

AGGREGATION OF SURFACE WATER CANAL COMPANIES INTO SURFACE WATER IRRIGATION ENTITIES

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DESIGN DOCUMENT OVERVIEW

Design documents are a series of technical papers addressing specific design topics on the Eastern Snake Plain Aquifer Model (ESPAM) Enhancement Project. Each design document will contain the following information: topic of the design document, how that topic fits into the whole project, which design alternatives were considered and which design alternative is proposed. In draft form, design documents are used to present proposed designs to reviewers. Reviewers are encouraged to submit suggested alternatives and comments to the design document. Reviewers include all members of the Eastern Snake Hydrologic Modeling (ESHM) Committee as well as selected experts outside of the committee. The design document author will consider all suggestions from reviewers, update the draft design document, and submit the design document to the ESPAM Enhancement Program Manager. The Program Manager will make a final decision regarding the technical design of the described component. The author will modify the design document and publish the document in its final form in .pdf format on the ESPAM Enhancement web site.

The goal of a draft design document is to allow all of the technical groups interested in the design of the ESPAM Enhancement Project to voice opinions on the upgrade design. The final design document serves the purpose of documenting the final design decision. Once the final design document has been published for a specific topic, that topic will no longer be open for reviewer comment. Many of the topics addressed in design documents are subjective in nature. It is acknowledged that some design decisions will be controversial. The goal of the Program Manager and the modeling team is to deliver a well-documented, defensible model, which is as technically representative of the physical system as possible, given the practical constraints of time, funding and manpower. Through the mechanism of design documents, complicated design decisions will be finalized and documented.

Final model documentation will include all of the design documents, edited to ensure that the “as-built” condition is appropriately represented.

INTRODUCTION

There are more than 100 surface water irrigation companies and numerous private surface water irrigators within the model boundary of the ESPAM Enhancement. Many of these irrigation companies share common acreage. In order to treat all surface water irrigated areas in a consistent manner, these surface water irrigation companies were aggregated into a smaller number of ‘irrigation entities’. The aggregated irrigation entities more accurately reflect the delivery of surface water to the irrigated acres by maintaining a level of resolution consistent with available diversion and return flow data.

Many tools were available for the ESPAM Enhancement Project that were not previously available for the University of Idaho/Idaho Department of Water Resources (UI/IDWR) ESPAM. These tools aided in the speed and accuracy with which the surface water aggregation process was completed. ArcView GIS 3.2a software was used to perform the aggregation using three main ArcView shapefiles. These shapefiles included surface water irrigation company service areas, irrigated land type (surface water, ground water, and mixed surface and ground water), and points of diversion and return flow.

This paper summarizes and analyzes the method of aggregating surface water irrigation companies in the study area. The topic of ground water irrigation aggregation will be discussed in a subsequent design document, DDW-009.

PREVIOUS WORK AND AVAILABLE DATA

A similar surface water irrigation company aggregation was performed for the original UI/IDWR ESPAM. Because ArcView software was not an available tool at that time, the irrigation company aggregation was a more difficult process and took much longer to complete. The earlier aggregation resulted in approximately 172,000 acres assigned to unnamed surface acres.

However, the aggregation scheme used in the previous model gave valuable insight to completing the current aggregation. Along with the use of ArcView GIS 3.2a software and three ArcView shapefiles, the previous aggregation scheme provided a starting point for the current aggregation. Shapefiles used to complete the current aggregation included surface water irrigation companies, source of irrigation water (surface water, ground water, and mixed surface and ground water), and points of diversion and return flow measurements.

AGGREGATION CRITERIA AND PROCEDURE

Several criteria were used in the process of aggregating surface water irrigation companies. These criteria included: boundaries of canal and irrigation companies, overlap of these boundaries, points of diversion, common conveyance, and return flow for each company, size of the company, contiguous service areas, limitations on the size of the aggregated entity, shared points of diversion or return, water priority dates, and management practices.

The process of aggregating surface water irrigation companies entailed selecting one irrigation company and identifying the point of diversion from the river and the likely corresponding return flow location. Adjacent irrigation companies were then examined for similar characteristics, including irrigation practice, depth to water, points of diversion, common conveyance, and return flow, soil type, water right priorities, common drainage

area, and previous aggregation in the earlier UI/IDWR ESPAM. If adjacent irrigation companies did not have any significant differences from one another, they were aggregated into the same irrigation entity.

Surface water and mixed surface water and ground water private rights (those rights not included within an established irrigation company) were identified using a source of irrigation water ArcView shapefile. Private right entities were formed based on priority dates and irrigation practices.

A surface water irrigation company service area map (Fig. 1) was used to identify 118 irrigation companies that lie either completely or partially within the study area. This service area map is maintained by the Idaho Department of Water Resources (IDWR) with information provided from the irrigation companies, IDWR water rights agents, and water claim files.

Locating points of diversion and points of return flow was done with the help of Water District 01. Water District 01 supplied diversion data that was used as a base and then edited with additional knowledge from the IDWR's River Reach Gain/Loss program and the United States Geological Survey's Water Resource Data for Idaho, published annually. The finished data was put together as an ArcView shapefile (Fig. 2) and overlain on the irrigation company service area map.

With the knowledge of the irrigation companies' service areas and the points of diversion and return flow, the aggregation process started by selecting a surface water irrigation company, centering on the company, identifying the water source and likely return flow location, and then comparing it to surrounding entities. If the surrounding entities shared similar irrigation practices, drainage areas, and water right priorities, they were aggregated into one irrigation entity. Also, the previous aggregation scheme was acknowledged as a double-check method.

Another criteria for aggregating irrigation companies together are shared points of diversion, common conveyance, or shared return flow. Two or more irrigation companies may share a diversion from the river or a point of return to the river, in which case the companies were aggregated together to maintain a level of irrigation company resolution consistent with the resolution of the diversion and return flow data. Similarly, if it appeared that runoff from one irrigation company was part of the supply for another company, the entities were aggregated to more correctly represent spatial distribution of recharge.

Most private water rights within the model boundary were aggregated with the organized irrigation companies. The private rights that were not aggregated with adjoining entities are: Basin 31 (Camas and Beaver Creek), Basin 32 (Birch Creek and Medicine Lodge Creek), and Basin 33 (Little Lost River). The private rights in these three basins were aggregated separately from each other and from the irrigation companies because

of different practices and water supply than the organized companies. Source of irrigation water was determined from IDWR adjudication data (see design document DDW-017).

Three irrigation companies in the Mud Lake area, including Jefferson Irrigation Company, Montevue Canal Company Incorporated, and Producers Irrigation Company, do not use surface water for irrigation. These companies use off-site ground water pumping and were aggregated with the surface water irrigation companies for model purposes. With ordinary ground water irrigation, it is assumed for modeling that the pumping and the recharge occur within the same model cell. This is not necessarily the case for the aforementioned canal companies. The wells used to obtain water may be miles from the place of use and conveyed by a canal. Therefore, in the model, the pumping and recharge would occur in different model cells. Because many irrigation companies that use off-site ground water pumping co-mingle the pumped ground water with the surface water in the canals, the ground water withdrawal was treated as a point extraction assigned to the model cell. This withdrawal, or volume extracted, was added to the surface water diversions for the respective irrigation entity (Contor, 2002). When water master records were not available to determine the amount of ground water pumped, estimates were made.

(Figure 1)

(Figure 2)

RESULT

The aggregation process resulted in 46 irrigation entities (Appendix 1). These 46 entities were assigned an identification number and a descriptive name. Identification numbers were assigned for the purpose of computer modeling. Descriptive names were created by choosing the largest (by area) organized irrigation company in the entity, and adding on to that name the number of organized companies aggregated to create that entity. For example, aggregated entity IESW16, named "Egin 2", consists of two organized companies, Egin Bench Canals Inc. and St. Anthony Union Canal Company, of which Egin Bench Canals Inc. is the larger (by area), of the two companies. See Figure 3.

(figure 3)

REFERENCES

Contor, B.A. 2002. Personal communication.

APPENDIX 1

Aggregated Surface Water Irrigation Entities

Entity ID	Entity Name	Irrigation Company(ies) Included in Entity
IESW01	A & B 1	A & B Irrigation District
IESW02	Aberdeen Springfield 1	Aberdeen Springfield Canal Co
IESW03	Arcadia 1	Arcadia Reservoir & Canal Co Ltd
IESW04	Bell Rapids 1	Bell Rapids Mutual Irrigation Co
IESW05	Big Lost River 3	Big Lost River Irrigation District Moore Water Users Association Darlington Land & Irrigation Co
IESW06	Big Spring 3	Banbury Pipe Company Inc Big Spring Water Users Assn Hagerman Water Users Association
IESW07	Big Wood 4	Justice Ditch Co Thorpe Ditch Co Big Wood Canal Company Mullins Canal & Reservoir Co
IESW08	Blaine 1	Blaine County Canal Co
IESW09	Burgess 5	Burgess Canal & Irrigating Co North Rigby Irrigation & Canal Co Inc Parks & Lewisville Irrigation Co Inc Rigby Canal & Irrigation Co Clark & Edwards Canal Company
IESW10	Burley 1	Burley Irrigation District
IESW11	Butte and Market 1	Butte & Market Lake Canal Co
IESW12	Canyon Creek 3	Enterprise Irrigation District Canyon Creek Lateral Ditch Assn Canyon Creek Canal Co Inc
IESW13	Consolidated Farmers 4	Roxana Canal Co Consolidated Farmers Canal Co Ltd Saurey-Sommer Ditch Island Ward Canal Co
IESW14	Corbett 4	Corbett Slough Ditch Company Eastern Idaho Water Co Little Butte Irrigation Co Ltd Younie Ditch Co
IESW15	Dewey 1	Dewey Canal Co
IESW16	Egin 2	Egin Bench Canals Inc St Anthony Union Canal Co
IESW17	Fall River 1	Fall River Irrigation Co
IESW18	Falls 3	Falls Irrigation District Warm Creek Irrigation Co Fort Hall Indian Reservation
IESW20	Harrison 5	Rudy Irrigation Canal Co Ltd Harrison Canal & Irrigation Co Kite And Nord Ditch Enterprise Canal Co Ltd Butler Island Canal Co
IESW21	Heise 1	Heise Canal
IESW22	Idaho 2	Snake River Valley Irrigation District Idaho Irrigation District

Entity ID	Entity Name	Irrigation Company(ies) Included in Entity
IESW23	Independent 6	Lowder Slough Canal Co West Labelle Irrigation Co Ltd Dilts Irrigation Company Ellis-Bramwell Ditch CO Independent Irrigation Co Labelle Irrigating Co
IESW24	Island 1	Island Irrigation Co
IESW25	Little Wood 2	Fish Creek Reservoir Company Inc Little Wood River Canal Co
IESW26	Long Island 1	Long Island Irrigation Co
IESW27	Milner 1	Milner Irrigation District
IESW28	Minidoka 1	Minidoka Irrigation District
IESW29	Mud Lake 4	Level Canal Co Inc Mud Lake Water Users Inc Owsley Canal Company Holley Water Users Assn
IESW30	New Sweden 7	Smith-Maxwell Ditch Co New Sweden Irrigation District Shattuck Irrigation Co. Stattuck Irrigation Co Long Island Canal Co Blackfoot Irrigation Co Woodville Canal Co
IESW31	North Fremont 1	North Fremont Canal Systems Inc
IESW32	North Side 4	King Hill Irrigation District North Side Canal Company Ltd American Falls Reservoir Dist #2 Dba Bs Farms & Irrigation Co
IESW33	Osgood 4	Owners Mutual Irrigation Co Osgood Canal Co Inc H & W Water Users Association Bear Island Water Assn
IESW34	Peoples 8	Watson Slough Ditch And Irrigation Companies Peoples Canal & Irrigation Co Parsons Ditch Co Wearyrick Ditch Co Trego Ditch Co Danskin Ditch Company New Lavaside Ditch Company Limited Riverside Canal Co
IESW35	Progressive 2	Poplar Irrigation District Progressive Irrigation District
IESW36	Reid 6	Consolidated Feeder Canal Co Liberty Park Irrigation Co Inc Texas Slough Irrigating Canal Co Reid Canal Co Lenroot Canal Co

Sunnydell Irrigation District

Entity ID	Entity Name	Irrigation Company(ies) Included in Entity
IESW37	Reno 1	Reno Ditch Company Inc
IESW38	Rexburg 1	Rexburg Irrigation Co C/O Keith Erikson
IESW39	Silky 2	Silky Lateral Ditch Water Users Assn Silky Irrigation District
IESW40	Southwest 2	Oakley Canal Co Southwest Irrigation District
IESW41	Twin Falls 1	Twin Falls Canal Co
IESW42	Twin Groves 6	Wilford Irrigation And Mfg Co Pioneer Ditch Co Ltd Twin Groves Irrigation & Manufacturing Salem Union Canal Co Ltd Farmers Friend Irrigation Co Ltd North Salem Agr & Mill Canal Inc
IESW43	Woodmansee Johnson 6	Woodmansee-Johnson Canal Company Teton Irrigation And Manufacturing Co Pincock Garner Ditch Association Pincock-Byington Ditch Co Wolf Ditch Company Teton Island Feeder Canal Co
IESW44	Jefferson 3	Jefferson Irrigation Co Producers Irrigation Co Monteview Canal Co Inc Monteview Canal Co Inc