WOOD RODGERS

December 16, 2010 Job Number: 8359.008

Ms. Regina Espinoza
292 West Beamer Street
Woodland CA 95695

Dear Ms. Espinoza:

Subject: North Davis Meadows County Service Area - System Improvement Recommendations

In accordance with our contract, Wood Rodgers, Inc. is pleased provide you with this letter report detailing our recommendations for the North Davis Meadows County Service Area (NDMCSA) water supply system improvements. Cost estimates for alternatives are included in this report.

Background

NDMCSA Wells 1 and 2 have concentrations of nitrate that exceed the California Department of Public Health (CDPH) primary (health based) maximum contaminant level (MCL). Both wells have also exceeded the CDPH secondary (aesthetic) MCL for specific conductance and the CDPH notification level for boron. The Yolo County, Health Department, Environmental - Health Division issued Compliance Order No: 12-09 on December 1, 2009, which stated that this water system must be brought into compliance by December 1, 2010. Previous attempts to improve water quality have not achieved the desired level of success with regard to water quality improvements.

Project Alternatives Cost Estimates

The County has requested that three options be considered for the NDM community including: (1) destroying Well 1, rehabilitating Well 2 to provide redundant supply (500 gpm), and constructing a new supply well (at least 822 gpm); (2) destroy Wells 1 and 2 and construct two new supply wells (500 gpm each); and (3) destroy Wells 1 and 2 and construct two new wells (500 gpm and at least 822 gpm). Cost estimates for each of the three options are attached in a summary table and complete detailed cost estimates for each component of each of the three options are also included. This summary table also includes Wood Rodgers recommended option, which is a slight variation of Option 3.

Conclusions and Recommendations

Permanent well modifications may have a good chance of success as a solution to improve water quality and, if successful, would be the quickest way to improve the water quality for the system. Modifications could however reduce well capacity and thus leave the system short for redundant source capacity. Well modifications alone would not provide the desired capacity of water to meet maximum day demand, fire flow requirements, and redundant water supply. Modifications would also have limited service life. Modified wells would likely not last more then 5 to 20 years, depending on the type of modification.

New wells and pump stations are expensive, however new wells provide the best long term solution to improve the NDMCSA water system for the next 40 to 50 years. Even if well modifications are successfully implemented, a new well will be needed to increase source capacity for system redundancy and to make up for well capacity reductions as a result of the well rehabilitation programs.

Wood Rodgers recommends proceeding with funding options for two new large diameter (16-inch) wells. A complete outline detailing the project approach is outlined on the following page.

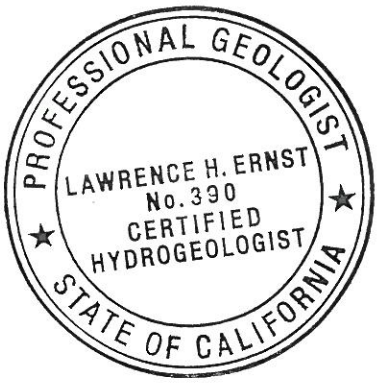
We look forward to working with you to improve the NDMCSA well field water quality and system capacity. If you have any questions or require additional information, please call me at (916) 341-7447 (office) or (916) 417-7687 (cell).

Sincerely,

Lawrence H. Ernst

Lawrence H. Ernst, PG, CEG, CHG
Principal Hydrogeologist

Enclosure



North Davis Meadows County Service Area

Wood Rodgers Recommended Project Approach

1) Select new well sites south of the existing Well 1 site and near the existing Well 2 on County owned or controlled property.
2) Prepare site maps showing CDPH offset requirements and preliminary future site layouts.
3) Submit site plans to CDPH for approval.
4) Prepare plans and specifications for test hole drilling and monitoring well construction.
5) Prepare plans and specifications for conceptual intermediate and deep well designs.
6) Prepare design reports detailing the production well pump stations.
7) Obtain funding.
8) Bid and award the monitoring well contract.
9) Drill the exploratory test hole at the Well 1 location.
10) If the aquifers appear favorable, construct a monitoring well at the Well 1 location to gain zone specific water quality information. If the aquifers are not favorable, move to the Well 2 site and drill a test hole. Construct the monitoring well at the better of the two well sites and destroy the other test hole.
11) Design production wells to depths that will have the best chance to meet the NDMCSA's desired water quality and well capacity objectives.
12) Modify the production wells plans and specifications to include the final well designs.
13) Submit designs to CDPH for approval and concurrence with approach.
14) Bid and award the production well contract.
15) Construct and test the new wells.
16) Prepare pump station designs and system upgrades.
17) Submit pump station plans and facility upgrades for CDPH approval.
18) Bid and award the pump station and facilities improvements.
19) Construct the pump station and facility improvements.
20) Submit permit amendment to CDPH to include the new wells.
21) Keep Well 2 in service as a "back-up" well.
22) Modify Well 1 to improve the water quality and equip it to become a low-flow "jockey" well for low demand periods and additional redundant non-restricted source of water supply.

Global Recommendations

1) Drill two new wells.
2) All new wells should be 16-inches in diameter (the 822 gpm design).
3) The Well 1 site should be used as the first choice for new wells to take advantage of existing infrastructure (providing the aquifer yields and water quality are favorable).

COST ESTIMATES

North Davis Meadows CSA

Option 1

Item No.	Description	Cost Estimate
1	Well 1 Destruction	$22,370
2	Well 2 Rehabilitation	$65,440
3	Monitoring Well	$79,146
4	New Production Well* (822 gpm)	$688,894
		$855,850

Option 2

Item No.	Description	Cost Estimate
1	Well 1 Destruction	$22,370
2	Well 2 Destruction	$23,036
3	Monitoring Well	$79,146
4	2 New Production Wells* (500 gpm)	$1,299,368
		$1,423,920

Option 3

Item No.	Description	Cost Estimate
1	Well 1 Destruction	$22,370
2	Well 2 Destruction	$23,036
3	Monitoring Well	$79,146
4	New Production Well* (500 gpm)	$649,684
5	New Production Well* (822 gpm)	$688,894
		$1,463,130

Wood Rodgers Recommended Option

Item No.	Description	Cost Estimate
1	Well 1 Modification	$31,270
2	Well 2 Remains as a Stand-by Well	$0
3	Monitoring Well	$79,146
4	2 New Production Wells* (822 gpm)	$1,377,788
		$1,488,204

Additional Items

Item No.	Description	Cost Estimate
1	City of Davis SCADA Requirements	$30,000
2	Facility Upgrade to Meet Maximum Daily Demand and Fire Flow Requirements	$50,000
3	An Additional Test Hole (if required)	$28,800
		$108,800

*Assumes all new wells will be in the 800 to 900 foot aquifer.

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ENGINEER'S ESTIMATE

North Davis Meadows
Conceptual Monitoring Well

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization	LS	$10,000	1	$10,000
2	Borehole Drilling	LF	$20	1000	$20,000
3	Geophysical (E-Log)	EA	$1,800	1	$1,800
4	Borehole Reaming & Wiping	LF	$20	900	$18,000
5	Well Casing 2-inch Sch. 40 PVC	LF	$4	1631	$6,018
6	Well Screen 2-inch Sch. 40 PVC	LF	$7	40	$268
7	Gravel Envelope & Bentonite Seals	LF	$15	730	$10,950
8	Annular Seal - Sand/Cement Seal	LF	$18	270	$4,860
9	Well Development	EA	$850	5	$4,250
10	2-inch Submersible Pump Rental	LS	$500	1	$500
11	Well Sampling	HR	$100	20	$2,000
12	Surface Completion	LS	$500	1	$500
					$79,146

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ENGINEER'S ESTIMATE

North Davis Meadows
Exploratory Drilling

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization w/ Permit	LS	$2,000	1	$2,000
2	Test Hole Drilling - 6" Minimum	LF	$20	1000	$20,000
3	Geophysical Survey - Robertson Tool	EA	$1,800	1	$1,800
4	Test Hole Abandoment - Sand/Cement Grout	LF	$5	1000	$5,000
					$28,800

ENGINEER'S ESTIMATE

North Davis Meadows CSA
Well 1 Modification

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization	LS	$3,000	1	$3,000
2	Well Casing - 6" Mild Steel	LF	$21	270	$5,670
3	Temporary Gravel Fill	LS	$500	1	$500
4	Neat Cement Annular Seal	LF	$20	270	$5,400
5	Airlift	HR	$275	8	$2,200
6	Test Pump Installation	LS	$3,000	1	$3,000
7	Well and Aquifer Testing	HR	$250	8	$2,000
8	Video Survey	LS	$1,000	1	$1,000
9	Well Disinfection	LS	$500	1	$500
10	New Pump	LS	$8,000	1	$8,000
					$31,270

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ENGINEER'S ESTIMATE

North Davis Meadows CSA
Well 2 Rehabilitation

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization	LS	$6,000	1	$6,000
2	Perforate Existing Well Casing	LF	$30	100	$3,000
3	Well Casing - 8" Mild Steel	LF	$25	432	$10,800
4	Well Screen - 8" Mild Steel Mill Slot	LF	$40	70	$2,800
5	Gravel Envelope	LF	$20	252	$5,040
6	Neat Cement Annular Seal	LF	$20	250	$5,000
7	Airlift	HR	$275	4	$1,100
8	Test Pump Installation	LS	$4,000	1	$4,000
9	Well Development	EA	$5,000	1	$5,000
10	Well and Aquifer Testing	HR	$250	8	$2,000
11	Video and Caliper Surveys	LS	$2,200	1	$2,200
12	Well Disinfection	LS	$500	1	$500
13	New Pump	LS	$18,000	1	$18,000
					$65,440

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ENGINEER'S ESTIMATE

North Davis Meadows CSA
Well 1 Destruction

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization w/ Yolo County Well Permit	LS	$6,000	1	$6,000
3	Perforate Existing Well Casing (STAR)	LF	$30	85	$2,550
4	Neat Cement Annular Seal	LF	$18	490	$8,820
5	Engineering	LS	$5,000	1	$5,000
					$22,370

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ENGINEER'S ESTIMATE

North Davis Meadows CSA
Well 2 Destruction

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization w/ Yolo County Well Permit	LS	$6,000	1	$6,000
3	Perforate Existing Well Casing (STAR)	LF	$30	100	$3,000
4	Neat Cement Annular Seal	LF	$18	502	$9,036
5	Engineering	LS	$5,000	1	$5,000
					$23,036

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ENGINEER'S ESTIMATE

North Davis Meadows CSA
Intermediate Production Well (822 gpm)

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization	LS	$30,000	1	$30,000
2	36-inch O.D. Conductor Casing and Sanitary Seal	LF	$450	50	$22,500
3	Geophysical (E-Log)	EA	$2,500	1	$2,500
4	28-inch Borehole Drilling	LF	$65	450	$29,250
5	16-inch O.D. Steel Well Casing	LF	$100	400	$40,000
6	16-inch O.D. Well Screen	LF	$270	75	$20,250
7	2-inch Dia. Sound Tube Pipe, Sch 40 BSP	LF	$10	300	$3,000
8	3-inch Dia. Gravel Fill Pipe, Sch 40 BSP	LF	$14	280	$3,920
9	Gravel Envelope	LF	$40	230	$9,200
10	Annular Seal	LF	$45	270	$12,150
11	Test Pump Installation	LS	$10,000	1	$10,000
12	Well Development	EA	$20,000	1	$20,000
13	Well and Aquifer Testing (Test Pumping)	HR	$250	24	$6,000
14	Plumbness & Alignment Test	EA	$3,000	1	$3,000
15	Video Camera Survey	LS	$2,500	1	$2,500
16	Site Cleanup and Records	LS	$3,000	1	$3,000
17	Well Disinfection	EA	$1,000	1	$1,000
18	Standby Time	HR	$150	4	$600
19	Pump Station	LS	$290,000	1	$290,000
20	Engineering	LS	$85,000	1	$85,000
					$593,870

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ENGINEER'S ESTIMATE

North Davis Meadows CSA
Deep Production Well (500 gpm)

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization	LS	$30,000	1	$30,000
2	30-inch O.D. Conductor Casing and Sanitary Seal	LF	$400	50	$20,000
3	Geophysical (E-Log)	EA	$2,500	1	$2,500
4	24-inch Borehole Drilling	LF	$55	850	$46,750
5	12-inch O.D. Steel Well Casing	LF	$80	783	$62,640
6	12-inch O.D. Well Screen	LF	$215	110	$23,650
7	2-inch Dia. Sound Tube Pipe, Sch 40 BSP	LF	$10	185	$1,850
8	3-inch Dia. Gravel Fill Pipe, Sch 40 BSP	LF	$14	621	$8,694
9	Gravel Envelope	LF	$35	300	$10,500
10	Annular Seal	LF	$40	600	$24,000
11	Test Pump Installation	LS	$8,000	1	$8,000
12	Well Development	EA	$20,000	1	$20,000
13	Well and Aquifer Testing (Test Pumping)	HR	$250	24	$6,000
14	Plumbness & Alignment Test	EA	$3,000	1	$3,000
15	Video Camera Survey	LS	$2,500	1	$2,500
16	Site Cleanup and Records	LS	$3,000	1	$3,000
17	Well Disinfection	EA	$1,000	1	$1,000
18	Standby Time	HR	$150	4	$600
19	Pump Station	LS	$290,000	1	$290,000
20	Engineering	LS	$85,000	1	$85,000
					$649,684

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ENGINEER'S ESTIMATE

North Davis Meadows CSA
Deep Production Well (822 gpm)

Item No.	Description	Units	Unit Cost Estimate	Quantity	Extended Cost Estimate
1	Project Mobilization/Demobilization	LS	$30,000	1	$30,000
2	36-inch O.D. Conductor Casing and Sanitary Seal	LF	$450	50	$22,500
3	Geophysical (E-Log)	EA	$2,500	1	$2,500
4	28-inch Borehole Drilling	LF	$65	850	$55,250
5	16-inch O.D. Steel Well Casing	LF	$100	783	$78,300
6	16-inch O.D. Well Screen	LF	$270	110	$29,700
7	2-inch Dia. Sound Tube Pipe, Sch 40 BSP	LF	$10	185	$1,850
8	3-inch Dia. Gravel Fill Pipe, Sch 40 BSP	LF	$14	621	$8,694
9	Gravel Envelope	LF	$40	300	$12,000
10	Annular Seal	LF	$45	600	$27,000
11	Test Pump Installation	LS	$10,000	1	$10,000
12	Well Development	EA	$20,000	1	$20,000
13	Well and Aquifer Testing (Test Pumping)	HR	$250	24	$6,000
14	Plumbness & Alignment Test	EA	$3,000	1	$3,000
15	Video Camera Survey	LS	$2,500	1	$2,500
16	Site Cleanup and Records	LS	$3,000	1	$3,000
17	Well Disinfection	EA	$1,000	1	$1,000
18	Standby Time	HR	$150	4	$600
19	Pump Station	LS	$290,000	1	$290,000
20	Engineering	LS	$85,000	1	$85,000
					$688,894

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