TST
CONSULTING ENGINEERS

GREATROCK NORTH WATER AND SANITATION DISTRICT
ENGINEER'S REPORT
April 25, 2014

EDOP Compliance

The second round of quarterly testing has been completed for Alluvial Well No. 1, Alluvial Well No. 2, South Evaporation Pond, and North Evaporation Pond. The results are presented in the attached EDOP Compliance Monitoring sheets (2 pages). The annual report is to be filed with the Solid and Hazardous Waste Program in June of 2014. A copy of the June 5, 2013 annual report is attached for reference (3 pages).

Cla-Val Units at Pump Stations

iSiWest, Inc. has executed the Independent Contractor Agreement and is awaiting a fully-executed copy from the District. iSiWest is aware of the need to coordinate the work with Ramey Environmental Compliance.

Rocking Horse Farms Tank Repainting

A pre-construction meeting was conducted on April 9, 2014. The meeting minutes are attached. I have drafted a change order proposal (COPR) request to install a flanged screen on the tank overflow pipe. Coblaco Services is reviewing the COPR, which may result in a project change order.

Box Elder Creek Ranch Pump Station

The pump station improvements were placed into service on March 13, 2014. Water Technology Group has installed the VFD control pads on the outside of the MCC buckets as requested. I recommend Ramey Environmental Compliance schedule the eleven (11) month warranty inspection to review the installation in advance of March 13, 2015.

Fire Hydrant Maintenance and Repairs

Attached is an updated summary (1 page) of the fire hydrants observed in the Box Elder Creek Ranch, Rocking Horse Farms and the Greatrock North subdivisions. I will solicit cost quotations from independent contractors for corrections.

Pump Station Fire Pumps

Attached is a summary of my research into procuring redundant fire pumps for Box Elder Creek Ranch/Rocking Horse Farms facilities and the Greatrock North pump station (2 pages).

Relocation of Water Meters in Rocking Horse Farms

Associated with the curb stop inspection, exercising, and repairs in the most recent Action Items matrix, Ramey Environmental Compliance is attempting to locate the 12 remaining curb stops. Upon determination that all possible curb stops have been located, a prioritization of the meters and landscaping impacts will need to be discussed with the Board.

Concentrate Disposal and Stream Reclassification

I met with Doug Camrud, of the Water Quality Control Division, on April 15. On April 25, Doug sent me an e-mail reporting on his research of the plans review actions. Doug also indicated that he will discuss the classification of Box Elder Creek with the permits and standards units and have someone contact me.

Other Activities

Blending to Improve Water Quality: On November 11, 2013 TLECC modified the programming code to allow the RO run time to be operator defined. The timer now ranges from 0 to 1,440 minutes (24 hours) and is currently set at 240 minutes (4 hours) – up from the 30 minutes previously established. Ramey Environmental Compliance sampled for total dissolved solids at each tank site in January and March to determine the impact of this change in operation. Below are results:

	March 5, 2014	January 8, 2014	October 28, 2013
Box Elder Creek Ranch	586 mg/l TDS	553 mg/l TDS	677 mg/l TDS
Rocking Horse Farms	543 mg/l TDS	559 mg/l TDS	643 mg/l TDS
Greatrock North	566 mg/l TDS	575 mg/l TDS	594 mg/l TDS

Utility Billings and Energy Costs: TST has initiated tracking of the United Power utility bills and associated water operations. Year-to-date information for usage and billings for the last three years is presented in the attached summary (3 pages). Furthermore, information associated with water operations and energy usage/billings per 1,000 gallons of water is also presented.

Monthly Flow Reports: TST is developing graphs to depict the daily water accounting. Copies of the draft materials for the period from March 27 to April 5 are attached (4 pages) and will be discussed at the Board meeting. There are a variety of formatting issues to be addressed for the final product.

			2013		2014				2015				2016	
			QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2
						ALV-1								
		120206			140311	140402								
Parameter	Unit	Baseline			Results	Results								
Sodium	mg/L	93			113.6	103.2								
Calcium	mg/L	97			131.5	122.0								
Magnesium	mg/L	17			23.3	21.5								
Iron	mg/L	0.007			0.012	<0.005								
Chloride	mg/L	120			193.7	170.45								
Sulfate	mg/L	133			207.54	197.01								
Alkalinity	mg/L	162			170.1	179.1								
TDS	mg/L	659			856	761								
Total Hardness (as CaCO3)	mg/L	309			424.2	393.1								
pH	s.u.	6.95			7.58	7.56								
Fluoride	mg/L	0.68			0.83	0.59								
						ALV-2								
		120206			140311	140402								
Parameter	Unit	Baseline			Results	Results								
Sodium	mg/L	99			115.3	117.2								
Calcium	mg/L	126			151.9	152.5								
Magnesium	mg/L	25			30.1	30.4								
Iron	mg/L	0.013			0.005	<0.005								
Chloride	mg/L	102			118.35	135.70								
Sulfate	mg/L	237			310.15	293.88								
Alkalinity	mg/L	198			255.7	261.1								
TDS	mg/L	816			958	1008								
Total Hardness (as CaCO3)	mg/L	412			503.3	505.9								
pH	s.u.	7.39			7.78	7.67								
Fluoride	mg/L	0.61			0.77	0.68								

			2013		2014				2015				2016	
			QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2
South Pond														
		120310			140305	140402								
Parameter	Unit	Baseline			Results	Results								
Sodium	mg/L	1412			1075.0	1404.0								
Calcium	mg/L	425			118.1	95.3								
Magnesium	mg/L	19			125.2	146.7								
Iron	mg/L	0.1			0.016	0.073								
Chloride	mg/L	1200			955.92	1166.48								
Sulfate	mg/L	1625			1210.67	1416.91								
Alkalinity	mg/L	1025			366.0	418.0								
TDS	mg/L	5707			4021	4746								
Total Hardness (as CaCO3)	mg/L	1142			810.1	841.6								
pH	s.u.	8.89			9.43	9.28								
Fluoride	mg/L	-			2.51	2.74								
North Pond														
					140305	140402								
Parameter	Unit	Baseline			Results	Results								
Sodium	mg/L				727.5	763.8								
Calcium	mg/L				157.2	149.1								
Magnesium	mg/L				134.3	135.0								
Iron	mg/L				0.849	0.295								
Chloride	mg/L				854.97	844.40								
Sulfate	mg/L				1135.43	1129.28								
Alkalinity	mg/L				187.5	173.1								
TDS	mg/L				3392	3534								
Total Hardness (as CaCO3)	mg/L				945.2	927.8								
pH	s.u.				9.21	9.09								
Fluoride	mg/L				2.07	1.51								

OLSSON ASSOCIATES

TECHNICAL MEMO

TO:	Doug Eagleton, P.E.
PHONE:	303-691-4065
FROM:	Andrea Bollinger
RE:	Greatrock North Water and Sanitation District (GNWSD), 2012 Annual Report
DATE:	June 5, 2013
PROJECT #:	012-1297
PHASE:	210

Section 9.3.5 (D) of the Hazardous Material and Waste Management Division's (Division) *Regulations Pertaining to Solid Waste Sites* and Facilities (Regulations) outlines the Annual Report requirements for GNWSD Type B impoundments, also known as the south and north evaporation ponds.

Per the letter dated May 19, 2013 from the Division to Waste Impoundment Facility Owners and Operators regarding *Section 9 Waste Impoundment Regulations Extension for Submittal of 2012 Annual Report*, GNWSD has until June 30, 2012 to submit the Annual Report for their Type B impoundments. Olsson Associates has prepared the 2012 Annual Report on behalf of GNWSD. The five items listed below follow Section 9.3.5 (D) of the Regulations.

(1) Total Volume

A schematic of GNWSD's reverse osmosis (RO) treatment system is provided in Figure 1. Flow from the alluvial wells is metered and is sent to the RO unit. A portion of the water bypasses the RO unit through a metered pipe and the remainder of the water is treated by the RO unit. The RO permeate is combined with the bypassed water where it is blended with metered raw water, disinfected, and sent to the distribution system.

Based on the RO manufacture, the RO unit is 75% efficient and this is the basis for calculating the RO concentrate volume. A 75% efficient unit results in 25% of the RO influent becoming RO concentrate. To calculate the total volume of concentrate, SCADA records for operation were utilized and determined by the following process:

4690 Table Mountain Drive, Suite 200
Golden, CO 80403
TEL 303.237.2072
FAX 303.237.2659
www.olssonassociates.com

The difference between the yearly metered alluvial well flow (FM1) and the RO bypass flow (FM2) equals the RO influent. The RO influent multiplied by 25% equals the RO Concentrate. Table 1 provides the calculated 2012 yearly totals for RO concentration.

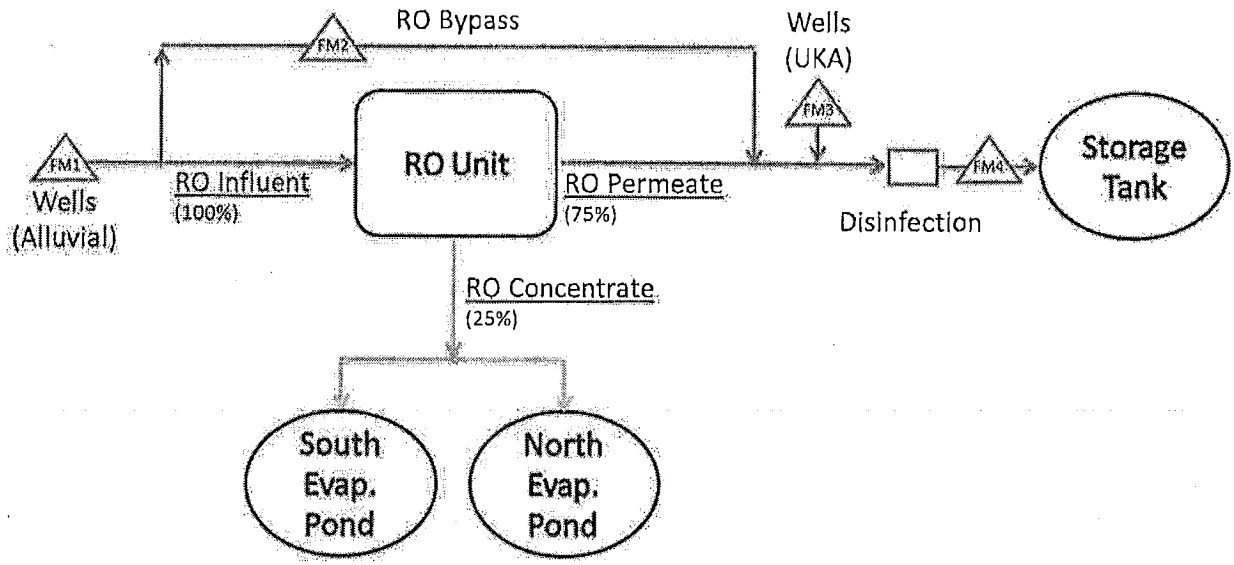

Figure 1: GNWSD Process Schematic

Table 1: 2012 Yearly Concentrate Totals

Alluvial Well Total (FM1) Gallons	RO Bypass (FM2) Gallons	Total RO Influent (FM1 - FM2) Gallons	Concentrate (25% of Total RO Influent) Gallons
42,402,000	17,780,000	24,622,000	6,155,500

(2) Concentrate Removed

Typically, concentrate is only removed via evaporation. In order to calculate evaporation rate, data was gathered from the Northern Colorado Water Conservancy District databases for three climate stations located within a thirty-two mile radius of the District. Assuming the maximum pond surface area, the approximate yearly pond evaporation is 5,421,000 gallons per year.

As a means of further reducing the RO Concentrate, GNWSD entered into an intergovernmental agreement in 2012 with the Town of Hudson Wastewater Treatment Facility (WWTF). Limited quantities of RO concentrate were trucked to the WWTF for treatment. However, issues arose at the WWTF, unrelated to the RO concentrate, which resulted in cancelling the agreement for the foreseeable future. Table 2 provides a summary of the concentrate removed from the evaporation ponds in 2012 via yearly evaporation and quantity of concentrate hauled off site.

Table 2: Estimated Quantities of Concentrate Removed in 2012

Pond Evaporation GPY	Haul to WWTF GPY
5,421,000	222,600

(3) Unplanned Releases

Not applicable, GNWSD did not have any unplanned releases in 2012.

(4) Third Party Wastes

Not applicable, GNWSD does not receive third party waste.

(5) Annual Ground Water Monitoring Report

During the 2012 operating year an approved ground water operating plan was not in place. However, GNWSD has submitted an Engineering, Design, and Operation Plan (EDOP) to the Division outlining the proposed Ground Water Monitoring Plan. Once the EDOP and Ground Water Monitoring Plan are approved, GNWSD will begin collecting data per the approved plan and will submit the available data in the 2013 Annual Report.

CC: Lisa Johnson, District Manager
Jeff Rabas, District Operator
Project file: F:\Projects\012-1297 - EDOP\Documents\Reports\2012 Annual Report\2013-06-05_Technical Memo_2012 Annual Report.doc

GNWSD - 2014 Fire Hydrant Evaluation

Subdivision: Box Elder Creek Ranch

Date	Location	Manufacturer	Year Mfg	Working Pressure	Bury Depth	Nozzle Distance Above Groundline (inches)*		
						Left Hose Nozzle	Pumping Hose Nozzle	Right Hose Nozzle
140211	16545 Timber Cove Street	Waterous	2000	250 psi	5'-6"	9.0	10.0	10.5
140211	16401 Timber Cove Street	Waterous	2000	250 psi	5'-6"	11.0	11.0	10.5
140211	16330 Timber Cove Street	Waterous	2000	250 psi	5'-6"	10.0	9.0	9.5
140211	16461 Tree Haven Street	Waterous	2000	250 psi	5'-6"	12.0	10.5	10.5
140211	16550 Tree Haven Street	Waterous	2000	250 psi	5'-6"	8.5	8.5	9.0
140211	16670 Tree Haven Street	Waterous	2000	250 psi	5'-6"	12.0	11.0	11.0

Subdivision: Rocking Horse Farms

Date	Location		Year Mfg	Working Pressure	Bury Depth	Nozzle Distance Above Groundline (inches)*		
						Left Hose Nozzle	Pumping Hose Nozzle	Right Hose Nozzle
140423	16385 Jalna Court**	Mueller Super Centurion 250	1999	250	Unknown	8.5	9.0	9.0

Subdivision: Greatrock North

Date	Location		Year Mfg	Working Pressure	Bury Depth	Nozzle Distance Above Groundline (inches)*		
						Left Hose Nozzle	Pumping Hose Nozzle	Right Hose Nozzle
140423	16225 Great Rock Way**	Waterous	1997	250	5'-6"	12.0	13.0	12.5
140423	160th Court and Electra Street**	Waterous	1997	250	5'-6"	16.5	18.0	16.0
140423	28925 East 160th Place**	Waterous	1988	150	5'-0"	14.0	15.0	15.5
140306	28925 East 160th Place	Waterous	Per J. Wyckoff e-mail, this hydrant appears to have been hit and is leaning to the west.					

* Waterous recommends the nozzle elevation (centerline) above groundline be no less than 18 inches.

** Identified via e-mail from L. Johnson on April 14, 2014

Greatrock North Water and Sanitation District
Fire Pump Contingency

Box Elder Creek Ranch and Rocking Horse Farms Pump Stations

The existing Box Elder Creek Ranch fire pump is a Goulds 18BF2U2B0 (75 horsepower, 12.5" impeller).

The existing Rocking Horse Farms fire pump is a Goulds 18BF2T2C0 (60 horsepower, 12.3125" impeller).

A spare Box Elder Creek Ranch fire pump could be maintained as a redundant arrangement for both pump stations. A valve on the fire pump discharge pipe at Rocking Horse Farms could be used to control the flow, or the larger arrangement would simply result in some additional flow from this pump station.

The Goulds 18BF2U2B0 is a cast iron, bronze fitted, end-suction flanged pump in the Goulds 3656M line.

The model 3656 offers close coupled design for space saving and simplified maintenance.

The 18BF2U2B0 product code is also the catalog number for the pump. The meaning of each digit in the product code is shown below.

18BF = 6x8-13 Pump Size (BF = bronze fitted)
2 = 60 Hz, 4 pole, 1750 RPM Driver
U = 75 HP Rating
2 = 3 Phase, ODP Motor
B = 12-1/2 inch Impeller Code
0 = Seal Code Materials
- Carbon Rotary
- Ceramic Stationary
- BUNA-N Elastomers
- 316 SS Metal Parts

The pump weighs 290 pounds and the motor weighs 1005 pounds.

The pump/motor footprint (for storage) is 47.5" (L) x 28.625" (W). The pump/motor height is 20".

The budgetary price for the pump/motor arrangement is $10,000 ($8,850.00 quoted by Quadna on 02/19/14).

The lead time is around three to six weeks (provided by Quadna on 03/20/14).

On April 21, 2014, Water Technology Group quoted an alternate spare configuration – a Model 10AI/BF / Size 4x5-8, 3500 RPM, 75 horsepower unit – for $13,500, with a lead time of 10 weeks.

Greatrock North Water and Sanitation District
Fire Pump Contingency

Greatrock North Pump Station

The existing Greatrock North fire pump is a Goulds VIT-CATM 12RJLC 4-stage vertical turbine pump (60 horsepower, 7.8125" impeller).

A spare Greatrock North fire pump arrangement (bowls, column, discharge head, and motor) could be procured from Water Technology Group.

The total weight of the unit (bowls, column, discharge head, and motor) is 2,059.2 pounds.

The pump and column measure 15 feet in length. The discharge head is approximately 2 feet in diameter and approximately 18 inches in height. The motor is approximately 3 feet in height.

The budgetary price for the arrangement is $24,000 ($21,232.00 quoted by Water Technology Group on 04/21/14).

The lead time is around eight to 10 weeks (provided by WTG on 04/21/14).

Usage (KWH)

	Alluvial Wells			BECR			GN			RHF		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Jan	2970	2136	2341	13520	13680	15360	4200	5400	5440	3960	17520	2400
Feb	2177	1832	1972	12520	12240	14400	5040	4840	5160	3840	11520	2200
Mar	2724	1854	2329	11960	11400	11600	4200	5080	4720	3400	10720	2080
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
YTD	7871	5822	6642	38000	37320	41360	13440	15320	15320	11200	39760	6680

Billing Amount

	Alluvial Wells			BECR			GN			RHF		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Jan	$ 547.88	$ 358.98	$ 277.72	$ 1,651.60	$ 1,725.12	$ 1,108.54	$ 467.45	$ 670.70	$ 435.45	$ 372.28	$ 1,596.64	$ 226.87
Feb	$ 532.28	$ 341.31	$ 236.47	$ 1,621.27	$ 792.21	$ 1,057.09	$ 705.94	$ 364.19	$ 412.92	$ 512.12	$ 899.32	$ 208.26
Mar	$ 553.69	$ 223.28	$ 276.38	$ 1,645.34	$ 823.97	$ 862.64	$ 643.23	$ 422.21	$ 391.36	$ 520.05	$ 894.39	$ 202.38
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
YTD	$ 1,633.85	$ 923.57	$ 790.57	$ 4,918.21	$ 3,341.30	$ 3,028.27	$ 1,816.62	$ 1,457.10	$ 1,239.73	$ 1,404.45	$ 3,390.35	$ 637.51

Water Operations (gallons)

	Alluvial Wells			BECR			GN			RHF		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Jan			1,720,830			2,144,122			542,401			443,608
Feb			1,507,059			1,886,973			424,378			349,397
Mar			1,664,857			1,977,083			383,936			401,330
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
YTD			4,892,746			6,008,178			1,350,715			1,194,335

Water Operations (KWH/1000 gallons)

	Alluvial Wells			BECR			GN			RHF		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Jan			1.3604			7.1638			10.0295			5.4102
Feb			1.3085			7.6313			12.1590			6.2966
Mar			1.3989			5.8672			12.2937			5.1828
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
YTD			1.3575			6.8840			11.3421			5.5931

Water Operations ($/1000 gallons)												
	Wells			BECR			GN			RHF		
	2012	2013	2014	2012	2013	2014	2012	2013	2014	2012	2013	2014
Jan			$ 0.1614			$ 0.5170			$ 0.8028			$ 0.5114
Feb			$ 0.1569			$ 0.5602			$ 0.9730			$ 0.5961
Mar			$ 0.1660			$ 0.4363			$ 1.0193			$ 0.5043
Apr												
May												
Jun												
Jul												
Aug												
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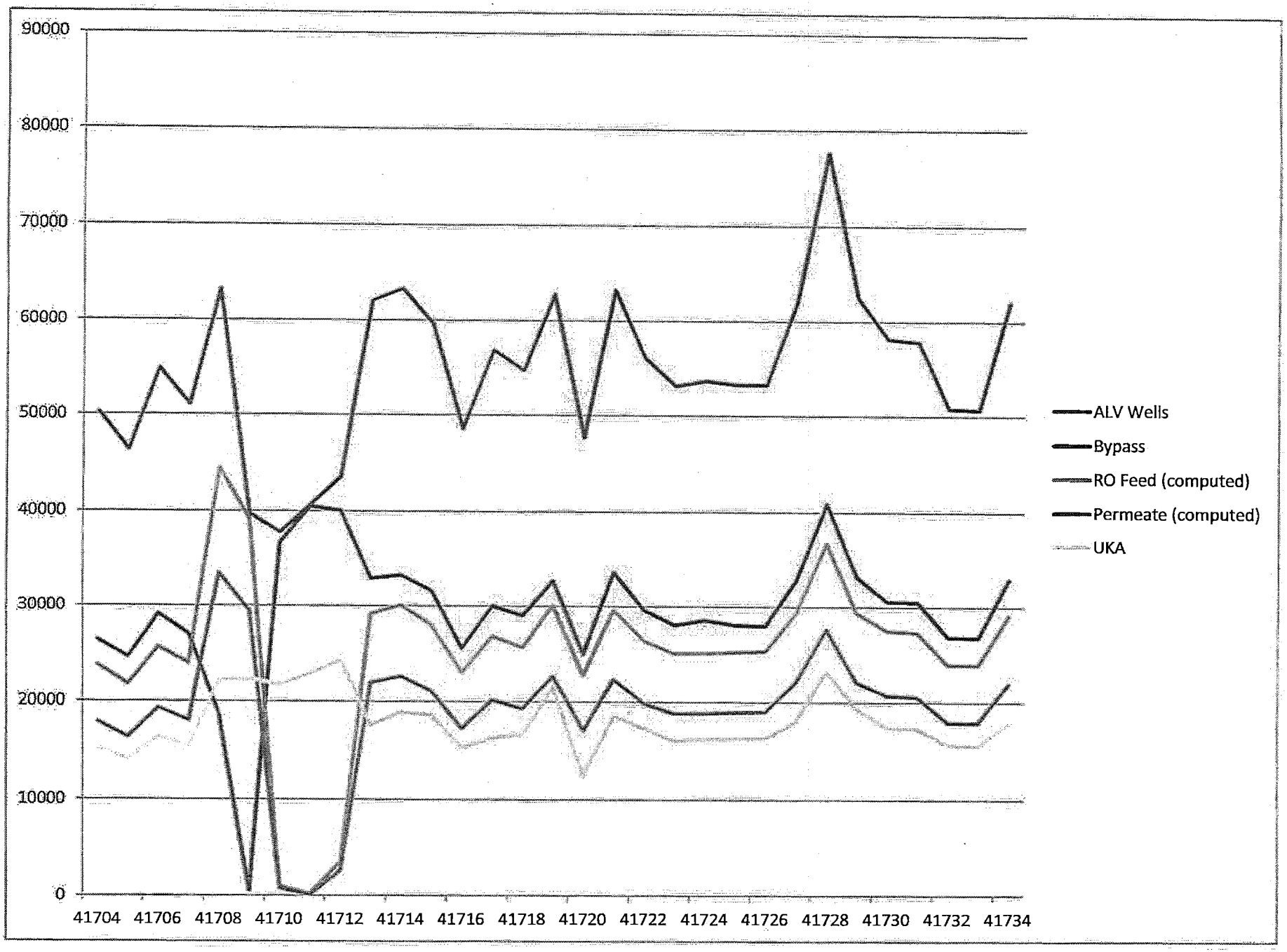
Nov												
Dec												
YTD	0	0	$ 0.1616	0	0	$ 0.5040	0	0	$ 0.9178	0	0	$ 0.5338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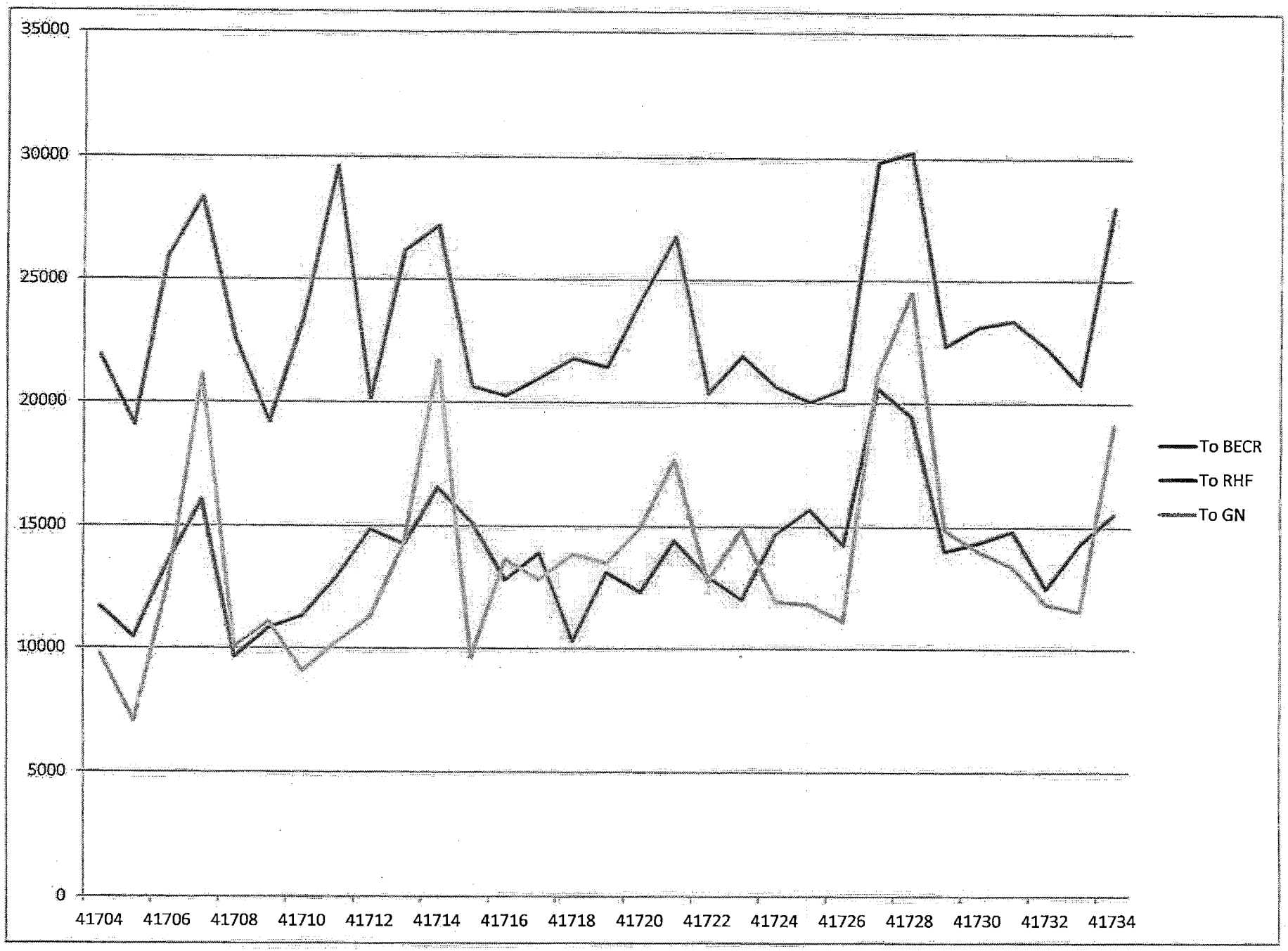
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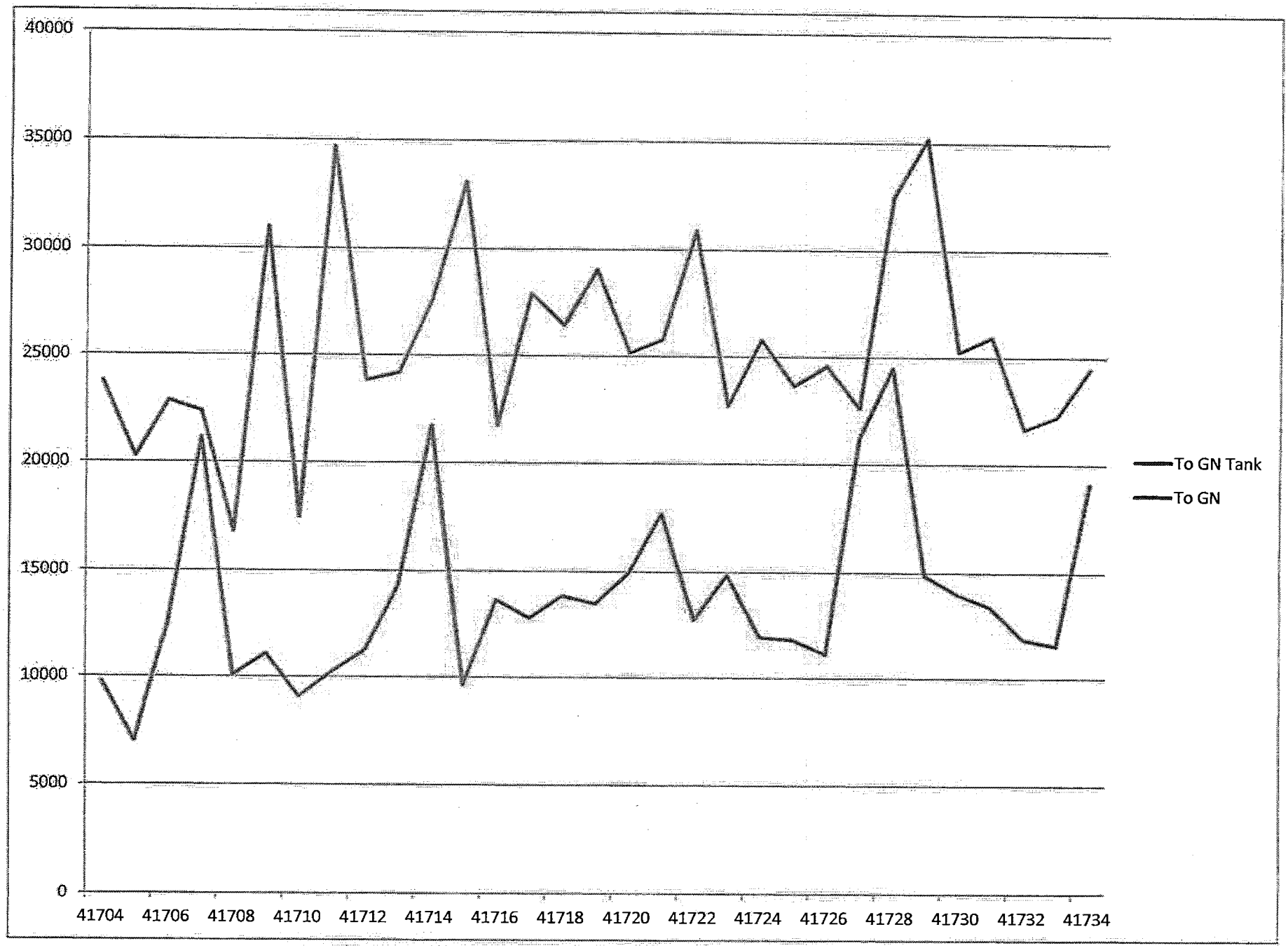
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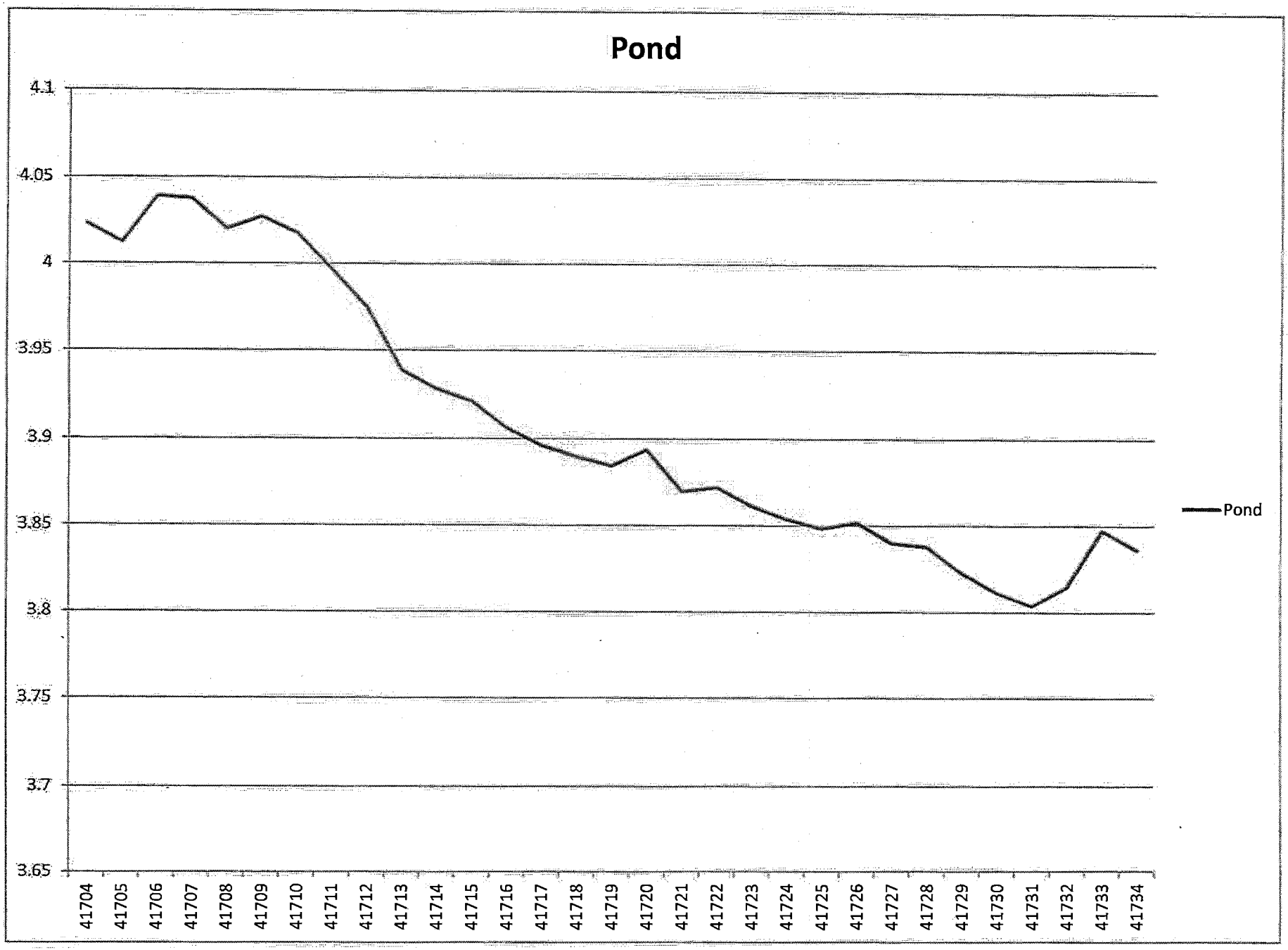
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