 7, middle of first paragraph. Please capitalize "district."
4. If it is possible, could the conditionally unstable polygons that are presently located with the Piedmont Unstable Landform shape file be relocated into a separate shape file? This would allow us to place the piedmont information into our database more easily.

I have no more comments at this time. Once the above comments are either incorporated into the report or addressed in another manner by the consultant, the District will consider the report as the final.



Flood Control District of Maricopa County

INTEROFFICE MEMORANDUM

Date: April 29, 2005
To: Valerie Swick, Project Manager
From: Kathryn Gross, Hydrologist
Subject: Buckeye-Sun Valley ADMS – Task 2.6.5 Delineation of Erosion Hazard Zones Areas 2 and 3 Report Review December 2004 Submittal

I have reviewed the report and the delineations and have the following comments.

Report

1. Page 4, section 2.3. Please consider revising the usage of erosion hazard setback where appropriate. Whenever the final delineation is referred to, it should be referred to as the erosion hazard zone. The erosion hazard zone was delineated based on information provided from calculating the erosion setback, the 50-foot floodplain limit, and geomorphic information.
2. Page 6, Area 2 Sheet 5, Map 9 discussion. The latest revision of the floodplain delineation expanded into the area discussed. The text needs to be revised or possibly removed.
3. Please include additional statements in the conclusion section documenting what is on the cd.
4. Could an index sheet be provided for the Area 2 and Area 3 exhibit sheets?
5. Exhibit sheets. Could the legend be updated to state "Erosion Hazard Zone" instead of "Erosion Hazard Setbacks"?
6. Exhibit Area 3 Sheet 4 of 6 Map 7. Please correct the street typo "Tacome Salome Highway" to "Tonopah Salome Highway".
7. Otherwise, report content appears reasonable.

Delineations

1. Bank line delineations. Area 2 and Area 3 bank line delineations appear reasonable. Why were no bank lines delineated on the southern-most tributary to White Tank Wash?
2. Floodplain limits. Floodplain limits provided for Area 3 appear reasonable. It appears that the Area 2 floodplain limits provided to Ayres have been updated significantly since the erosion hazard delineation submittal. Please coordinate with PBS&J to get the latest revision. This will significantly impact the +50 ft limits and ultimate erosion hazard zone delineation.
3. Floodplain +50 ft delineation. Area 2's delineation will need to be updated based on Comment 9. Area 3's floodplain +50 ft delineation appears reasonable.
4. Erosion Hazard Zone. For Area 2, some updates may be necessary due to the above comments. For Area 3, please update the following: (1) continue the delineation down to the Buckeye FRS based on geomorphic limits and (2) please add your recommended erosion limit to the final erosion hazard delineation where BSV Fan #14 is located. Otherwise, Area 3's erosion hazard zone appears reasonable.
5. Erosion Hazard Zone. Regarding the final erosion hazard zone, both the Area 2 and Area 3 delineations should be included in one shape file. The zone should also be submitted as a polygon shape file for incorporation into our GIS database.

I have no more comments at this time.

**BUCKEYE SUN VALLEY ADMS
FCD2002C027
Kick-Off Meeting June 19th, 2003**

ATTENDEES:

Burke Lokey	PBS&J	Carroll Reynolds	Buckeye
Matt Baird	PBS&J	Bill Spitz	Ayres
Valerie Swick	FCDMC	Scott Peters	EPG
Kathryn Gross	FCDMC	Sam Kao	Entellus
Gregory Jones	FCDMC	Hernan Aristazabal	Entellus
Julie Cox	FCDMC	Steve Jackson	Eng Alliance
Kevin Lavallee	FCDMC	Jit Pegany	Eng Alliance
Melissa Lempke	FCDMC	Laurie Miller	LTM Eng
Joe Blanton	Buckeye		

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Kick-Off Meeting, held at the FCDMC on June 19th. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of the meeting.

SUMMARY OF MEETING NOTES

Item 1. Welcome and Introductions The meeting began with short self introductions. Valerie Swick led off by discussing her understanding of the project and her expectations. Burke Lokey added that the objectives of PBS&J were to complete this project assignment exceeding the District's and Town of Buckeye's expectations, while also leveraging and demonstrating our technology edge.

Mike Ellegood made some opening comments concerning his expectations. He noted that he expected PBS&J to take care of administrative issues promptly on a monthly basis, pay subs in a timely manner, provide early notification if budget problems arise, and stay on schedule. He also noted that the District was committed to providing PBS&J with appropriate training in FCD procedures including GIS and WMS training.

Item 2. Administration Other administrative issues which were discussed included invoicing format and schedule, anticipated budget, and retention. Subconsultant invoices must be submitted and in to PBS&J by the 27th of the month. PBS&J will submit our invoice to the District by the 15th. The District will pay within 30 days and PBS&J will cut subconsultant checks within a week of receiving payment from the District. Retention will be withheld unless special arrangements are made. The District has allocated \$60,000 for FY2002/2003 and \$800,000 for FY2003/2004. The contract balance will be allocated in FY2004/2005. It is possible that more or less money may actually be available but the District watches this trend closely and will keep us apprised. Invoice formats should be based on or include all the information given in a sample format to be sent out the week of June 23.

The Team Access website was discussed. The site is up and several team members are already set up for access. The rest of the team will be added shortly. It was decided that we would have a live demonstration on using the site at the first Progress meeting.

Regular progress meeting will be held on the first Wednesday of the month at 10 am and will normally last no more than 1.5 hours.

Item 3. Project Schedule The project schedule is currently based on a 24-month duration because of the District's financial considerations. The updated schedule will be posted on the Team Access website so that team members can use and peruse. Based on input from the District. The following priorities were established.

- Area II hydrology and floodplain delineation
- Area III hydrology for the FRS structure hydraulics analyses
- Area I Agricultural Hydrology Study

One potential hangup is that the mapping is not ready – the District is pressing the contractor hard but expects that the mapping may be delayed another month.

Item 4. Project Issues General issues include the following: FCD is looking for erosion hazard setbacks and guidelines for both existing and new floodplain delineations. The Buckeye corporate limits shown on the map exhibit were not current – the updated boundary should be available from the Town website. Flooding pictures may be available from the Buckeye Valley Historical Museum, the Buckeye Valley News and the Desert Sun (area newspapers) and Jackie Meck's wife. Issues specific to each area were then discussed.

1. Most flooding in Area 1 is caused by the canal and railroad embankments and associated ponding. These areas are starting to affect existing housing, especially in the downtown area. The agricultural lands study will be important in this respect. Also, the canal operators may be able to help identify locations where the canals overtop.
2. Floodplain delineations can be expected to affect some existing houses in Area 2 – there was a lot of discussion about whether an initial public meeting was needed just for the delineation effort or whether just a notification by mail would be adequate. This issue was deferred to include with revised of the Public Involvement Plan.
3. The active fans in Area 3 will be a challenge. One potential method for dealing with these is to designate a one or more wide natural drainageways with each sized to handle more than a proportional split of the flow. Alternatively, it can be assumed that all of the flow goes in more than one direction.
4. No new studies are anticipated for Area 4. Rather, current master drainage plans will be reviewed for large developments currently in the planning process with particular attention paid to whether the drainage planning effort complies with current FCD policy and direction.

Item 4. Field Trip The field trip agenda was discussed and agreed upon.

**BUCKEYE SUN VALLEY ADMS
FCD2002C027
PROGRESS MEETING JULY 2, 2003**

ATTENDEES:

Burke Lokey	PBS&J	Valerie Swick	FCD
Matt Baird	PBS&J	Robert Winsor	PBS&J
Steve Jackson	E.A.	Laurie Miller	LTM
Julie Cox	FCD	Kathryn Gross	FCD
Kevin Lavallee	FCD		

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting, held at the FCDMC on July 2. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of the meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

Team Access Website: The meeting began with a quick introduction to the team access web site found at <http://buckeye.pbsjteamaccess.com/logon.asp>. The Username is your name and the password is Buckeye. We went through each of the options that are available including announcements, email, calendar, and documents. A few of the points that were made:

1. Announcements can only be put on by the webmaster.
2. Emails using the site email will automatically save for record keeping purposes.
3. Emails sent from another provider with an individuals team access site email included will be routed and saved by the team access site.
4. You are not able to attach documents to emails you send from the site.
5. All team members are classified as Managers and will have access to all areas.
6. Stakeholders will be classified as users and have limited access to documents and other options.
7. Valerie Swick brought up the point that all Project files should be able to be viewed in PDF format. We agreed that all file formats will be maintained in two different file formats.
8. The link for Buckeye Project Site will be added
(www.fcd.maricopa.gov/neighborhood/ProjectDetails.asp?Wproject=49)
9. Burke will run a couple of test messages and ask for response to verify email receipt and to make sure the system is running smoothly
10. Valerie said anything with a zip extension cannot be accepted by FCD.
11. When a calendar event is added a notification will be sent out to all team members automatically.
12. Jim Smith is currently scrubbing the list of property owner names and sorting it by area. We need to do the notification mailings for the floodplain delineations.

Item 2. Project Schedule

We did a general discussion about the project schedule. Mapping was a big issue that may yet be a hurdle. The public involvement plan was put out and tentatively agreed on. Some of the main points:

1. Valerie is getting a revised schedule from the mapping guys and within two weeks she should know where we stand with them.
2. The DTMs that we have received contain errors in them.
3. Valerie is getting a progress report every day from mapping.
4. Burke asked if there was a question about the validity of the raw data.
5. The cross-sections are barely with-in tolerance.
6. We will tentatively have only two public meetings – we will add more if needed. The first should be in early fall when floodplains are discussed, the other one in mid spring before the FEMA submittal.

Item 3. Data Collection

We are still currently in this phase and some of the ongoing efforts are:

1. A large request for reports from FCD is in progress.
2. The railroad maps have been requested and should be here by Tuesday.
3. Phil Garthright, from Buckeye, has been contacted for any plans or help the city can give us. He referred us to Carol Reynolds who is out of town until the 10th of July.
4. Next step is to look at historical photos and major utilities.
5. Next week see if Tom Renkley is available and have Laurie get an idea of what he has and what we need to do to supplement TetraTech.

Closing Remarks

Next meeting August 6th 10:00 am at FCD. Joe said he would be able to make it. Greg Jones wants to plan several progress meetings in the town of Buckeye itself.

Total Time 50 minutes.

**BUCKEYE SUN VALLEY ADMS
FCD2002C027
PROGRESS MEETING AUGUST 6, 2003**

ATTENDEES:

Burke Lokey	PBS&J	Valerie Swick	FCD
Wen Chen	PBS&J	Jake Lesué	PBS&J
Steve Jackson	E.A.	Tom Renckly	FCD
Julie Cox	FCD	Kathryn Gross	FCD
Melissa Lempke	FCD	Scott Peters	EPG
John Stock	FCD	Tom Farnsworth	E.A.
Carroll Reynolds	Buckeye	Joe Blanton	Buckeye

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting, held at the FCDMC on August 6, 2003. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of the meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

1. Previous meeting minutes can be found on the team access website.
2. A request was made to attach the meeting minutes to the monthly agenda.
3. The Team Access web site should be up and working. The link is <http://buckeye.pbsjteamaccess.com/logon.asp>. Contact Burke Lokey if you have problems logging in or need additional info.

Item 2. Project Schedule

Schedule Review

1. Valerie requested the schedule be included as a MS Project file in addition to the PDF file on the Team Access web site.
2. No changes have been made to the schedule except that the subsidence study has been moved up and is currently in progress.
3. Data collection should be completed in August.
4. Valerie mentioned that requests have already been made by homeowners for flood plain maps and finish floor elevations in Area 2.
5. Carroll Reynolds has submitted a CIP application addressing some existing flooding problems.
6. The agriculture pilot study will begin shortly.
7. Request was made to include public meetings as milestone dates in the Project schedule.

In Progress Items

1. Data collection
2. FCD was hopeful or "very optimistic" the mapping will be completed by the end of the month (August).

3. Surveying has been completed for the canal profiles, benchmarks, and structures. The agriculture land survey hasn't started pending direction from the Ag Study working group.
4. The Subsidence Study is well underway by Frank Turek, who should have a draft report by the end of the month.
5. Rules of development were discussed briefly.

Pending tasks

1. Ag Land Pilot Study
2. Hydrology Area 3
 - o Will start with existing topo maps (10 foot contour intervals)
 - o Have existing White Tanks Wash Hydrology model
 - o PBS&J will update the model and make changes consistent with the dynamic hydraulic analysis of the FRS's.
 - o Geomorphic analysis
 - o RBF is currently working on the Bell 3000 development but is unlikely to get very far before the geomorphic analysis is completed. Their progress needs to be monitored to make sure they aren't going to be surprised by the study results.
 - o Lennar may have bought the "Tartesso North" site but does not appear to be working on it at this time.
 - o Ayres cannot start until sometime in the fall – possibly November since they arranged their work schedule based on FCD's direction with respect to schedule requirements.

Item 3. Progress to Date

Data Collection

1. Burke and Jake met with Carroll Reynolds and Phil Garthright, the Buckeye Senior Planner in the Community Development Dept. to discuss known flooding problems and to review new developments in the area.
2. Exhibit A contains the list of existing and proposed developments.
3. Exhibit B contains the structures from As-Built plans from I-10, MC 85, Sun Valley Parkway, and the Railroad.
4. PBS&J has requested several documents from FCD as shown in Exhibit C.
5. PBS&J will begin reviewing the existing studies as part of the data collection.

Closing Remarks

Next meeting September 3rd. Valerie mentioned that the 10:00 time may not work for her and asked if it will conflict with any others schedules if the meeting for September was held at 1:00. Valerie said she would provide more details at a later time as to the exact time for the next meeting.

Total Time 50 minutes.

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING

September 3, 2003

ATTENDEES

Julie Cox – FCD
Tom Renckley - FCD
Valerie Swick - FCD
Robin Bain - PBSJ
Matt Baird – PBSJ
Wen Chen - PBSJ
Jacob Lesue – PBSJ
Burke Lokey - PBSJ

Joe Blanton – Buckeye
Carrol Reynolds – Buckeye
Woody Scoutten – Buckeye
Scott Peters – EPG
Laurie Miller – LTM
Steve Jackson – EA
Bill Spitz – Ayres
Anthony Alvarado - Ayres

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #3, held at the FCDMC on September 3, 2003. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

1. Previous meeting minutes can be found on the team access website.
2. The Team access website link is <http://buckeye.pbsjteamaccess.com/logon.asp>. Contact Burke Lokey if you have problems logging in or need additional information.

Item 2. Project Schedule

Schedule Review (see Team Access website)

1. Geomorphology has been moved up and the field work will begin in late October. The expected completion date is the end of November to early December.
2. Mapping is to be completed September 30. After the mapping has been completed Area 2 hydrology work can begin.
3. Arizona St. University is looking for a flood plain analysis project. Valerie is considering using the Buckeye/Sun Valley area.

In-Progress Items

1. Mapping - FCD was hopeful the mapping will be completed by the end of the month (September).
2. Data Collection - A Data Collection Report (draft) will be submitted to FCD for review by the end of the month (September).
3. Area 3 Hydrology & Hydraulics - Expected completion in 1½ months. A work plan for Area 3 unsteady hydraulic analysis was discussed after the meeting. PBS&J, potentially together with FCD, will submit a conference paper based upon use of the Unsteady Hydraulic Model in RAS 3.1.

4. Subsidence - No apparent subsidence has been observed or predicted so far. However, Joe Blanton and Carroll Reynolds from Town of Buckeye indicated subsidence would be a big issue in Buckeye area. A preliminary subsidence report will be submitted to FCD and the Town within 2-3 weeks.
5. Rules of Development were discussed briefly. A list of properties, ownership in the study area is available.

Pending Tasks

1. Agricultural Hydrology Pilot - Entellus will select a location (less than 5 sq-mi) for the agricultural land hydrology pilot. They are waiting for mapping too. FCD was aware of over-stated runoff from crop land because of 100% saturation assumption applied to crop land.
2. Geomorphology - Ayres will conduct an *in-situ* geomorphologic investigation. Erosion setback for FRS #2 and #3 will be evaluated. Valerie would like to send FCD staff with Ayres for the field investigation.

Item 3. Progress to Date

1. Data Collection - Base, land use, and land ownership maps are being developed by PBS&J Henderson office. Known flooding areas were identified and marked on Base Map. As part of the data collection, PBS&J is reviewing the existing studies, a draft data collection report will be made available by the end of this month.
2. Area 3 Hydrology & Hydraulics - Green and Ampt parameters have been updated for Area 3 based on FCD provided land use and soil map. An unsteady hydraulic work plan was proposed and discussed after the meeting. Major problems are what data set we should use, NOAA-2 or NOAA-14? How to define storm distributions above 100-year 24-hour?
3. Subsidence - A preliminary subsidence for Buckeye/Sun Valley Area is well underway by Frank Turek. It will be submitted at the end of this month.

Closing Remarks

Next meeting (October 1, 2003 10:00 AM).

Total time 55 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING

October 1, 2003

ATTENDEES

Sam Kao - Entellus
Tom Renckly - FCD
Valerie Swick - FCD
Robin Bain - PBSJ
Wen Chen - PBSJ
Jacob Lesue - PBSJ

Burke Lokey - PBSJ
Carrol Reynolds - Buckeye
Scott Peters - EPG
Steve Jackson - EA
Frank Turek - PBSJ
Kathryn Gross - FCD

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #4, held at the FCDMC on October 1, 2003. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

1. Previous meeting minutes can be found on the team access website.
2. The Team access website link is <http://buckeye.pbsjteamaccess.com/logon.asp>. Contact Burke Lokey if you have problems logging in or need additional information.
3. Some technical issues have been found with the team access website. If anyone experiences a "blank screen of death" please contact PBS&J immediately to correct the problem.

Item 2. Project Schedule

Schedule Review (see Team Access website)

1. Area 3 Hydrology is well under way. The delay in the completion of mapping has pushed back some items. For example, the agriculture study and hydrology for area 1 & 2 Hydrology. Geomorphic study is in progress and Ayres is currently completing office work.

In-Progress Items

1. Mapping - FCD says significant problems have arisen with the DTM. Spikes and pits and showing up in the data are the district working to get these corrected.
2. Data Collection - A draft report will be delivered within the week to the FCD.
3. Area 3 Hydrology & Hydraulics - First submittal to FCD for review.
4. Subsidence - Draft report has been submitted to FCD for review.
5. Public Involvement - Brochures are planned to go out next month. The first public meeting is scheduled for the spring of 2004.

Pending Tasks

1. Agricultural Hydrology Pilot - Ready to go as soon as the mapping is completed.

2. Geomorphology – Fieldwork will begin at the end of the month.

Item 3. Progress to Date

1. Data Collection – Maps were displayed for the data collection report.
2. Area 3 Hydrology & Hydraulics
 - a. Identified discrepancies in Alpha Model
 - b. Preliminary comparison of Alpha and PBS&J results
 - c. Precipitation data and distribution patterns
3. Subsidence – Frank Turek discussed the draft report given to the FCD. The summary by Frank mentioned no existing subsidence problems. There is not enough information to predict future subsidence problems north of the IRD.

Closing Remarks

It was suggested by Tom Renckly for PBS&J to meet with FCD hydrologic groups and Entellus engineers to coordinate and discuss hydrology issues raised in Buckeye/Sun Valley and Whitman ADMS. The meeting was scheduled at 1:30 pm on October 15 tentatively. Valerie will confirm the agenda for the meeting.

Next meeting

November 5, 2003 10:00 AM

Total time 90 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

**BUCKYE / WHITMAN ADMS JOINT MEETING
HYDROLOGY ISSUES**

October 22, 2003

ATTENDEES

Bing Zhao - FCD

Valerie Swick - FCD

Burke Lokey - PBS&J

Tom Renckly - FCD

Wen Chen - PBS&J

Jacob Lesue - PBS&J

Laurie Miller - LTM

Amir Motamedi - FCD

Kelli Sertich - FCD

Mike Duncan - FCD

Julie Cox - FCD

Henan Aristazabal - Entellus

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley and Whitman ADMS Joint Meeting, held at the FCDMC on October 22, 2003. This purpose of this meeting is to discuss several common hydrologic issues in both Buckeye/Sun Valley (PBS&J) and Whitman (Entellus) ADMS. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. NOAA-2 and NOAA-14

1. NOAA-2 shall be used for both Buckeye/Sun Valley and Whitman ADMS due to the difficulties of technical and policy support from FCDMC for NOAA-14. Specifically, aerial reduction data is not available for NOAA 14
2. Severe flood events such as 100-year 10-day, 200-year/500-year 24-hour precipitation data are not available in NOAA-2 dataset, and shall be interpolated from other methods such as TR-20. Storm distribution pattern will follow SCS Type II in the *FCD Hydrology Manual* (1995).
3. PBS&J and Entellus will follow the same procedure to interpolate the precipitation data for those severe flood events

Item 2. Storm Distribution Pattern for 6-Hour Event

1. Precipitation adjusted with sub-basin and storm distribution pattern based upon the entire basin done by Alpha Engineering (1996) shall not be used.
2. FCDMC method in WMS 7.0 should be used for precipitation and storm distribution patterns adjusted with sub-basin sizes.

Item 3. Storm Duration for 200-/500-year storms

Storm duration for 200-/500-year storms will use 24-hour since the dam safety is more related to flood volumes than peak flow. PBS&J will look at differences in 6- vs 24-hour storms to verify worst case.

Item 4. Discrepancies in Alpha's Study

Discrepancies in Alpha's Study (1996) should be corrected. A list of discrepancies and comments will be provided in PBS&J study.

Item 5. Common Boundaries between Buckeye and Whitman Study Area

Common boundaries exist between Buckeye and Whitman Study Area. Entellus will decide the Whitman boundaries and PBS&J will use the results from Entellus'.

Item 6. FLO-2D vs. HEC-RAS Unsteady Model

It is FCDMC's intent to compare application of FLO-2D and HEC-RAS unsteady model for dam safety studies. The comparison shall cover issues such as cost, accuracy, stability, and sensitivity. Agency review and approvals of either model from organizations such as ADWR and ADOT would also be considered. FCD will review implementation of each model at completion of the project and will determine at that time whether additional work is needed, and whether any such work would be done in-house or not.

Total time 90 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING

November 5, 2003

ATTENDEES

Julie Cox - FCD

Valerie Swick – FCD

Kathryn Gross- FCD

Greg Jones – FC D

Melissa Lempke – FCD

Robin Bain - PBSJ

Wen Chen – PBSJ

Jacob Lesue – PBSJ

Burke Lokey - PBSJ

Joe Blanton – Buckeye

Scott Peters – EPG

Laurie Miller – LTM

Sam Kao - Entellus

Steve Jackson – EA

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #5, held at the FCDMC on November 5, 2003. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

1. Previous meeting minutes can be found on the team access website.
2. The Team access website link is <http://buckeye.pbsjteamaccess.com/logon.asp>. Contact Burke Lokey if you have problems logging in or need additional information.
3. An action item list will be created and used for the remainder of the project.
4. Schedule Review
 - Mapping Delays – Valerie mentioned that the mapping has essentially taken a step backwards. However, November 17th is the target date for the latest submittal to the District.
 - Area 3 Hydrology - PBS&J has made the revisions outlined by Julie Cox. The next step is to make field visits to check culverts and basin thalwegs.
 - Stakeholder Involvement – Several items were discussed. The first flyer draft is ready for review. Comments were proposed about if there be a separate meeting with the developers. A suggestion was made to give special treatment to the developers because of their role in the community. The Town of Buckeye has a list of developers on their website. Another comment was to have a one-on-one meeting with the developers. The push is to get the process and timeline started and create a base for the future.

Item 2. Progress to Date

1. Draft Data Collection Report – Revisions are currently being made and completion is expected this month.
2. Area 2 Floodplain Delineation – A preliminary Area 2 Floodplain delineation is turned into the District for review.

3. Area 3 Hydrology – hydrological parameters and basin delineation are completed, and the model is ready for run prior to field check.
4. Public Involvement – Melissa has finished a draft brochure and the questionnaire is nearing completion.

Item 3. Project Issues

1. In-Progress Items

- Data Collection – The relatively small number of reported problem-flooding areas are due to sparsely populated areas and the success of the FRS. It was mentioned that the Buckeye museum is now open for the winter. Additional data will come available with this resource and from future town meetings and a questionnaire provided by the FCDMC.
- Area 2 Floodplain Delineation – No issues to discuss at this point.
- Area 3 Hydrology & Hydraulics – No additional information than previously mentioned.
- Geomorphology – seek for historical aerial photography available in Area 3 and 4.
- Public Involvement – Previously addressed by Melissa.

2. Pending Tasks

- Agriculture Hydrology Pilot – Will begin when mapping is completed.
- Area 3 Hydrology Field Investigation
- Stakeholder Involvement

Closing Remarks

Next meeting

December 4, 2003 10:00 AM

Total time 90 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING

December 4, 2003

ATTENDEES

Julie Cox - FCD

Valerie Swick - FCD

Kathryn Gross- FCD

Greg Jones - FC D

Melissa Lempke - FCD

Robin Bain - PBSJ

Wen Chen - PBSJ

Jacob Lesue - PBSJ

Burke Lokey - PBSJ

Joe Blanton - Buckeye

Scott Peters - EPG

Laurie Miller - LTM

Sam Kao - Entellus

Steve Jackson - EA

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #6, held at the FCDMC on December 4, 2003. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

1. Previous meeting minutes can be found on the team access website.
2. The Team access website link is <http://buckeye.pbsjteamaccess.com/logon.asp>. Contact Burke Lokey if you have problems logging in or need additional information.
3. An action item list will be created and used for the remainder of the project.
4. Schedule Review
 - Mapping Delays - Still on hold. However, Mark is saying that the latest revision is looking pretty good. Hard copies will be available next week. Digital copies can be expected by the first of the year.
 - Area 3 Hydrology - Work is coming to a close. Future conditions are under way and a CD has been delivered to Julie Cox for comments and review. The 100-year 10-day is being completed using manual calculations rather than HEC-1.
 - Geomorphology - Bill has completed office work and will be in the field next week. Burke will set up a conference call with Bill & Valerie to coordinate ATV visit to field.
 - Stakeholder Involvement - PBS&J met with Steve and is in process of reviewing plan. Also, a discussion took place of the role of developers in future public meetings.
5. Coordination w/ PEC (Buckeye CAR) - PEC has been assigned a car to asses downtown flooding issues.

Item 2. Progress to Date

1. Area 2 Floodplain Delineation – Kathryn had a few comments and work will push forward as soon as mapping is completed.
2. Area 3 Hydrology & Hydraulics – HEC-1 results have been delivered to Julie Cox. A question was raised on the hydrology report for area3. Does it need to be stand alone or combined with all areas? Valerie mentioned she would make a decision later.
3. Public Involvement – Brochure being translated

Item 3. Project Issues

1. In-Progress Items
 - Area 2 Floodplain Delineation –
 - Area 3 Hydrology & Hydraulics –
 - Geomorphology –
 - Public Involvement –
2. Pending Tasks
 - Agriculture Hydrology Pilot –
 - Area 3 Hydrology Field Investigation
 - Stakeholder Involvement

Closing Remarks**Next meeting**

February 4, 2004 10:00 AM

Total time 75 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING

February 4, 2004

ATTENDEES

Julie Cox - FCD

Valerie Swick - FCD

Kathryn Gross - FCD

Melissa Lempke - FCD

Robin Bain - PBSJ

Wen Chen - PBSJ

Jacob Lesue - PBSJ

Burke Lokey - PBSJ

Scott Peters - EPG

Laurie Miller - LTM

Hernan Aristizabal - Entellus

Steve Jackson - EA

William Spitz - Ayres

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #7 held at the FCDMC on February 4, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the team access website.

Item 2. Progress to Date

- Area 1: Agriculture Hydro Study - Hernan with Entellus gave a pre-meeting briefing on the status. The study is under way now that the new mapping has been completed.
- Area 2: Hydrology - The model has been set up and is under way. Waiting for a review by the FCD.
- Area 3: Hydrology and Hydraulics - A brief discussion took place about the setup procedure for the HEC-RAS model. After the meeting Wen Chen presented a power point presentation of the initial results for each FRS.
- Geomorphology - Bill Spitz from Ayres gave a status report over the phone from his office in Fort Collins, CO. The mapping is completed and they are starting on the tech memos for review. They expect a draft by the end of the month.
- Public Involvement - Newsletter has been completed and approximately four thousand copies will be mailed out by the end of the week. The goal for a public meeting was discussed and decided to wait until the completion of area 2 flood plain delineation.

Item 3. Project Issues

- Geomorphology – suggestions of using ATV for field survey to FCD
- Pending Tasks
 - Agriculture Hydrology Pilot
 - Area 2 Hydrology
 - Stakeholder Involvement
 - FRS RAS Model
 - Area 3 Final Hydrology and Hydraulics Report

Closing Remarks

Next meeting

March 3, 2004 10:00 AM

Total time 75 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

BUCKEYE / SUN VALLEY ADMS SPECIAL MEETING

HYDROLOGY ISSUES – BUCKEYE AREA 3 FUTURE CONDITIONS

February 19, 2004

ATTENDEES

Burke Lokey - PBS&J

Amir Motamedi – FCD

Wen Chen - PBS&J

Julie Cox – FCD

Jacob Lesue – PBS&J

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Special Meeting, held at the FCDMC on February 19, 2004. The purpose of this meeting is to discuss several review comments and future assumptions applied to Buckeye Area 3 hydrologic analyses. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Retention Volumes

PBS&J explained the methodologies addressed in “Area 3 Future Condition Hydrologic Analyses” submitted in December, 2003. The Town of Buckeye does not allow any increase of peak discharge, runoff volume, and velocity of runoff for post-development. It is encouraged to retain 100-year 2-hour onsite. PBS&J proposed the retention volumes based upon the difference between pre- and post-development, not based on 100-year 2-hour runoff volume. The final onsite retention volume is determined through iterative process until the peak discharge from post-development is not larger than that from pre-development (existing condition).

Item 2. Review comment – isopluvial maps

PBS&J used FCDMC digitized isopluvial maps in WMS in Area 3 Hydrologic Analyses. The digital isopluvial maps seemed to cause some discrepancy. PBS&J will double check the point rainfall values using the isopluvial map in Appendix in the Hydrology Manual (1995). Copy of the isopluvial maps with the project site will be attached as appendix in the final submittal.

Item 3. Review comment – velocities in routing channels

PBS&J understood that FCD used the average basin slope to calculate the velocity in routing channel, thus the velocities for routings C1-C2 and F1-F2 are 13 fps and 14 fps. PBS&J will double check the results and consider modification to reduce the routing velocities.

Item 4. Ratio of 10-year over 100-year peak discharges

PBS&J will provide judgments for the parameters used in the model, especially those runoff parameters seemingly related to storm return frequency.

Total time: 65 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#8

March 3, 2004

ATTENDEES

Valerie Swick – FCD

Kathryn Gross- FCD

Wen Chen – PBSJ

Jacob Lesue – PBSJ

Burke Lokey - PBSJ

Scott Peters – EPG

Laurie Miller – LTM

Hernan Aristizabal - Entellus

Steve Jackson – EA

Joe Blanton – Town of Buckeye

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #7 held at the FCDMC on March 3, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the team access website.

Item 2. Progress to Date

- Area 1: Agriculture Hydro Study –Entellus is reviewing existing infrastructure within the proposed study area. Melissa is working on a list of property owners in the study area. Once Entellus gets the property owners list, they will begin contacting the owners to determine how receptive they would be to the study..
- Area 2: Hydrology – model and results were submitted to Julie via Valerie for review.
- Area 3: Hydrology and Hydraulics – Hydrology report was submitted to LTM for internal review and comment prior to final submittal. H&H for Future condition in Area 3 are done. The FRS Unsteady Hydraulic Model was submitted to Joe Rumann for review.
- Geomorphology –Draft technical memos for the landform stability analyses are being prepared. After they are reviewed internally and Ayres can revise they will be submitted to the District, approximately the end of March.
- Public Involvement – The first public meeting date is tentatively set on either May 12 or May 24, 2004. The Town of Buckeye will assist in meeting preparation. Sun Valley stakeholder involvement has begun. Initial efforts will involve major developers and agencies.

Item 3. Project Issues

- **Pending Tasks**
 - Agriculture Hydrology Pilot – PBS&J shall provide Entellus contour map for the study area
 - Area 2 Floodplain – We need to identify an appropriate naming system for the floodplains in Area 2. FCD (Kathryn) will assist with the final determination.
 - Stakeholder Involvement – It was agreed that we would hold the first stakeholder meeting approximately 2 weeks after the public information meeting.
 - FRS RAS Model – A brown-bag presentation is to be given to the District in April
 - Area 3 Final Hydrology and Hydraulics Report – Report format and arrangement of different report volumes are to be determined. The reports are expected to submit to the District by the end of March.

Closing Remarks

Next meeting

April 7, 2004 10:00 AM

Total time 55 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#9

April 7, 2004

ATTENDEES

Valerie Swick – FCD
Kathryn Gross- FCD
Julie Cox –FCD
Greg Jones –FCD
Joe Rumann –FCD
Melissa Lemke –FCD
Brett Howey –FCD
Robin Bain -FCD
Wen Chen – PBSJ

Jacob Lesue – PBSJ
Burke Lokey – PBSJ
Scott Peters – EPG
Laurie Miller – LTM
Hernan Aristizabal - Entellus
Steve Jackson – EA
Joe Blanton – Town of Buckeye
Carroll Reynolds – Town of Buckeye

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #9 held at the FCDMC on April 7, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.
- The Sun Valley stakeholder/developer meeting has been scheduled for Wed, April 14th at 10:30AM.
- Revisions have been made to the TeamAccess web site directory structure to facilitate a more user friendly organization with the project data.
- The next progress meeting in May has been rescheduled to Wed, May 12th at 10:30AM.
- The project schedule file is located on the TeamAccess web site and a PDF version will be available soon.
- Valerie requested that all members please update your TeamAccess contact information so all members can have access to that information.

Item 2. Progress to Date

- Area 1: Agriculture Pilot Study – The local farmers in the proposed pilot study area have been contacted and one is expressing concern over the study about future flood plain boundaries devaluing property. Hernan and Laurie are working with Stan Ashby of RID and the farmer to get his cooperation. Joe Blanton mentioned that he knew this person and will talk to him as well.
- Area 1: Hydrology – Will begin soon in coordination with Entellus work on the agriculture area pilot study.
- Area 2: Floodplain Delineation - PBS&J waiting on review comments from FCD. Julie Cox provided review comments for the Area 2 Hydrology to Valerie

Tuesday, 3/30. These comments were forwarded to PBS&J and will be incorporated into the hydrology models. As soon as final Q's are determined Kathryn can finish her review of the floodplain delineations.

- Area 3:Hydrology and Hydraulics – FRS hydraulics has been submitted for review. The draft Hydrology TDN will be delivered to FCD Tuesday 4/13. Wen Chen will meet with Joe Rumann to go over his review of the hydraulics model.
- Geomorphology – The technical memorandums on landforms and stability analyses were turned in last week.
- Public/Stakeholder Involvement – A NTP has been given for the rules of development.

Item 3. Project Issues

- Area 1 H&H – Hernan from Entellus gave a report on the Ag Pilot Study. He mentioned that Entellus has taken an inventory of the crops in the area and are waiting on confirmation from the local farmers to proceed with the surveying. Tom Lavalett with EA will do the surveying. The projected schedule looks to be approximately 1-2 months for completion.
- Pending Tasks
 - Area 2 Floodplain Delineations – Kathryn from the FCD is currently reviewing.
 - Area 3 H&H – After discussing the TDN being prepared it was decided to prepare three different volumes for area 1, area 2, and area 3. The future conditions have been completed and will be included in the forthcoming TDN. The draft hydraulics report will be ready to submit to the FCD around mid-April.

Closing Remarks

Next meeting

May 12, 2004 10:30 AM

Total time 75 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#10

May 12, 2004

ATTENDEES

Valerie Swick – FCD

Brett Howey –FCD

Joe Rumann –FCD

Kathryn Gross- FCD

Julie Cox –FCD

Melissa Lemke –FCD

Carroll Reynolds – Town of Buckeye

Burke Lokey – PBS&J

Wen Chen – PBS&J

Jacob Lesué – PBS&J

Harry Strasser – PBS&J

Scott Peters – EPG

Laurie Miller – LTM

Steve Jackson – EA

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #10 held at the FCDMC on May 12, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.
- The 2nd Sun Valley stakeholder/developer meeting has been scheduled for Wed, April 12th at 1:00PM.

Item 2. Progress to Date

- Area 1: Agriculture Pilot Study – still working on access permission from the landowners for surveying. Concerns were expressed if the agriculture pilot study could supplement the Area 1 hydrology study on time. A contingency plan will be proposed next week if no progress is made on pilot study.
- Area 1: Hydrology – is under way to update the existing McLaughlin study. An engineer is added on the team to work on this area.
- Area 1: Hydraulics – a work plan will be provided by the end of May. Tentatively an unsteady HEC-RAS model will be established to model the RID and BID canals associated with the ponding areas.
- Area 2: Hydrology – is conditionally approved. PBS&J responded to the review comments and a major modification is addition of base flow for one of the sub-basins.
- Area 2: Floodplain Delineation – Review is under way. A more detailed description and explanation about the Manning's n -values used in the study shall

be supplied, and coordination with the developers shall notify the District, commented Kathryn from the District

- Area 3:Hydrology and Hydraulics – submitted and the reviews are under way. A courtesy copy of FRS hydraulics will be sent to ADWR after revisions are implemented with the District review. PBS&J continues to coordinate with the stakeholder consultants, and a summary report of alluvial fan flood hazard mitigation was submitted to the District and will be discussed in the 2nd Sun Valley Stakeholder Meeting.
- Geomorphology – The technical memorandums on landforms and stability analyses were submitted and the review is under way. RBF has requested the geomorphic study as guideline for more detailed study.
- Public/Stakeholder Involvement – a meeting with the District and EPG is scheduled to discuss the details for public meeting on May 26 tentatively. This meeting will be introductory only. Work maps to be exhibited will only include preliminary delineations. Floodplain and floodway in Area 2 are not required. Stakeholder meeting is to be held after this monthly meeting. A separate meeting minutes will be provided.

Item 3. Project Issues

- Agricultural Hydrology Pilot – landowner approvals
- Unsteady RAS model of canals and ponding areas – a work plan shall be submitted first prior to do the analysis.
- FRS Emergency Spillway Inundation Mapping – there are overflows on the emergency spillways only in PMP events. Brett Howey will confirm with Tom Renckly if inundation mapping shall be conducted for 100-year storm event only; and arials and topography downstream of the emergency spillway #3 will be supplied provided that inundation mapping is required for all storm events.

Closing Remarks

Next meeting

June 2, 2004 10:00 AM

Total time 75 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#11

June 2, 2004

ATTENDEES

Valerie Swick: FCD

Brett Howey:FCD

Kathryn Gross- FCD

Julie Cox:FCD

Melissa Lemke:FCD

Carroll Reynolds: Town of Buckeye

Burke Lokey: PBS&J

Wen Chen: PBS&J

Jacob Lesué: PBS&J

Sarah Houghland: PBS&J

Scott Peters: EPG

Laurie Miller: LTM

Steve Jackson: EA

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #11 held at the FCDMC on June 2, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.

Item 2. Progress to Date

- Area 1: Agriculture Pilot Study: Access permission was obtained from the landowners for surveying. The study is now under way. Entellus will contact EA regarding survey requirements.
- Area 1: Hydrology: We are currently working to update the existing McLaughlin study, including basin boundaries and routings.
- Area 1: Hydraulics: A work plan was prepared. The unsteady flow HEC-RAS model will be used to model the RID and BID canals associated with the ponding areas.
- Area 2: Hydrology: This has been conditionally approved. We are addressing comments from Julie.
- Area 2: Floodplain Delineation: PBS&J is working on the floodplain revision based upon the review comments received from Kathryn

- Area 3:Hydrology and Hydraulics: Hydraulics review is under way. Hydrology is conditionally approved with minor revision. PBS&J continues to coordinate with the stakeholder consultants. The next Sun Valley stakeholder meeting is scheduled for June 17 at 1 pm here at the District. Valerie will invite Bob Stevens (FCD 404) to sit in.
- Geomorphology: The technical memorandums on landforms and stability analyses were submitted and the review is under way. RBF has requested the geomorphic study as guideline for more detailed study.
- Public/Stakeholder Involvement: We are making preparations for the first public meeting on June 9, 2004. Presentation outline and detailed meeting agendas were discussed.

Item 3. Project Issues

- Kathryn requested that the RAS models for each stream be prepared as separate models. A clarification was made that all would be submitted in one report (TDN). Kathryn further noted that she would develop and prepare a naming convention for our use at a later date. The District wants to take the lead in this area to provide more consistency across studies.
- Unsteady RAS model of canals and ponding areas: A work plan has been prepared and submitted for review. Discussion with the District will be scheduled on June 16, 2004.
- FRS Emergency Spillway Inundation Mapping: There are overflows on the emergency spillways only in PMP events. PBS&J will work on the inundation mapping for the Buckeye emergency spillways #2 and #3. A draft work plan including information request, model selection and development, additional preparative work will be scoped out after the meeting. Discussion with the District will be scheduled on June 16, 2004.
- A copy of the Buckeye FRS PMF Hydraulics Report will be submitted through Brett Howey to ADWR.

Closing Remarks

Next meeting

July 7, 2004 10:00 AM

Total time 75 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

BUCKEYE / SUN VALLEY ADMS SPECIAL MEETING

Emergency Spillway Inundation Mapping & Area 1 Workplan

June 16, 2004

ATTENDEES

Valerie Swick – FCD

Julie Cox – FCD

Joe Rumann – FCD

Brett Howey – FCD

Burke Lokey - PBS&J

Wen Chen - PBS&J

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Special Meeting, held at the District on June 16, 2004. The purpose of this meeting is to discuss the Buckeye FRS Emergency Spillways #2 and #3 inundation mapping, Area 1 Hydrology & Hydraulics workplan, and requirements for submittal of FRS H&H to ADWR. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Inundation Mapping

Discussions on the Buckeye FRS Emergency Spillways #2 and #3 inundation mapping are summarized as below:

a) Additional Topographic Mapping for Emergency Spillway FRS#3

The flow from the emergency spillway #3 will spread towards and overtop I-10 segments located between Dean Rd and Verrado Way. The flow will not spread further east beyond Verrado TI before it overtops I-10. However, it is possible for the flow to spread further east up to the Tuthill Dike after it crosses over I-10. Additional topographic mapping is required to delineate geometry data for the Emergency Spillway of FRS#3. The topographic limit will be bounded on the east by Tuthill Rd, on the west by Dean Rd, on the north by McDowell Rd, and on the south by the RID canal. There is an existing floodplain from an unknown wash going east along the north side of McDowell Rd. Additional efforts shall be taken to verify whether the inundation will interfere with this wash and its floodplain.

b) Model Selection

HEC-RAS steady model and DAMBRK were used for inundation mapping delineation in the Buckeye watershed. Other options include the HEC-RAS unsteady flow program and the FLO-2D program. PBS&J will use the HEC-RAS unsteady program.

c) Discharge Flow

The emergency spillway discharge capacity was used for spillway downstream delineation in the Stanley Consultants' study (1996). PBS&J unsteady model has

indicated it is unlikely the emergency spillway will discharge at its full capacity for the Buckeye FRSs. In this case, the discharge results from the FRS unsteady model (less than the emergency spillway full capacity) will be used for the inundation mapping. Brett will work with ADWR to obtain confirmation for this approach.

Joe noted there was overtopping of the dam crest in the FRS#2 at the PMF event. The dam crest overtopping can be prevented if roadway profile is altered for Miller Rd, a dirt road crossing the FRS#2. Such an alteration could change the emergency spillway #2 discharge profile at the PMF event accordingly. It would be more appropriate to delineate the inundation mapping by using a discharge profile without dam crest overtopping. As an alternative analysis PBS&J will modify the RAS model focusing on the Miller Rd structure and profile to eliminate crest overtopping.

For emergency evacuation action plan, delineation of one third, two thirds, and full discharge capacity are required. The inundation mapping task scoped in Buckeye/Sun Valley ADMS was scoped to do delineations for discharges based on the unsteady modeling. Therefore, PBS&J will do the delineation with only one flow profile.

d) Model Set-up

Several assumptions will be used in inundation mapping delineation. The District approved that local contributing areas below each emergency spillway would not produce discharges that are either concurrent in time or greater in magnitude than the spillway flows. Small culverts or underpasses along I-10 and other roadways will be included but are expected to be insignificant compared to the PMF discharge.

e) Schedule

There is no extra budget for additional topographic map in the Buckeye/Sun Valley ADMS. Brett mentioned the Dam Safety Branch may schedule budget for the additional topographic maps at a future date. Two options related to the work schedule are open pending mutual agreement between the District and PBS&J. One option is to set up the inundation model by using existing topographic maps with some supplemental field survey, and then update the model once new topographic maps are available. Another option is to hold off until the new topographic maps are available. In either option, an approval of discharge(s) to be used in the model shall be obtained from ADWR first.

Item 2. FRS PMF Hydraulics Report to ADWR

PBS&J will revise the FRS Hydraulics Report based upon Joe's review comments, extract relevant major hydrology sections from Area 3 Hydrology Report, and will combine the PMP (6/72-hr) hydrology and PMF hydraulics into one FRS PMF Hydrology and Hydraulics Report to be submitted to ADWR through Brett. A hardcopy and a CD will be provided by the end of June or early July.

Item 3. Area 1 H&H Workplan

PBS&J explained the workplan in detail, especially issues on ponding and overtopping simulations in the unsteady model. The analysis will assume during a 100-year storm event, the canals operate at their full capacities. Valerie suggested a sensitivity analysis prior to implementation of the H&H workplan to determine if it is necessary to set up an unsteady model if the canal is assumed to flow full during significant storm events.

Julie asked that the workplan be updated to include and address future conditions in more detail. PBS&J will submit Area 1 hydrology sub-basin delineation by the end of this week.

Total time: 95 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#12

July 7, 2004

ATTENDEES

Valerie Swick: FCD

Brett Howey: FCD

Kathryn Gross: FCD

Julie Cox: FCD

Melissa Lemke: FCD

Carroll Reynolds: Town of Buckeye

Burke Lokey: PBS&J

Wen Chen: PBS&J

Jacob Lesué: PBS&J

Scott Peters: EPG

Steve Jackson: EA

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #12 held at the FCDMC on July 7, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.

Item 2. Progress to Date

- Area 1: Agriculture Pilot Study: Entellus conducted field trip and requested more land accesses for field investigation. Currently Entellus is working on agricultural drainage modeling, and will present their initial results at the next monthly progress meeting.
- Area 1: Hydrology: The Area 1 sub-basin delineation was submitted on June 16, 2004. The District finished the review and comments were sent on the meeting.
- Area 1: Hydraulics: Work plan was approved. The unsteady flow HEC-RAS models for both RID and BIC canals are underway.
- Area 2: Hydrology: Response to the review comments from the District was submitted.
- Area 2: Floodplain Delineation: response to the review comments from the District about the draft floodplain delineation was discussed with Kathryn, and the revised floodplain delineation is underway.

- Area 3: Additional FRS hydraulics analyses were submitted for review. Revision to Area 3 Hydraulics Report and PMF Hydraulics Report to ADWR are underway. Emergency spillway inundation mapping will use the emergency spillway capacity other than the results from the FRS unsteady analysis. Steady model will be established by using the 1996 Stanley Consultant study as a basis.
- Geomorphology: PBS&J has completed initial calculations on sediment yield, and worked with Ayres for coordination. Ayres is working on revisions to the tech memos for landform identification and stability.
- Public Involvement: FCD is working on compiling contact list from the first public meeting. Altogether there are 41 comment sheets received. The second public meeting will be scheduled once the Area 2 floodplain delineation is finished.
- Rule of Development: Scott Peters from EPG is working on rule of development. A stage report will be available by the end of September.
- Stakeholder Involvement: PBS&J continues to coordinate with the stakeholder consultants. The next Sun Valley stakeholder meeting is scheduled for July 8 at 1 pm at the District.

Item 3. Project Issues

- Julie Cox mentioned some outstanding items during the BSV ADMS submittal for review. PBS&J will comply with the review comments and make revisions to the District by July 23.

Closing Remarks

Next meeting

August 4, 2004 10:00 AM

Total time 50 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#13

August 4, 2004

ATTENDEES

Valerie Swick: FCD

Brett Howey: FCD

Julie Cox: FCD

Melissa Lempke: FCD

Carroll Reynolds: Town of Buckeye

Laurie Miller: LTM

Burke Lokey: PBS&J

Wen Chen: PBS&J

Jacob Lesué: PBS&J

Scott Peters: EPG

Steve Jackson: EA

Hernan Aristizabal: Entellus

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #13 held at the FCDMC on August 4, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.
- Valerie requested the TeamAccess should allow project team member to add personal information to facilitate contact and coordination among members. Burke agreed to check on this w/ the webmaster, also to determine if there was other ways to add this info.
- Julie Cox and Scott Peters made comments to the previous meeting minutes, and Wen Chen has made changes accordingly and the revised previous meeting minute now is available on the TeamAccess web site.

Item 2. Progress to Date

- Subsidence Report: the final report was submitted to the District.
- Area 1: Agriculture Pilot Study: Entellus continues working on agricultural drainage modeling, and will present their preliminary results by August 20th. At this time there should be enough data available from the pilot study to make a determination about its use in the Buckeye Hydrology study. A draft report should be available in September.
- Area 1: Hydrology: PBS&J is working on Area 1 Hydrology model using previous McLaughlin Kmetty study as a basis. A basic model will be available to the District for review by middle of August.
- Area 1: Hydraulics: PBS&J is working on unsteady flow HEC-RAS models for both RID and BIC canals. Preliminary results will be available to the District for review in August.
- Area 2: Hydrology: The hydrology analysis is complete and has been reviewed. Preparation of the Hydrology TDN is underway.

- Area 2: Floodplain Delineation: the natural floodplain delineation was conditionally approved by the District. However, the nomenclature for the reach name, the mapping title, and other miscellaneous items still need to be coordinated with Kathryn. Currently PBS&J has finished the floodway delineation using method 4. Complete floodway delineation shall be available to the District for review in August. Upon completion of the delineation, the hydraulics TDN will be prepared.
- Area 3: Final draft Hydrology and Hydraulics TDN were submitted to the District with all the review comments implemented. The PMF report to ADWR will be delivered to the District by Friday (August 6, 2004).
- Geomorphology: No update has been made for landform and stability tech memos, and Ayres is waiting formal comments from the District (Kathryn). Ayres will return to Phoenix for additional fieldwork on erosion setback in September.
- Public Involvement: The second public meeting will be held upon completion of Area 2 floodway delineation. PBS&J would like to have the meeting by early October.
- Stakeholder Involvement: PBS&J continues to coordinate with the stakeholder consultants. The next Sun Valley stakeholder meeting is scheduled on August 5, 2004 at 10 am at CMX for primary wash corridors discussion, and another stakeholder meeting is scheduled on August 12, 2004 for development of regional design criteria and guidelines.
- Rule of Development: EPG has finished zoning, land use, and land form studies related to development, and would like to schedule a meeting with the District and PBS&J the second week of August. Archeological report will be available by the end of September, and environmental studies have not been addressed yet.

Item 3. Project Issues

- Valerie commented floodway encroachment should not go into the riverbank limits even though some cross sections are apparently very wide in Area 2.
- Valerie indicated coordination efforts should be added in the course of floodway delineation in Area 2 such as elevation certificate for the residential buildings within the floodplain.

Closing Remarks

Next meeting: September 1, 2004 11:00 AM

Total time 70 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#14

September 1, 2004

ATTENDEES

Valerie Swick: FCD

Julie Cox: FCD

Kathryn Gross: FCD

Burke Lokey: PBS&J

Wen Chen: PBS&J

Jacob Lesué: PBS&J

Laurie Miller: LTM

Sue Lewin: EA

Steve Jackson: EA

Hernan Aristizabal: Entellus

Jacob Sweeting: Entellus

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #14 held at the FCDMC on September 1, 2004. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.

Item 2. Progress to Date

- Area 1: Agriculture Pilot Study: Entellus presented their preliminary results. A calibration model was established based upon the SCS curve number (CN) method. For the next step, Entellus will correlate the SCS method parameters to the Green & Ampt method parameters. A draft report will be submitted to the District by the middle of September. PBS&J would intimately coordinate with Entellus on the agricultural pilot study.
- Area 1: Hydrology: PBS&J is working on Area 1 Hydrology model using previous McLaughlin Kmetty study as a basis. The model will incorporate the latest development in Area 1 from land development drainage plans. PBS&J has requested drainage plans from the Town of Buckeye. As a continuous effort, the model will be updated by incorporating results from Entellus.
- Area 1: Hydraulics: PBS&J is working on unsteady flow HEC-RAS models for both RID and BIC canals. Results from a 2-mile RID from Apache Rd. to Miller Rd. hydraulic unsteady test model were presented to the District. The model was workable.
- Area 2: Hydrology: PBS&J is working on the Hydrology TDN.
- Area 2: Floodplain Delineation: The District reviewer Kathryn Gross advised that the thalweg STA should begin from Hassayampa thalweg, and cross sections should be added as needed. Other comments from the District reviewer Richard Harris can be expected by September 10th. The District continues working on the

Hassayampa tributary name convention. PBS&J will submit digital floodway delineation to the District to speed up the second public meeting by September.

- Area 3: PBS&J presented the preliminary HEC-RAS results for FRS#2 Emergency Spillway inundation study. FRS#3 Emergency Spillway inundation study is underway. Addendum of the Buckeye FRS PMF report to ADWR was submitted to the District (Brett). PBS&J continues working on the Hydrology and Hydraulics reports towards final submittals.
- Geomorphology: Ayres is working on the District's comments and the revised technical memos shall be ready by early September. Ayres will return to Phoenix for one additional fieldwork on erosion setback in September or October. Report on alluvial fan hazard mitigation/control including erosion sediment yield is underway.
- Public Involvement: The District is working on the second public meeting. PBS&J will submit Area 2 digital floodway delineation.
- Stakeholder Involvement: PBS&J continues to coordinate with the stakeholder consultants. The next Sun Valley stakeholder meeting is scheduled on September 22nd. EA presented a Stakeholders Involvement Plan. The District would move some of the sub-tasks into ADMP stage due to a shortened project schedule.
- Rule of Development: No update was addressed.

Item 3. Project Issues

- Due to a shortened project schedule, the District, PBS&J, and the sub-consultants shall identify the workable items and deliverables.

Closing Remarks

Next meeting: October 6, 2004 10:00 AM

Total time 70 minutes

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING#15

October 6, 2004

ATTENDEES

Valerie Swick: FCD

Julie Cox: FCD

Kathryn Gross: FCD

Burke Lokey: PBS&J

Wen Chen: PBS&J

Jacob Lesué: PBS&J

Laurie Miller: LTM

Sue Lewin: EA

Steve Jackson: EA

Hernan Aristizabal: Entellus

Jacob Sweeting: Entellus

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #15 held at the FCDMC. Please refer any corrections or clarifications to Burke Lokey at PBS&J. If no comments are received, then this memorandum will become a record of this meeting.

SUMMARY OF MEETING NOTES

Item 1. Administrative Issues

- Previous meeting minutes can be found on the TeamAccess web site.

Item 2. Progress to Date

- Area 1: Agriculture Pilot Study: Entellus has completed their modeling and is preparing a draft report to be submitted to the District by the end of the week. PBS&J will coordinate with Entellus on the agricultural pilot study. Julie Cox requested a coordination meeting w/ Bing Zao to review the study.
- Area 1: Hydrology: PBS&J will use updated McLaughlin Kmetty study as a baseline. The model will incorporate the latest development in Area 1 from land development drainage plans. PBS&J has requested drainage plans from the Town of Buckeye. The hydrographs will be used as input to the canal hydraulic models. The hydraulic model can be updated at a future date by incorporating results from Entellus' agricultural study.
- Area 1: Hydraulics: PBS&J is working on unsteady flow HEC-RAS models for both RID and BIC canals. Models for both canals are complete and functioning. We are waiting on the results of the hydrology models to use actual rather than test hydrographs.
- Area 2: Hydrology: PBS&J is working on the Hydrology TDN.
- Area 2: Floodplain Delineation: Revised floodplain delineations were submitted to FCD. We are working on the TDN submittal package. Also waiting on the public meeting to incorporate comments.
- Area 3: We are waiting on Review comments for the Addendum of the Buckeye FRS PMF report from ADWR (Brett). PBS&J may revise the Hydrology report to add CPs at fan apexes in support of the Sun Valley Stakeholder effort.

- **Geomorphology:** Ayres is working on the District's comments and the revised technical memos shall be delivered w/I 2 weeks. Ayres will return to Phoenix for one additional fieldwork on erosion setback in late October. Draft report on alluvial fan hazard mitigation/control including erosion sediment yield was submitted.
- **Public Involvement:** The District is working on the second public meeting which is expected to be early November (11/9/04). PBS&J has addressed comments on floodway delineations and will submit revised Area 2 model and workmaps.
- **Stakeholder Involvement:** PBS&J continues to coordinate with the stakeholder consultants. The general stakeholder meeting is scheduled on October 25nd. EA presented a Stakeholders Involvement Plan.
- **Rule of Development:** No update was addressed.

Item 3. Project Issues

- Due to a desire to start the ADMP in early 2005, the District, PBS&J, and the sub-consultants shall identify adjustments required to complete the work items and deliverables. This likely involves deferring the bulk of the Alternatives Analysis Task to the ADMP.

Closing Remarks

Next meeting: November 3, 2004 10:00 AM

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING #18

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #18 held at the FCDMC on January 12, 2005 at 1:00 p.m. Please refer any corrections or clarifications to Frank Turek at PBS&J. If no comments are received, then this memorandum will become a record of this meeting. A copy of the Agenda is attached.

ATTENDEES

Julie Cox – FCDMC

Kathryn Gross – FCDMC

Valerie Swick – FCDMC

Brett- Howley – FCDMC

Scott Peters – EPG

Matt Baird – PBS&J

Frank Turek – PBS&J

John Ullinskey – PBS&J

1.0 Administrative Issues

- Meeting participants were introduced.
- Mr. Ullinskey introduced PBS&J's Transition Team and reviewed the agenda. Mr. Turek will be the Project Manager for PBS&J responsible for overall project administration. Mr. Baird will lead the technical efforts. Mr. Ullinskey said Mr. Turek will lead future meetings.
- Mr. Ullinskey reported he could not locate Progress Meeting minutes for either the November or December, 2004 meetings. Ms. Swick reported there are no minutes for the December meeting because it was a brief meeting to get ready for the public meeting. The group agreed there does not appear to be any minutes posted for the November meeting. PBS&J will contact Mr. Lokey to verify if the minutes were prepared for the November 2004 Status Meeting.
- Ms. Swick asked PBS&J to check the distribution lists on the project website because the notice for the meeting today was distributed to the entire list rather than just the project team. PBS&J will check the lists.
- Mr. Ullinskey reported on the status of Subcontract with Michael Baker for Draft Area 2 H&H Report. He said the agreement is under review by the Michael Baker corporate office in Pennsylvania. He expects to get a reply from Michael Baker next week.
- Mr. Ullinskey reported he received an email from Mr. Lokey at Michael Baker stating the report was still in preparation. Mr. Lokey had committed to complete the Draft Area 2 H&H Report by January 10, 2005 during a meeting held on January 3, 2005 at the FCDMC. When PBS&J did not receive the draft report by the end of business on January 10, he contacted Mr. Lokey. Mr. Ullinskey reported Mr. Lokey said the draft report is coming along. Mr. Ullinskey said he asked Mr. Lokey if he needed any information from PBS&J to complete the draft and that Mr. Lokey said he has all he needs. Mr. Ullinskey

confirmed when PBS&J receives the draft Area 2 report from Mr. Lokey, it will be provided to Ms. Laurie Miller of LTM Engineering for QAQC review, then after Ms. Miller's comments are addressed the draft will be provided to the FCDMC for review.

- Mr. Ullinskey said he is working on the Change Order on Alternatives Analysis for Phase II ADMPs and will provide this to the FCDMC by January 18, 2005.
- Ms. Swick said the MBE report for the most recent invoice was missing. Mr. Ullinskey will provide the MBE report to the FCDMC by January 18, 2005. She suggested the current invoice be reviewed to verify the completion status of all the subconsultants. PBS&J will do this.
- PBS&J suggested an Action Item List be incorporated as a part of the Status Meeting minutes. The group agreed to the suggestion and the initial Action Item List is attached and will be an item listed on future meeting agenda.

2.0 Progress To Date

- Ms. Julie Cox of the FCDMC provided a memorandum she prepared to summarize the project deliverable items PBS&J needs to submit to the FCDMC. These items are incorporated into the Action Item List. A copy of the memorandum is attached to these minutes.

- **Area 1 Hydrology**

Ms. Swick said Entellus, like the other subconsultants, only attend the meetings when they have something to report. Entellus will be contacting PBS&J for all the survey data. PBS&J will coordinate with Entellus about providing them with the information. Entellus will then prepare the Agricultural Hydrology technical memorandum. Ms. Swick provided background information why the Agricultural Hydrology was incorporated into this project.

Ms. Cox reported she has a preliminary RID and BIC unsteady hydraulic results model of the area for review but no documentation. The information she has is adequate to test the model. The information she needs is summarized in her memorandum which is attached. The combined H&H model was submitted to the FCDMC for review.

Mr. Ullinskey reported that Mr. Baird will be leading the technical team to complete the Area 1 studies and will prepare the deliverables. Ms. Cox said the draft of the sub-basin delineations with the comments has been approved but the FCDMC needs the final version of the delineation.

Mr. Baird and Mr. Ullinskey reported the GIS analyses for Area 1 has started and PBS&J will provide a more detailed status report at the next meeting.

- **Area 2 Floodplain Delineation**

Mr. Ullinskey provided a status report on the Area 2 draft report to be completed by Michael Baker as a part of 1.0 Administrative issues.

Ms. Gross said the flood plain delineation will be changing in Area 2 but not the other areas. The FCDMC owns the land included in the ponding areas. In Area 1 she is looking for the analyses because it may show different flood elevations simulated by the dynamic flow routing. She anticipates the water may not get as high as projected with previous models. She said the Hassayampa River needs to be shown on the maps. Ms. Gross said PBS&J provided a submittal in November and she is working on the review and preparing comments. She promises to provide the comments to PBS&J.

Ms. Gross said the TDN draft report is due. The model may need to be edited to reflect her comments. She said because the modeling may need to be revised the information should not be printed out at this time.

- **Area 3 Hydrology & Hydraulics**

Mr. Howey of the FCDMC said he needs the PBS&J responses to ADWR comments. He said PBS&J prepared a draft PMF model and report on all three FRS in Buckeye. The NRCS and the FCDMC built the structures. Mr. Howey gave copies of the draft report to the NRCS and ADWR. He said ADWR raised some concerns and ADWR had recommendations for additional work to address their comments. Mr. Howey said Mr. Lokey and Mr. Chen did an addendum to the draft report. ADWR provided written comments. Ms. Swick said she sent the comments from both NRCS and ADWR to PBS&J. She said some action is needed to address ADWR comments, probably a memorandum 3 or 4 pages long. Mr. Howey said the comments need to be addressed but the method of addressing them could include incorporating the comments into the memorandum or stating PBS&J does not agree with the comments. If the changes are small, Ms. Swick said to do them but if the changes will require substantial effort, then PBS&J needs to discuss the effort with her.

Mr. Howey said the FRS 3 inundation to the RID is in the scope. PBS&J needs to get the modeling done and produce the map. Mr. Howey said the downstream mapping deliverable is defined in scope section 2.4.5.3. Mr. Howey said he will make a CD of the Area 3 materials and provide it to PBS&J. Section 2.4.5 defines the cross-sections for the three FRS and Mr. Howey will provide the information to PBS&J by January 14, 2005.

Ms. Cox said she needs a CD with the three FRS inundation information discussed in her memorandum. She said Mr. Chen has the data and PBS&J should contact him to get the data. She said she needs three paper copies and one electronic copy of the information.

She said Mr. Chen had modeled the CP at the fan apex sites. The CP was different from the topographic apex point. The hydrologic apex point migrated downstream from the topographic apex and the CP is what the developers need to design flood improvements. Ms. Swick said Mr. Chen should have the data to prepare the revised model. Mr. Ullinsky will contact Mr. Chen for the required information and to get a status report on the deliverable. Ms. Swick said Mr. Lokey was working on revising the hydrology for Area 3

due to the changes in the alluvial fan apex. Mr. Ullinskey will contact Mr. Lokey to get the revised hydrology information.

- **Geomorphology**

Mr. Ullinskey reported he spoke with Mr. Bill Spitz at Ayres Associates and the draft deliverables for Technical Memorandum defined in scope sections 2.6.2, 2.6.3, 2.6.4 and 2.6.7 are complete. They have been reviewed by Ms. Miller. PBS&J will provide the Technical Memorandum to the FCDMC. Mr. Ullinskey will contact Mr. Spitz to get a final date for completion of the third copy of the deliverables and will target January 18, 2005 as the goal. Mr. Ullinskey said the two copies of the drafts can be provided to the FCDMC by January 14, 2005.

- **Rules of Development**

Mr. Scott Peters of EPG provided the status report. EPG is working on this task and asked PBS&J to provide electronic mapping showing the flooding areas. Mr. Ullinskey said PBS&J will provide the mapping as soon as possible. Ms. Swick said the map contains flooding areas based on public input. The public reported where they had seen flooding in the past. Mr. Peters provided a preliminary draft outline of the rules of development memorandum. Ms. Swick advised that the draft outline was acceptable to the FCDMC.

Ms. Swick said she will gather input from FCDMC staff on rules of development. She said the key is agricultural land because the agricultural land can hold back water. In the past, agricultural land was modeled as providing no retention. She feels when the agricultural land is converted to urban development, the runoff will increase. She wants to know if the FCDMC should recommend to the Town of Buckeye to address this extra volume of runoff in development agreements.

- **Alternatives Analysis**

Mr. Ullinskey is working on a change order for this effort. The FCDMC is deleting the work from the ADMS and will include it in the upcoming ADMP.

- **Stakeholder Involvement**

Ms. Swick reported the first general meeting was completed and the Sun Valley Stakeholders Group meeting is done. Fuller is working with the FCDMC on this issue.

- **Public Involvement**

Ms. Swick said she needs a copy of the sign-in sheet from the December 1, 2004 public meeting. She will ask Melissa Lempke of the FCDMC if she has the sheet. Ms. Swick said Engineering Alliance is done relative to the survey information and public meetings.

3.0 Project Issues

- Mr. Ullinskey said this meeting and the information provided by the FCDMC will help PBS&J prepare a revised schedule. The Action Item List will be used to contact Michael Baker's staff to verify the outstanding deliverables and when they will provide the required information. PBS&J will use the most recent schedule dated in August 2004 and update it as required.
- Ms. Swick would like to have the floodplain delineation submitted to FEMA by February or March. She said a contract time extension may be needed to allow PBS&J to address FEMA's comments. She said in the past the review period was 60 days but recently it was more than one year. In February or March she will know if PBS&J will need a contract time extension.
- Mr. Ullinskey said all the subconsultants will be contacted to verify their percent complete and if any deliverables are due.
- Ms. Swick said Mr. Lokey had been working on a draft report summarizing alluvial fan development and flood control techniques. She said the FCDMC need the final of the draft report. The deliverable is part of a previously authorized \$44,000 allowance. Mr. Ullinskey said PBS&J would contact Mr. Lokey about this.
- Progress Report Meeting # 19 is scheduled for February 2, 2005 at 9:00 am at the FCDMC.

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING #19

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #19 held at the FCDMC on February 2, 2005 at 9:00 a.m. After the Progress Meeting, several member of the team toured Area 1 of the ADMS area. Please refer any corrections or clarifications to Frank Turek at PBS&J. If no comments are received, then this memorandum will become a record of this meeting. A copy of the Agenda is attached.

ATTENDEES

Julie Cox – FCDMC
Kathryn Gross – FCDMC
Valerie Swick – FCDMC
Scott Peters – EPG
Laurie Miller – LTM Engineering

Steve Rogers – PBS&J
Matt Baird – PBS&J
Frank Turek – PBS&J
John Ullinskey – PBS&J

1.0 Administrative Issues

- Meeting participants were introduced.
- Mr. Ullinskey introduced Mr. Steve Rogers a member of PBS&J's Transition Team.
- Ms. Swick asked PBS&J to check the team members listed as a part of the team access website calendar distribution list. She reported the meeting notice was sent to everyone on the team rather than just the core project team. PBS&J will check the distribution list.
- Mr. Turek asked the group if there were any comments on the January 12, 2005 Status Meeting minutes and none were made. The minutes were accepted into the project record.
- The group reviewed the action item list – copy attached. Mr. Turek explained the items completed since the previous meeting are shaded gray in the status column. This will continue in the future. When a completed item is discussed at a progress meeting the entire line will be shaded to show it is an archived item on future lists.
- Mr. Ullinskey reported he contacted Mr. Lokey and no minutes were prepared for the November 2004 status meeting.
- Many of the on-going items on the action item list relate to negotiations with Michael Baker. Mr. Ullinskey reported he was told the professional services subconsultant agreement is being reviewed by Michael Baker staff but they are concerned working with PBS&J could represent a conflict of interest. Mr. Ullinskey asked the FCDMC staff if they feel this is a conflict and Ms. Swick said she did not. Mr. Ullinskey requested Ms. Swick send PBS&J a letter stating there is no conflict to allow PBS&J to forward the letter to Michael Baker. Ms. Swick said she would ask the FCDMC legal staff about the conflict and would make some calls to try and get the subconsultant contract moving.

- Mr. Ullinskey reported Mr. Lokey dropped off a draft report on January 28, 2004 after 5:00 p.m. He said PBS&J can not use this report from Mr. Lokey without a signed subconsultant agreement.
- Mr. Ullinskey reported he left a message for Mr. Chen after the January Status Meeting to get information about the final concentration point/hydrologic apex map but to date his message has not been returned.
- Ms. Swick sent comments to PBS&J on the draft change order. Mr. Ullinskey will now finalize the COR and send it to Ms. Swick.

2.0 Progress to Date

• Area 1 Hydrology

- Ms. Swick and Ms. Miller both reported they have signed and sealed copies of the Entellus report of the Agricultural Pilot Study Hydrology Report. Ms. Miller had reviewed the draft and said most of her comments appeared to be addressed in this signed report. Ms. Miller said she will review **this most recent report to verify that the comments provided by Ms. Cox were addressed and because the study includes some very complex technical issues that were difficult to fully assess in the draft report.** Ms. Swick agreed. PBS&J will contact J. Aristazabal of Entellus to set up a meeting to discuss the report and new comments. The participants will be Ms. Swick, Ms. Miller, Ms. Cox, Entellus and PBS&J. The tentative dates are February 15 in the afternoon or February 16 before noon. The meeting should be planned for 2 hours.
- Ms. Swick asked this meeting be added to the project calendar to keep the meeting record up to date.
- The group discussed the Area 1 Hydrology Report. Ms. Swick said this must be a top priority to complete because it should have been done about 6-months ago. The deliverables needed are listed in Ms. Cox's letter attached to the January Progress Meeting minutes. Mr. Rogers said he will review the deliverables and what has been completed and will provide a time table to complete the Area 1 Hydrology Report by February 9, 2004.
- Ms. Swick requested the schedule on the team access website be updated to reflect the new schedules.
- The group discussed the status of the GIS materials. PBS&J will make this a top priority to complete.
Ms. Cox reported said she still needs the documentation for the RID and BIC unsteady hydraulic results model of the area. She said Mr. Chen had given her the model but no documentation. The information she has is adequate to test the model. PBS&J will work to provide the documentation. This effort will be accelerated once the subconsultant agreement with Michael Baker is consummated and PBS&J can work with Mr. Chen to complete the documentation text.

• Area 2 Floodplain Delineation

- Ms. Gross said she is working on the comments on the draft report. She will provide PBS&J with the comments by February 16.

- Ms. Swick said it is necessary to wrap up the TND to allow the Area 2 information to be submitted to FEMA for review. She would like PBS&J to set a date when it will be done but before the end of the contract period. She said PBS&J will need a contract extension to take this through the FEMA review period.

- **Area 3 Hydrology & Hydraulics**

- PBS&J reported the responses to the ADWR comments will be prepared once the subconsultant agreement with Michael Baker is signed and PBS&J can work with Mr. Chen to address the comments. Once PBS&J and Mr. Chen have discussed the comments, a meeting will be scheduled with the FCDMC to discuss addressing ADWR comments.

- **Area 4**

- The group discussed there is no hydrology report due for this area. The FCDMC needs the recommendation report being prepared by Ayres. This report should define what is needed for further analyses. Ms. Gross will check on what has been done to date. Ms. Swick said this needs to be completed ASAP. The FCDMC will include the recommendations in the ADMP scope of services. The FCDMC staff said there have been technical memoranda submitted rather than a report.

- **Geomorphology**

- Ms. Gross said she has everything needed for the review and will provide PBS&J with comments on the Ayres report. She asked that Ayres wait for the comments before continuing.

- **Rules of Development**

-
- PBS&J will get the mapping to EPG.
- Mr. Peters asked if the FCDMC had any comments on the outline he provided. Ms. Swick said no one provided her any but she will verify if there are any comments. Mr. Peters will send Ms. Swick an electronic copy of the outline to facilitate obtaining comments.
- Ms. Swick said she and Mr. Peters met with the Town of Buckeye Parks and Recreation Dept. staff to coordinate the efforts of the planned ADMP project. She needs a list of what is needed to address recreation issues from Mr. Peters and RBF (a Town of Buckeye consultant) so the FCDMC can provide answers and include the information in the ADMP scope.

- **Stakeholder Involvement**

- The group discussed the status of the alluvial fan report. Mr. Ullinskey report he has left a message with Mr. Chen about this but has not yet received a response. Ms. Gross said the FCDMC has a draft and will provide comments to PBS&J by mid February.

- Ms. Swick discussed the planned Alluvial Fan symposium and said it will be in mid to late April.

3.0 Project Issues

- PBS&J will revise the project schedule and the project calendar on the team access website.
- Ms. Swick would like to have PBS&J meet with Mr. Young, the new Public Works Director for the Town of Buckeye.
- Progress Report Meeting # 20 is scheduled for March 2, 2005 at 10:00 a.m. at the FCDMC.

4.0 Field Trip

After the Progress Meeting, representatives of the FCDMC and PBS&J drove to Buckeye to review the conditions in Area 1. The group drove on the Roosevelt Irrigation District canal bank from the east to the west, then to the Gila River on Highway 85 and then from the west to the east on the bank of the Buckeye Irrigation Company canal. This provided many opportunities to observe drainage issues and discuss potential methods to address issues. New construction in several locations were inspected to discuss the potential impacts the construction will have on drainage and the potential impacts future drainage may have on the newly built features.

BUCKEYE SUN VALLEY ADMS

FCD2002C027

SPECIAL STATUS MEETING

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Special Status Meeting held at PBS&J on February 11, 2005 at 2:30 p.m. A copy of the Agenda is attached.

ATTENDEES

Valerie Swick – FCDMC
Frank Turek – PBS&J
John Ullinskey – PBS&J
Burke Lokey – Michael Baker

BY PHONE

Steve Rogers – PBS&J
Kalvan Hone – PBS&J
Jeff Sickles – PBS&J
Sara Houghland – PBS&J
Marc Cavallaro – PBS&J

1.0 Review Agenda

Mr. Turek explained the agenda contained topics identified by the FCDMC staff during the January and February Progress meetings as requiring input from Mr. Lokey and Mr. Chen to complete.

2.0 Status of Subconsultant Agreement

The focus of this agenda item was to verify the status of the subconsultant agreement PBS&J sent to Michael Baker. Mr. Lokey said the Michael Baker Alexandria, VA office declined to sign the agreement and it has moved up the corporate chain. Mr. Lokey said the Michael Baker attorney promised to get back with him on Monday (Feb. 14, 2005). Mr. Turek asked Mr. Lokey if the Michael Baker concern related to a possible conflict of interest related to their contract with FEMA and Mr. Lokey confirmed this is the issue.

Mr. Ullinskey stated if Michael Baker declines to sign the agreement then PBS&J wants to contract with Mr. Lokey and Mr. Chen as independent consultants to complete the work for the FCDMC. Mr. Ullinskey told the group PBS&J has done this in the past and Mr. Lokey and Mr. Chen would be covered under PBS&J's insurance. Mr. Lokey said he did not know if this would be acceptable to Michael Baker. Mr. Ullinskey stated this is a unique situation required to complete the project for the client. Mr. Turek requested Mr. Lokey provide a written response if Michael Baker does not want to sign the subconsultant agreement and if they will not allow Mr. Lokey and Mr. Chen to work as independent consultants.

3.0 Status Report

Area 1

- The first item discussed was the RID & BIC unsteady hydraulics model. Ms. Cox had reported Mr. Chen gave her a draft of the model but no documentation. Mr. Lokey said he knows of this issue. He suggested Mr. Lesue meet with the PBS&J staff to review the files on the network. Mr. Lokey said the information is in the files on the network and Mr. Lesue could find it and it would only take a few hours to complete. Once this takes place, PBS&J can transmit the information to Ms. Cox at the FCDMC.
- Ms. Swick confirmed she is under pressure to get the hydrology report completed. PBS&J asked about the status of the mapping files and which files contained the most up to date information. Mr. Lokey and Ms. Swick confirmed the most up to date mapping was completed in November 2003 so all the mapping should be done. Ms. Swick confirmed Mr. Lokey and Mr. Chen did the regular hydrology but she needs the unsteady flow documentation and report. This was started by Mr. Lokey and Mr. Chen. There was a delay caused by the preparation of the Agricultural Pilot Study. Mr. Lokey said the documentation should be in the HEC-1 files but if it is in WMS, then when WMS is used it writes over the HEC documentation. Mr. Lokey said Mr. Chen has a draft outline for the notebook for this documentation but he did not get it done before he left PBS&J. Mr. Lokey said when the subconsultant agreement between Michael Baker and PBS&J is signed then Mr. Chen can finish the notebook and Mr. Lesue can work with the PBS&J staff to find the WMS and GIS files in the network.

Area 2

- Ms. Swick gave PBS&J comments prepared by Kathryn Gross of the FCDMC. Mr. Lokey briefly reviewed the comments and said they would not be difficult to address.
- Mr. Ullinskey said he has the unofficial draft report given to him by Mr. Lokey but could not accept it as an official document until either the subconsultant agreement with Michael Baker is executed or Mr. Lokey is working as an independent consultant. Once one of these two conditions is met, Mr. Ullinskey will transmit the document to Ms. Miller for technical review and then after Ms. Miller's comments are address, transmit the report to the FCDMC.
- Mr. Ullinskey said he would transmit comments from RBF, a consultant to the Town of Buckeye, to Mr. Lokey. RBF has questions about flood plain alignment.
- Ms. Swick asked for a schedule for completion of the Area 2 deliverables. She wants to submit the flood plain documents to FEMA at least 60 days prior to the end of the PBS&J contract. She said FEMA uses all of the 60 days allowed for each review. She needs the information from PBS&J by early April, 2005. Ms. Swick will confirm with Kathryn

Gross the amount of time the FCDMC will need to review the PBS&J submittal prior to sending it to FEMA.

- PBS&J asked about the most current GIS files related to Area 2. Mr. Lokey said the February 2004 files are the most recent. The flood plain work maps are dated October 2004. Ms. Swick is looking for the shape files of development. She asked PBS&J to provide her with documentation of the GIS files. PBS&J will research this and will strive to get it to her around February 14, 2005.
 - Mr. Lokey said the information includes;
 - Flood plain and hydrologic data
 - Erosion set backs
 - Future land use ownership – EPG work
 - Character
- Mr. Lokey said Mr. Lesue knows where the data files are located and can meet with PBS&J staff to identify them in the network files.

- Mr. Lokey said Mr. Chen can finalize the notebook for Area 2.

Area 3

- The group discussed the hydrologic apex points on the alluvial fans and the status of the revisions. Mr. Lokey said he had the list of point to modify and will use WMS to modify the basins using the modified fan apex points. He said this should be quick to complete in WMS and then the information could be cleaned up using HEC-1.
- Ms. Swick said this must be the number 1 priority to get done because she needs the information to provide to developers. This deliverable holds up the developers. Mr. Lokey said the points are in a GIS file and not all the points will move. He will get the points to Mr. Turek. Mr. Lokey said the fan apex file from Ayres had the data. He will get Mr. Lesue to identify the files.
- The team discussed the ADWR comments provided to FCDMC and the assistance Mr. Lokey needs to provide to address the comments. Mr. Howey provided the comments to Mr. Lokey and Mr. Chen when they were with PBS&J. Mr. Lokey said he knows the comments are not significant and can be easily addressed. Mr. Turek confirmed Mr. Howey said the comments need to be addressed even if the answer is PBS&J disagrees with the comment.

Alluvial Fan Report

- Ms. Swick reported she has the draft but needs the final report submitted by Mr. Lokey. She hopes to have the FCDMC's comments to PBS&J in three weeks, approximately during the first week in March.

- PBS&J can then work with Mr. Lokey to finalize the report.

Mapping

- Mr. Lokey said Mr. Lesue can work with the PBS&J staff to show them where the most recent map files are located. Mr. Lokey said he will coordinate with Mr. Turek to set a date when Mr. Lesue can meet with the PBS&J staff.

Other Project Issues

- Mr. Turek reported he is working with Mr. Rogers to update the project schedule. A major factor in the schedule will be the signing of the subconsultant agreement with Michael Baker because many of the tasks require input by Mr. Lokey and Mr. Chen.
- Ms. Swick asked about the status of the change order. Mr. Ullinskey verified Ms. Swick had provided all her comments on the scope for the change order. Mr. Ullinskey said he would have the change order to Ms. Swick on February 15, 2005.

BUCKEYE SUN VALLEY ADMS

FCD2002C027

PROGRESS MEETING #20

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #20 held at the FCDMC on March 2, 2005 at 9:00 a.m. Please refer any corrections or clarifications to Frank Turek at PBS&J. If no comments are received, then this memorandum will become a record of this meeting. A copy of the Agenda is attached.

ATTENDEES

Julie Cox – FCDMC

Kathryn Gross – FCDMC

Valerie Swick – FCDMC

Greg Jones – FCDMC

Scott Peters – EPG

Steve Rogers – PBS&J

Matt Baird – PBS&J

Frank Turek – PBS&J

Laurie Miller – LTM Engineering

Wen Chen – Michael Baker

1.0 Administrative Issues

- Meeting participants were introduced.
- Mr. Turek asked the group if there were any comments on the February 2, 2005 Status Meeting minutes and none were offered. Mr. Turek said comments received from Ms. Miller were incorporated into the minutes.
- The group reviewed the action item list – copy attached. Mr. Turek reviewed the items completed since the last meeting.

2.0 Progress to Date

- **Area 1 Hydrology**
- The group discussed the Entellus Agricultural Pilot study report. The FCDMC said the report is complete. Ms Cox performed a sensitivity analysis using the FCDMC's DTHETA value and the Entellus value and found little change. Differences in the results ranged between 1.8 and 4.8 percent. The FCDMC will provide PBS&J with a letter stating how to reference the Agricultural study in the Area 1 Hydrology and Hydraulics reports.
- PBS&J reported the modeling is mostly completed with the unsteady flow analysis. Comments on the sub-basins need to be addressed point by point and Mr. Chen of Michael Baker Jr. will assist. Ms. Cox will provide red line comments on the model. PBS&J will complete the draft TDN after the comments are addressed.

- Mr. Rogers stated if the models are updated, revisions can be given to Ms. Cox by the week of March 11, 2005. Ms. Swick said she needs the submittal as soon as possible.
- Mr. Rogers said PBS&J has identified all the GIS layers. Ms. Swick said to give the GIS materials to the FCDMC GIS department when it is all done and reviewed. Mr. Rogers said Mr. Kalvan Hone, PBS&J's GIS person, has been talking with the FCDMC GIS people about formatting.
- Ms. Swick said she needs the GIS shape files for the developments with the mapping of the developers' projects. She needs the contour intervals, control points and datum used. Mr. Chen said this information was used only as a reference and not incorporated into the files.
- **Area 2**
- PBS&J said they will send the draft to Ms. Miller for review after PBS&J completed the in-house review. Ms. Gross said she needs the technical notebook with the full report including maps. The plan is for PBS&J to review the comments, submit responses to Ms. Gross and then submit the full package with the responses. The hydrology has been approved, the hydraulics are needed.
- PBS&J reported the GIS maps were sent to Mr. Peters.
- PBS&J said they are still looking for the community flood problems file. Mr. Chen suggested looking in the existing conditions report and Mr. Chen will have Mr. Lesue contact Mr. Rogers with the file name.
- **Area 3**
- PBS&J received the disk with the ADWR comments. The FCDMC said most of the comments are minor but if there are major comments they need to be discussed with the FCDMC. A valid response can be that PBS&J does not agree with the ADWR comment. The group noted the NRCS review during the meeting.
- PBS&J needs to update the WMS to reflect the new hydrologic apex data. This needs to be revised and an addendum is needed to update the existing report.
- **Geomorphology**
- Ms. Gross is looking for the approved corridor map for flood channels. The shape file has all apex points divided into topographic and hydrologic apex points. Ms. Gross wants a separate shape file for each.
- Ms. Gross will complete her review of the Area 4 geomorphology including the stage 1, stage 2 and stream classification. She will provide her comments by March 21 and requested PBS&J schedule a meeting to review her comments with Ayers.

- **Rules of Development**

- Mr. Peters reported he needs the Hazards identification map and the set back map.
- Rules of development should be a separate report and referenced in the Master Summary for the ADMS.

- **Stakeholder Involvement**

- Ms. Swick said another meeting may be needed to present the stage 2 hydrology. The developers need the flow data for Area 3. A memorandum indicating the revised flow rates from the revised fan apexes should be provided as soon as possible and a meeting to discuss this with the stakeholders should be scheduled.

3.0 Project Issues

- Ms. Swick asked PBS&J to send out a meeting reminder.
- Mr. Chen asked that the Michael Baker staff assisting on the project be provided access to the team site. Mr. Turek said this will be done as soon as Michael Baker signs the subconsultant agreement.
- Ms. Swick asked for a list of the people included in the team site email lists. PBS&J will provide the lists.
- PBS&J revised the project schedule and provided it to Ms. Swick for review and comment.
- Progress Report Meeting # 21 is scheduled for April 6, 2005 at 1:00 p.m. at the FCDMC.

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PROGRESS MEETING #21

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #21 held at the FCDMC on April 6, 2005 at 1:00 p.m. Please refer any corrections or clarifications to Frank Turek at PBS&J. If no comments are received, then this memorandum will become a record of this meeting. A copy of the Agenda is attached.

ATTENDEES

Julie Cox – FCDMC

Kathryn Gross – FCDMC

Valerie Swick – FCDMC

Brett Howey – FCDMC

Scott Peters – EPG

Steve Rogers – PBS&J

Matt Baird – PBS&J

Frank Turek – PBS&J

Laurie Miller – LTM Engineering

Wen Chen – Michael Baker

1.0 Administrative Issues

- Meeting participants were introduced.
- Mr. Turek asked the group if there were any comments on the March 2, 2005 Status Meeting minutes and none were offered. Mr. Turek said comments received from Ms. Miller were incorporated into the minutes. The revised minutes were posted on the project website.
- The group reviewed the action item list – copy attached. Mr. Turek reviewed the items completed since the last meeting. Note – the attached action item list contains assignments made as a part of Progress Meeting 21 as detailed in these minutes.
- Ms. Swick requested the updated schedule be put on the team access site. Mr. Turek will do this in a pdf format to allow for easier access.

2.0 Progress to Date

- **Area 1 Hydrology**
- Mr. Rogers gave a copy of the Area 1 Hydrology Report to the FCDMC for review and comment.
- Ms. Cox sent a memorandum to PBS&J with the direction how to reference the Entellus Agricultural Study. She reviewed the differences in the modeling results.

- **Area 2**

- PBS&J has the comments from Ms. Gross on the Area 2 hydraulics. She reviewed four comments that remain outstanding during the meeting. Mr. Rogers said he will address these issues.
- Mr. Rogers reported PBS&J is working to get the models and mapping completed. The Hydrology Report will be included in the TDN and the TDN will be done in the FEMA submittal format.
- Ms. Swick will check to see if she has the survey data book. The FCDMC needs this for the official FEMA submittal and final documentation.
- Mr. Rogers will schedule a meeting with Ms. Gross on May 4, 2005 to discuss and review the Area 2 TDN information.

- **Area 3**

- Mr. Chen reported that Mr. Lesue of Michael Baker has completed the WMS modeling for the revised apexes. He will have the update done by April 6, 2005. The FCDMC stated they need the memorandum with the model to summarize what was done. Michael Baker will send the information to PBS&J by April 6 and will get the addendum to PBS&J by April 11, 2005.
- Mr. Chen said Michael Baker will provide PBS&J with responses to the ADWR and NRCS comments. They hope to have this done by April 29, 2005. This can be added to the Area 3 report as an addendum.
- Mr. Howey said he had no comments on the Ayres reports. The other FCDMC staff said they had no significant comments.
- Ms. Swick said she will send PBS&J a corridor map showing where the developers plan to have drainage corridors.

- **Area 4**

- Ms. Gross discussed the Ayres materials she reviewed. She said Ayres was to identify areas of concern but did a pediment study which was more than was called for in the scope of work.

- **Geomorphology**

- The FCDMC requested Mr. Lokey of Michael Baker complete the Alluvial Fan Report. The FCDMC needs a copy to review.

- Ms. Gross said that final comments have been provided on the Stage 1 report (landform delineation) . She will have her Stage 2 (landform stability) comments done by April 8, 2005 and would like the responses by the week of April 25. Ms. Gross said she will provide comments on the erosion memorandum the week of April 11, 2005. She will have her review of the primary washes memorandum done by April 8 and would like responses by the week of April 25, 2005.
- **Rules of Development**
- Ms. Swick said she will have comments on the Rules of Development report outline to Mr. Peters at EPG by April 7, 2005. She has not received comments on the table of contents from others at the FCDMC.
- The group discussed the Rules of Development and how they are study area specific. Ms. Swick and Ms. Miller discussed the rules of development prepared for the Wittmann ADMS and Ms. Swick said she would get a copy for Mr. Peters to review.
- Mr. Peters sees the need for the document to show the flood hazards. The group discussed the map and GIS shape file which shows the flood hazards identified by the residents, locations where flooding has occurred. PBS&J will provide Mr. Peters with a CD with all the GIS data.
- **Stakeholders**
- Ms. Swick requested a copy of the GIS developer shape files. PBS&J sent the files to Ms. Cox and Ms. Cox said she would forward them to Ms. Swick.
- Ms. Swick will organize a meeting to discuss/present the revised apex hydrology for Area 3.

3.0 Project Issues

- Mr. Chen asked that the Michael Baker staff assisting on the project be provided access to the team site. Mr. Turek said this will be done as soon as Michael Baker signs the subconsultant agreement.
- PBS&J revised the project schedule and provided it to Ms. Swick for review and comment. The schedule has been posted on the Team Access site.
- **Progress Report Meeting # 22 is scheduled for May 11, 2005 at 10:00 a.m. at the FCDMC. The date was moved due to meeting conflicts.**

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PROGRESS MEETING #22

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #22 held at the FCDMC on May 11, 2005 at 10:00 a.m. Please refer any corrections or clarifications to Frank Turek at PBS&J. If no comments are received, then this memorandum will become a record of this meeting. A copy of the Agenda is attached.

ATTENDEES

Valerie Swick – FCDMC
Kathryn Gross – FCDMC
Brett Howey– FCDMC
Pat Quinn – JE Fuller
Scott Peters – EPG

Sarah Houghland – PBS&J
Laurie Miller – LTM Engineering
Frank Turek – PBS&J
Jake Lesue– Michael Baker

1.0 Administrative Issues

- Meeting participants were introduced.
- Mr. Turek asked the group if there were any comments on the April 6, 2005 Status Meeting minutes and none were offered. Several reported that they were not able to locate the April meeting minutes on the website.
- The group reviewed the action item list – copy attached. Mr. Turek reviewed the items completed since the last meeting.
- Ms. Swick requested the updated schedule be put on the team access site. Mr. Turek will do this in a pdf format to allow for easier access.
- PBS&J will get Ms. Pat Quinn access to the team website
- Ms. Swick said PBS&J's invoices are being processed.
- PBS&J will try to put the Progress Meeting minutes in date order on the Team Site with the most recent first.

2.0 Progress to Date

- The focus of the meeting was the status of deliverables and the schedule to get the deliverables completed prior to the June 17, 2005 contract completion date.
- Area 1

- Ms. Cox to provide PBS&J with her review comments on the Area 1 report.
- **Area 2**
- Ms. Houghland reported the modeling is completed. Ms. Miller will get the draft report for review.
- Ms. Swick requested PBS&J keep about \$2,000 in the contract to address FEMA comments.
- Ms. Houghland will get the submittal finalized and submit it to Ms. Gross during the next week for review.
- **Area 3**
- Mr. Howey said to reference the FRS 1 report in the ADWR/NRCS comments to identify the comments which will be addressed in the FRS 1 report.
- **Geomorphology**
- The FCDMC requested Mr. Lokey of Michael Baker complete the Alluvial Fan Report. The FCDMC needs a copy to review
- **Rules of Development**
- Mr. Peters said EPG will submit the draft Rules of Development to Ms. Miller for review on May 25. Ms. Miller will complete her review and the draft will be submitted to the District on May 31 for District review. The District review should be completed by June 6 to allow Mr. Peters to complete the final by June 10.

3.0 Project Issues

- Ms. Gross questioned when the GIS data would be submitted. Ms. Houghland said she will check on the status and provide Ms. Gross with a date. Ms. Swick said she needs the GIS data to be submitted prior to the June 17, 2005 contract completion date.
- Ms. Swick said she needs all the deliverables 100 percent done by June 9 or 10 but they must be done prior to the June 17 project completion date. The only work to remain for completion after June 17 relates to addressing FEMA comments. The group recommended moving the June progress meeting from June 1 to June 8 to allow for the presentation of deliverables to the District and to allow some time for review prior to the end of the contract.

- **Progress Report Meeting # 23 is scheduled for June 8, 2005 at 10:00 a.m. at the FCDMC. The date was moved due to completion of project deliverables.**

BUCKEYE SUN VALLEY ADMS

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PROGRESS MEETING #23

The following is a summary of the items covered or discussed in detail at the Buckeye Sun Valley ADMS Progress Meeting #23 held at the FCDMC on June 8, 2005 at 10:00 a.m. Please refer any corrections or clarifications to Frank Turek at PBS&J. If no comments are received, then this memorandum will become a record of this meeting. A copy of the Agenda is attached.

ATTENDEES

Valerie Swick – FCDMC

Brett Howey – FCDMC

Julie Cox – FCDMC

Pat Quinn – JE Fuller

Scott Peters – EPG

Laurie Miller – LTM Engineering

Matt Baird – PBS&J

Steve Rogers – PBS&J

Frank Turek – PBS&J

Wen Chen – Michael Baker

Burke Lokey – Michael Baker

1.0 Administrative Issues

- Meeting participants were introduced.
- Mr. Turek asked the group if there were any comments on the May 11, 2005 Status Meeting minutes and none were offered at this meeting. The revised minutes were posted on the project website.
- The group reviewed the action item list – copy attached. Mr. Turek reviewed the items completed since the last meeting. This list was briefly reviewed because of the progress made toward project completion.

2.0 Progress to Date

- The focus of the meeting was the status of deliverables and the schedule to get the deliverables completed. The format of the meeting was to discuss the volumes in the ADMS rather than study areas as had been done in previous meetings. The District requested the deliverables date be shifted to July to allow them sufficient time to review drafts and provide comments. Based on the discussions during the meeting, PBS&J will prepare a revised deliverable schedule and submit it to the District. The District can then select a date for the final Project Status meeting projected to occur during the last two week of July 2005.

- GIS deliverables
 - Ms. Swick requested the GIS files be transmitted to the District by the end of June 2005. She asked that two sets be sent to her and she will distribute them within the District.

- Master Summary Report
 - This is to be a summary volume.

- Volume 2 Data Collection Report
 - 2.a Data Collection. This report is complete and the District has copies. An electronic copy is in the PBS&J files.
 - 2.b Survey Report – PBS&J has copies but needs the final covers with the surveyor's seal and signature.

- Volume 3 Hydrology report
 - The draft Area 1 report was submitted to the District. Ms. Cox is working to prepare the comments and transmit them to PBS&J.
 - Ms. Cox is targeting the Area 2 comments to be done by June 27, 2005
 - Area 3 comments are done and have been sent to PBS&J
 - Ms. Swick said the dates for completion are fine because the contract has been extended to cover the submittal review time by FEMA.

- Volume 4
 - The District has the draft for review
 - Mr. Rogers will transmit Ms. Miller's comments to Ms. Cox.
 - Ms. Cox will focus on Area 2 comments first and will have a goal to complete the comments by June 27, 2005. The target is to finalize Area 2 by July 11, 2005.
 - Ms. Miller said most of the comments are on future conditions which would not impact the present conditions for the FEMA submittal. However, some of the comment are on existing conditions, which would affect the floodplain delineations.
 - 4a will be the existing conditions for Area 2 and 4b. will be the future conditions.

- Volume 5
 - Michael Baker is working on the revisions for the apex points. The Michael Baker revisions are due June 17, 2005. Ms. Cox will complete her review by July 11, 2005.
 - The Area 3 PMF to be finalized by PBS&J by June 10, 2005. The District needs five printed copies and two CDs.
 - PBS&J will request electronic copies from Engineering Alliance.

- Volume 6

- The erosion and sediment transport memoranda are done. They will be put in one volume.
- The District said Ms. Gross would like a DVD with all the soils data. Once she receives the DVD she can sign off on the volume. Mr. Rogers will check on the status of the DVD.
- Volume 7
 - This is done.
- Volume 8
 - Miscellaneous report volume. Ms. Swick suggested this contain the information for the Project Administration Report but not the agriculture report or rules of development.
- The Alluvial Fan Report being prepared by Michael Baker should be completed by June 17, 2005.
- Rules of Development Report
 - The report will include rules not covered by existing regulations.
 - The report will have subareas in the 4 major areas, will summarize flooding concerns and information in the draft relating to existing regulations will be removed from the draft.
 - In Area 1 the report will document the rules of development for flooding and erosion related to natural areas, agricultural lands and developed (urbanized) lands.
 - The District said flooding is probably covered by existing regulations.
 - The District said rules are needed for pre and post development of agricultural lands including rules for spreader basins, conveyance corridors and regional drainage solutions.
 - There is also concerns of ponding at canals and the canal overflow points. Suggested rules include raised FFEs and disallowing solid fences.
 - The District said there is a concern about undeveloped areas with existing washes and the need to preserve the sediment transport capacity of the existing washes.
 - The District said in areas with 100-year water surface elevation data, the building pad must be set 18 inches above the high point of the lot.
 - Hassayampa Area 2
 - There are natural lands and agricultural lands
 - There is a need to preserve the sediment transport capacity in the washes.
 - The agricultural area rules in Area 1 also apply to Area 2.
 - Need to state not to build in an erosion hazard zone.
 - Area 3
 - Concerns are active alluvial fans and erosion hazard zones.
 - State do not build in erosion hazard zones.

- Need a discussion on development on alluvial fans, including a discussion on the uncertainty of split flow distribution on inactive fans and how flow splits are maintained.
- Note that a regional solution is needed if development is allowed on an alluvial fan.
- Issues related to drainage crossings of Sun Valley Parkway should be compatible with the Wittman ADMSU Rules of Development.
- EPG needs an up-to-date shapefile of EHZs produced by Ayres.
- Area 4
 - Similar to Area 3
 - Maintain Wagner Wash sediment transport.
 - Use the Wittman example of rules near the CAP canal.
 - Need to preserve natural washes.
- Ms. Swick said the agriculture impact report is done and will be a separate document, not a volume in the ADMS. The land subsidence report is complete and is also a separate document.
- Next Meeting Date - PBS&J will prepare a revised schedule and coordinate with Ms. Swick to select a date in late July.