SPDSS Memorandum
Final

To: Ray Alvarado
From: Riverside Technology, inc., Nils Babel
Subject: SPDSS, 2005 Irrigated Parcel Well Adjustment Procedure and Results
Date: 2nd February, 2010

1 Introduction

In 2005 the State of Colorado adopted a new administration policy regarding irrigation wells. Wells were required to be in an augmentation plan or risk being shut down. In 2005 and 2006 many parcels were ordered to cease irrigating. The CWCB requested Riverside Technology, inc. (Riverside) to adjust the 2005 irrigated parcels with new information on ground water usage. The new information makes it possible to determine which wells were not operating in 2005. This was not possible at the time of the 2005 irrigated acreage analysis and thus many parcels were matched to a well that may have not been operating in 2005. The CWCB decided that the parcels should be adjusted with the new information on 2005 well usage. This was done to serve several purposes. (1) The consumptive use model was overestimating the ground water usage. Users did not believe there could be that much ground water usage given the new administration policy. (2) Given the new administration policy the state felt that it would cause confusion if the 2005 parcels were not adjusted.

Riverside attended a meeting with members of Leonard Rice Engineers, CWCB, and DWR to discuss the wells on January 9, 2009. The group decided that it was now possible to determine "Active" wells in 2005 with the following criteria:

1. Wells that are currently (2009) in an augmentation plan
2. Wells decreed as non-tributary to the South Platte (e.g. the Coffin Wells)
3. Wells located in Designated Basins
4. Wells decreed as alternate points

These criteria were used by DWR to provide a new well list of "Active" irrigation wells to Riverside. Following a Scope of Work written by Riverside in the memo dated 2/20/09, Riverside used this list to adjust the 2005 irrigated parcel dataset by removing wells from the GW attributes.

2 Procedure

Riverside followed the approach laid out in the Scope of Work. This procedure involved four main steps:

1. Create New 2005 Irrigation Wells List
2. Remove 'Shutdown' Wells from 2005 Irrigation Parcels' Groundwater Attributes
3. Validate Parcels' Water Source
4. Finalize Parcels and Reporting

The first step in this procedure was to create a new well list. Riverside provided DWR staff with the original well list used in the 2005 irrigated parcel analysis, as well as the HydroBase query used to generate the well list. DWR used this data together with the "Active" well criteria to generate a list of active 2005 irrigation wells.

Riverside received the well list and reviewed it. The wells were mapped to display their impact on the 2005 irrigated parcels. An online meeting was then held to display the parcels and ensure that all parties agree with the new well list. During the meeting some items were identified that needed more attention. This included new wells or WDIDs that were created since 2005 and conditional water rights. The group decided in the meeting not to include any new wells or WDIDs that had been created since 2005. However, the group decided that conditional water rights would be included. Following the review the state created a new well list that excluded any new wells or WDIDs and included conditional water rights.

Riverside used the well list to adjust the 2005 irrigated parcels in a two step procedure. First the wells were joined with the original list of wells used in the 2005 well matching. Wells in the original list that did not match a well in the new list were removed and labeled as 'shutdown' wells. The 'shutdown' wells were removed from the ground water attributes in the 2005 irrigated parcel database. Second, the wells in the new list that did not join wells in the original list of wells (conditional right wells) were manually matched to a parcel.

The 'shutdown' wells were removed from the irrigated parcel ground water attributes by joining them with each individual attribute (GW_ID1, GW_ID2, etc.). When a match with an attribute was found, the well ID was removed from the parcel dataset. A python script written by Riverside automated the processing.

The next step in the procedure was to validate the irrigation status for parcels that no longer had a water source after well IDs were removed. The original Landsat NDVI imagery was reviewed to determine if the parcel appeared strongly irrigated. Those parcels that did not appear strongly irrigated from the NDVI Imagery were removed from the parcel dataset. Those parcels that did appear strongly irrigated were assigned the nearest active irrigation well with the appropriate well class.

After all the parcels were assigned a water source the dataset was reviewed and quality controlled. The dataset was reviewed for topology, HydroBase standards, and overall analysis accuracy. The dataset was also reviewed by Leonard Rice Engineers and the Colorado DWR. Doug Stenzel at the DWR discovered that four wells from the original well list had been corrected since the list was made. These wells were assigned different WDIDs and corrected in the parcel dataset. The dataset was delivered to the state and DWR a second time on January 28, 2010 and correctly loaded into HydroBase.

3 Results

The 2005 parcel adjustment task resulted in a decrease in irrigated acreage, which was expected. Overall 181 parcels were removed, totaling 7,590 acres. **Table 1.** shows the 2005 adjusted Division 1 irrigated acreage by Water District and Crop Type. **Table 2.** shows the 2005 adjusted Division 1 irrigated acreage by Water District and Water Source. **Table 3.** shows the difference in the original Division 1 2005 irrigated acreage and the adjusted acreage. This table shows that a considerable amount of acreage (30,452 acres) was changed from ground water and surface water to surface water only.

District	Alfalfa	Corn	Dry Beans	Grass/ Pasture	Orchard	Small Grains	Sod Farm	Sugar Beet	Vegetables	Total
1	91,057	119,839	10,899	25,489	257	25,247	3,169	8,084	7,720	291,761
2	37,178	33,230	2,506	24,554	827	5,454	2,388	2,002	8,402	116,541
3	25,020	39,215	7,781	37,834	51	7,095	1,656	5,803	7,571	132,026
4	12,776	15,483	1,921	17,867	-	5,076	262	2,202	1,238	56,825
5	12,248	10,270	581	21,687	61	5,360	550	1,987	457	53,202
6	5,243	2,521	133	11,643	29	2,562	166	608	565	23,471
7	20	-	-	1,309	63	-	-	-	61	1,452
8	266	6	-	3,196	102	109	-	-	-	3,679
9	-	-	-	1,435	-	-	-	-	-	1,435
23	-	-	-	5,225	-	-	-	-	-	5,225
48	-	-	-	3,950	-	-	-	-	-	3,950
64	53,645	63,371	4,866	5,836	-	7,762	-	4,542	57	140,079
80	-	-	-	874	-	-	-	-	-	874
Total	237,454	283,936	28,687	160,898	1,389	58,665	8,192	25,227	26,071	830,518

Table 1. Division 1 2005 Irrigated Acreage by Crop Type

District	Ground Water	Ground Water & Surface	Surface Only	Other irrigation	Total
1	94,432	85,812	111,517	-	291,761
2	13,853	32,687	70,001	-	116,541
3	3,550	25,393	101,300	1,783	132,026
4	230	1,437	55,158	-	56,825
5	318	65	52,818	-	53,202
6	-	11	23,460	-	23,471
7	-	52	1,399	-	1,452
8	840	246	2,593	-	3,679
9	-	-	1,435	-	1,435
23	-	-	5,225	-	5,225
48	-	-	3,950	-	3,950
64	33,619	40,676	65,784	-	140,079
80	-	20	854	-	874
	146,843	186,399	495,493	1,783	830,518

Table 2. Division 1 2005 Irrigated Acreage by Water Source

	Ground Water	Ground Water & Surface	Surface Only	Other irrigation	Total
Adjusted 2005 Acreage	146,843	186,399	495,493	1,783	830,518
Original 2005 Acreage	154,405	216,880	465,041	1,783	838,109
Difference	-7,562	-30,480	30,452	0	-7,590

Table 3. Acreage Differences