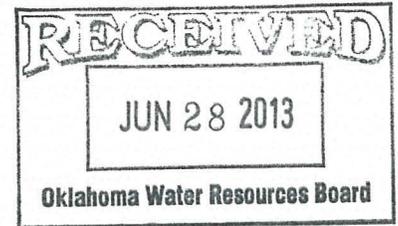




DOLESE®

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25 June 2013
13-ED-304



Mr. Kent Wilkins, Assistant Chief
Planning and Management Division
Oklahoma Water Resources Board
3800 North Classen Boulevard
Oklahoma City, OK 73118

**RE: Water Monitoring Plan Report, 1st Quarter 2013, for Dolese Bros. Co.
Davis Quarry, Murray County, Oklahoma**

Dear Mr. Wilkins:

According to the Oklahoma Water Resources Board's Title 785, Chapter 30, Subchapter 15, Part 4, *Mines with Preexisting Exemptions*, Dolese Bros. Co. Davis Quarry qualifies as a mine with a preexisting exemption. As part of maintaining this exemption status, the regulation requires us to do the following:

1. Adopt and implement a plan to monitor and report to the Board the accumulation and disposition of pit water during the previous calendar year;
2. Make quarterly and annual reports of the measured or reasonably estimated groundwater and surface water volumes, separately stated, entering the pit, of the water that is diverted from the pit, of the disposition of the water from the pit, and of the consumptive use of the water from the pit on or before the deadlines provided by Title 82 of Oklahoma Statutes, § 1020.2(E)(1); and
3. At any time after March 31, 2015, demonstrate to the satisfaction of the Board within the pertinent report or reports that the mine has not consumptively used during the previous twelve-month period, from the mining site, an amount of groundwater which combined with any amounts used from permitted groundwater wells exceeds the MEPS¹. Such demonstration may require providing to the Board a copy of the mine's monitoring plan and all of the data collected and procedures used to support the calculations and results reported.

As part of this process, you will recall that we met with you and other members of the OWRB staff a couple of times to review our progress and draft plans, and to review the general concept of the water monitoring procedures that we planned to use at the subject facility in order to comply with the above-stated requirements. Based on these discussions, we believe that we were all in agreement that our plans for our monitoring and reporting procedures were on the right track, and that this quarry could maintain its exemption, provided we comply with the requirements outlined in Items #1-3, shown above.

¹ Mine's Equal Proportionate Share

Based on the plan that we have adopted and implemented to monitor and report the accumulation and disposition of pit water, and based on the timely submittal of this First Quarterly Report for 2013 (1QTR13), we believe that we are currently in full compliance with all of the regulations that allow us to maintain our preexisting exemption.

Enclosed please find a Water Flow Diagram, labeled Diagram #1, that shows detailed water flows that were measured or reasonably estimated throughout the facility during 1QTR13. All of the calculations pertinent to obtaining each of these water flow figures have been included in this 1QTR13 submittal, as you requested during our most recent consultation with your staff. As we also agreed, beginning with the second quarterly submittal of 2013, we will include only the summary of the required information in the reports.

The provisions of Item #3, shown above, will eventually require that we demonstrate to the satisfaction of the Board that we have not consumptively used during the previous twelve-month period, from the mining site, an amount of groundwater which combined with any amounts used from permitted groundwater wells exceeds the MEPS. We are currently preparing for these annual summaries by generating this first quarter summary, which is a component of the upcoming annual summary. After analyzing this quarterly summary report, we were pleased to realize that our consumptive use of groundwater from the Arbuckle Simpson Aquifer (ASA) region is very low, and just a fraction of the quantity that we are entitled to use by law.

Please be assured that Dolese Bros. Co. Davis Quarry will continue to manage the waters of the ASA in a responsible manner while conducting mining operations at the site, to always search for better ways to manage these valuable waters, and to never consume more than our share of groundwater.

Please contact me if you have any questions or comments concerning this submittal. Thank you.

Sincerely,
DOLESE BROS. CO.



Daniel E. Becker, P.E.
Environmental Engineer

dh
Enclosures

Consumptive Use Summary for 1QTR13

Activity or Location	Amount of Pit Water Used, Acre-Feet	Percent Ground-Water	Groundwater Component, Acre-Feet
1 North Water Well	0.00	All	1.21
2 South Water Well	0.00	All	0.23
3 Material Moisture Hauled from Site	3.09	12.35% *(0.1235)	0.38
4 Land Application for Roadway Dust Suppression	7.35	12.35% *(0.1235)	0.91
5 Evaporation from Mine Pit	0.20	20.45% *(0.2045)	0.04
For 1QTR13, Total Groundwater Consumption from ASA at Davis Quarry =			2.77 Acre-Feet

Determination by Location of Groundwater Rights

See attached aerial photograph, *Davis Quarry, Location of ASA Boundary - Subcrop*, that shows the location of the Arbuckle-Simpson Aquifer Subcrop boundary across the Davis Quarry.

Davis Quarry Groundwater Rights

From Acreage ON the Arbuckle-Simpson Aquifer

And Included in the ASA Groundwater Rights:

$$(1,083 \text{ acres on ASA}) * (0.2 \text{ ac-ft/acre}) = 216.6 \text{ acre-feet ON the ASA}$$

From Acreage OFF the Arbuckle-Simpson Aquifer

And Excluded from the ASA Groundwater Rights:

$$(937 \text{ acres off ASA}) * (2.0 \text{ ac-ft/acre}) = 1,874 \text{ acre-feet OFF the ASA}$$

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PAGE -0- OF

LOCATION DAVIS QUARRY

PROJECT _____

DATE 30 MAY '13BY DANIEL E. BECKER DEPT. _____

CHECKED BY _____

SUBJECT DESCRIPTION OF "PLANIMETER" USED TO MEASURE SURFACE AREASINSTRUMENT DESCRIPTION:→ COMMON NAME OF INSTRUMENT -

• PLANIMETER

→ TYPE -• GEBRUDER HAFF G. M. B. H. PFRONTEN (BAYERN)
PLANIMETER NO 3156→ LOCATION MANUFACTURED

• GERMANY

→ SERIAL NO.

• 10572

NOTE:

THE ABOVE DESCRIBED INSTRUMENT (PLANIMETER) WAS USED TO MEASURE VARIOUS SURFACE AREAS ON AERIAL PHOTOS. MANY OF THE FOLLOWING PAGES SHOW DATA COLLECTED BY THE PLANIMETER.

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LOCATION DAVIS QUARRY

PROJECT _____

DATE 30 MAY 13

BY DANIELE BECKER

DEPT. _____

CHECKED BY _____

SUBJECT SURFACE AREA CALCULATIONS OF WATERSHED FOR QUARRY AREA
(EXCLUDING MINE PIT ITSELF)

PLANIMETER READINGS

SCALE → 1" = 300'

START	0.00	} AVERAGE = 56.73
	56.75	
	113.52	
	170.19	

56.75
56.77
56.67

$a = 56.73$

$$y = \frac{S}{200} = \frac{300}{200} = 1.5 = y$$

$$(y^2)(a) = A$$

$$(1.5^2)(56.73) = 127.64 = A$$

$A_{\text{WATERSHED WEST QUARRY}} = 127.64 \text{ ACRES}$

	0.00	} AVERAGE = 30.90
	30.96	
	61.78	
	92.70	

30.96
30.82
30.92

$a = 30.90$

$$y = \frac{S}{200} = \frac{300}{200} = 1.5 = y$$

$$(y^2)(a) = A$$

$$(1.5^2)(30.90) = 69.53 = A$$

$A_{\text{WATERSHED CENTRAL QUARRY}} = 69.53 \text{ ACRES}$

	0.00	} AVERAGE = 25.76
	25.78	
	51.62	
	77.33	

25.78
25.84
25.71

$a = 25.76$

$$y = \frac{S}{200} = \frac{300}{200} = 1.5 = y$$

$$(y^2)(a) = A$$

$$(1.5^2)(25.76) = 58.01 = A$$

TOTAL WATERSHED AREA OF MINE PIT
127.64 ACRES
69.53 ACRES
57.72 ACRES
254.89 ACRES

$A_{\text{WATERSHED EAST QUARRY W/O MINE PIT}} = 58.01 \text{ ACRES}$

$A_{\text{WATERSHED EAST QUARRY W/O MINE PIT}} = 57.72 \text{ ACRES}$
(SEE NEXT PAGE FOR MINE PIT CALCS)

LOCATION DAVIS QUARRY PROJECT _____ DATE 30 MAY '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT AVERAGE SURFACE AREA OF MINE PIT

QUARRY SUPERINTENDENT ART FAULKNER OBSERVED THE "MINE PIT" NEARLY EVERY DAY OF THE QUARTER (1 QTR '13). HE STATED THERE WAS VERY LITTLE FLUCTUATION IN THE SIZE OF THE SURFACE AREA OF THE WATER IN THE MINE PIT. THE ONLY EXCEPTION WAS WHEN THEY HAD HEAVY RAINS, AND IT ONLY TOOK A FEW DAYS TO RETURN THE WATER LEVEL TO "NORMAL" BY PUMPING.

WHEN THE MINE PIT BEGINS TO TAKE ON WATER DURING A STORM EVENT, THE PUMP(S) ARE TURNED ON TO DRAIN THE MINE PIT TO THE NORMAL LEVEL. THE WATER FROM THE MINE PIT IS ALWAYS PUMPED TO THE "FRESH WATER LAKE" WHERE IT IS STORED UNTIL NEEDED.

BELOW ARE THE ESTIMATED SURFACE AREAS OF THE WATER IN THE MINE PIT DURING THE FIRST QUARTER OF 2013 — MEASURED AROUND THE FIRST OF EACH MONTH. APPROXIMATE MEASUREMENTS AND A SKETCH ARE INCLUDED IN THIS SUBMITTAL PACKAGE, TITLED "DIMENSIONS OF MINE PIT ON 02 JAN '13 & OTHER PONDS," AND "DIMENSIONS OF MINE PIT ON 01 FEB '13 & OTHER PONDS," AND "DIMENSIONS OF MINE PIT ON 01 MAR '13 & OTHER PONDS"

DATE	MINE PIT WATER SURFACE AREA
02 JAN 2013	0.37 ACRES
01 FEB 2013	0.145 ACRES
01 MAR 2013	$(0.129 \text{ ac}) \left(\frac{26}{31}\right) + (1.55 \text{ ac}) \left(\frac{5}{31}\right) = 0.358 \text{ AC (AVG.)}$

TOTAL (AVG.) = 0.291 ACRES AVERAGE FOR 1 QTR '13

LOCATION DAVIS QUARRY PROJECT _____ DATE 30 MAY '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT SURFACE AREA OF WATERSHED OF FRESHWATER LAKE AND SURFACE AREA OF FRESH WATER LAKE

INCL. F.W.L.

SURFACE AREA OF WATERSHED OF FRESH WATER LAKE MINUS SURFACE AREA OF FRESH WATER LAKE

PLANIMETER READINGS

START	0.00	} 34.87	} AVG = 34.91	
	34.87			} 34.96
	69.83				} 34.91
	104.74			

$a = 34.91$

$$r = \frac{S}{200} = \frac{300}{200} = 1.5 = r$$

$$(r^2)(a) = A$$

$$(1.5^2)(34.91) = 78.55 = A$$

$A_{\text{WATERSHED FRESH WATER LAKE W/F.W.L. INCLUDED}} = 78.55 \text{ ACRES}$

SURFACE AREA OF FRESH WATER LAKE (F.W.L.)

AN AERIAL PHOTO OF THE SITE IS FLOWN ONCE PER YEAR IN THE FALL. WE USED A GEBRUDER HAFF PFRONTEN PLANIMETER NO. 315b (MADE IN GERMANY) TO MEASURE THE SURFACE AREAS OF THE FRESH WATER LAKE ON TWO AERIAL PHOTOS IN WHICH THE WATER ELEVATION WAS ESTIMATED. A GRAPH (ATTACHED TO THIS REPORT) WAS DEVELOPED WITH THE TWO (2) KNOWN DATA POINTS — AND THIS GRAPH WILL BE USED TO ESTIMATE THE SURFACE AREA OF THE FRESH WATER LAKE WHEN THE WATER ELEVATION IS KNOWN. A BENCHMARK WAS ESTABLISHED NEAR THE BANK OF THE LAKE FOR EASY ACCESS. THE ELEVATION OF THE FRESH WATER LAKE WILL BE SURVEYED ONCE A MONTH, AND USED TO DETERMINE THREE (3) SURFACE AREAS EACH QUARTER. THEN, THE THREE SURFACE AREAS WILL BE AVERAGED TO ARRIVE AT THE AVERAGE ACREAGE OF THE FRESH WATER LAKE FOR THE QUARTER.

02 JAN '13	— 25.92 AC.	} AVG. = 26.30 AC
01 FEB '13	— 26.16 AC	
01 MAR '13	— 26.87 AC.	

$$A_{\text{F.W.L. 1 QTR 13}} = 26.30 \text{ AC}$$

$$A_{\text{WATERSHED OF F.W.L. 1 QTR 13}} = 52.25 \text{ AC}$$

LOCATION DAVIS QUARRY

PROJECT

DATE 04 JUN '13

BY DANIEL E. BECKER

DEPT.

CHECKED BY

SUBJECT SURFACE AREA OF SETTLING POND & WATERSHED OF SETTLING POND

(EXCLUDING SETTLING POND)

PLANIMETER READINGS

START	0.00	} 4.58	} AVG. = 4.58	
	4.58			} 4.57
	9.15				} 4.58
	13.73					a = 4.58

$$y = \frac{S}{200} = \frac{300}{200} = 1.5 = y$$

$$(y^2)(a) = A$$

$$(1.5^2)(4.58) = 10.31 = A$$

$$A_{\text{SETTLING POND}} = 10.31 \text{ ACRES}$$

START	0.00	} 8.48	} AVG. = 8.52	
	8.48			} 8.55
	17.03				} 8.54
	25.57					a = 8.52

$$y = \frac{S}{200} = \frac{300}{200} = 1.5 = y$$

$$(y^2)(a) = A$$

$$(1.5^2)(8.52) = 19.18 = A$$

$$A_{\text{WATERSHED OF SETTLING POND INCL. SETTLING POND}} = 19.18 \text{ ACRES}$$

$$A_{\text{WATERSHED OF SETTLING POND}} = 8.87 \text{ ACRES}$$

LOCATION DAVIS QUARRY

PROJECT _____

DATE 04 JUN '13

BY DANIEL E. BECKER DEPT. _____

CHECKED BY _____

SUBJECT ACTUAL RAINFALL & EFFECTIVE RUNOFF

METHOD OF ESTIMATING STORM WATER RUNOFF FROM WATERSHEDS FROM INDIVIDUAL STORM EVENTS:

- USED SCS RUNOFF CURVE NUMBER (CN) METHOD

FORMULA:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

WHERE

Q = RUNOFF (IN.)

P = RAINFALL (IN.)

S = POTENTIAL MAXIMUM RETENTION AFTER RUNOFF BEGINS (IN.)

I_a = INITIAL ABSTRACTION (IN.)
(ALL LOSSES BEFORE RUNOFF BEGINS)

$$I_a = 0.2 S$$

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

$$S = \frac{1000}{CN} - 10$$

- DETERMINE CURVE NUMBER (CN) FOR QUARRY WATERSHED

• CHOOSE HYDROLOGIC SOIL GROUP = "D"

• CHOOSE A COVER DESCRIPTION = GRAVEL STREET OR ROAD

$$\therefore \text{CURVE NUMBER} = \underline{91}$$

SEEMS TO SIMULATE THE WATERSHEDS OF THE THREE DRAINAGE BASINS BEST. MAY NEED TO ADJUST IN THE FUTURE AS MORE DATA IS COLLECTED.

- EXAMPLE: (FOR 0.3" RAINFALL)

$$S = \frac{1000}{91} - 10 = 0.989$$

$$S = 0.989$$

$$Q = \frac{(P - (0.2)(0.989))^2}{(P + 0.8(0.989))} = \frac{(P - 0.1978)^2}{(P + 0.7912)} = \frac{(0.3" - 0.1978)^2}{(0.3" + 0.7912)} = 0.01" \text{ EFFECTIVE RUNOFF}$$

(SEE NEXT PAGE FOR INDIVIDUAL RAIN EVENTS DURING THE FIRST QUARTER (1 QTR 13), AND THE EFFECTIVE RUNOFF AMOUNTS - USING THIS FORMULA.)

- CONTINUED -

LOCATION DAVIS QUARRY

PROJECT _____

DATE 04 JUN '13BY DANIEL E. BECKER

DEPT. _____

CHECKED BY _____

SUBJECT ACTUAL RAINFALL & EFFECTIVE RUNOFF (CONTINUED FROM PREVIOUS PAGE)
& RAIN GAUGE INFORMATIONRAIN GAUGE INFORMATION:→ CURRENTLY USE AN ACURITE MAGNIFYING RAIN GAUGE

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→ THIS RAIN GAUGE WAS INSTALLED ^{AND OPERATED} ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

ACTUAL RAINFALL (IN INCHES)	EFFECTIVE STORM WATER RUNOFF (INCHES)
(8 JAN '13) 0.30	0.01
(9 JAN '13) 0.90	0.29
(10 JAN '13) 0.30	0.01
(12 JAN '13) 0.36	0.01
(29 JAN '13) 0.40	0.03
(7 FEB '13) 0.40	0.03
(10 FEB '13) 0.50	0.07
(12 FEB '13) 1.00	0.36
(20 FEB '13) 1.00	0.36
(21 FEB '13) 0.40	0.03
(25 FEB '13) 1.10	0.43
(9 MAR '13) 0.70	0.17
(22 MAR '13) 0.01	0.00
(31 MAR '13) 0.10	0.01
7.41 INCHES FOR 1QTR 13	1.81 INCHES FOR 1QTR 13

CONCLUSION:

- OF THE 7.41 INCHES OF RAINFALL RECEIVED DURING 1QTR 13, ONLY 1.81 INCHES RAN OFF THE QUARRY FLOOR INTO THE LAKE(S).

LOCATION DAVIS QUARRY

PROJECT

DATE 06 JUN '13

BY DANIEL E. BECKER DEPT.

CHECKED BY

SUBJECT CALCULATE STORM WATER RUNOFF FROM WATERSHED OF MINE PIT, PLUS DIRECT RAINFALL CALCULATIONS INTO MINE PIT FOR 1QTR 13.

CALCULATE WATERSHED OF MINE PIT, EXCLUDING MINE PIT:

$$127.64 \text{ AC} + 69.53 \text{ AC} + (58.01 \text{ AC} - 0.29 \text{ AC}) = 254.89 \text{ AC}$$

CALCULATE STORM WATER RUNOFF DURING 1QTR 13:

$$\left(\frac{1.81 \text{ INCHES OF EFFECTIVE RUNOFF}}{12 \text{ IN}} \right) \left(\frac{1 \text{ FT}}{12 \text{ IN}} \right) (254.89 \text{ AC}) = 38.45 \text{ AC-FT}$$

AVERAGE SURFACE AREA OF MINE PIT (PREVIOUSLY CALCULATED):

$$\text{AREA} = 0.29 \text{ AC.}$$

CALCULATE AMOUNT OF DIRECT RAINFALL INTO MINE PIT:

$$(0.29 \text{ AC}) \left(\frac{7.41 \text{ INCHES OF RAIN}}{12 \text{ IN}} \right) \left(\frac{1 \text{ FT}}{12 \text{ IN}} \right) = 0.18 \text{ AC-FT}$$

CALCULATE AMOUNT OF TOTAL EVAPORATION FROM MINE PIT:

$$(0.29 \text{ AC}) \left(\frac{8.21 \text{ IN.}}{1 \text{ QTR '13}} \right) \left(\frac{1 \text{ FT.}}{12 \text{ IN.}} \right) = \frac{0.20 \text{ AC-FT}}{1 \text{ QTR 13}}$$

NOTE:

A COUPLE OF DETENTION BERMS ARE USED IN THE WEST QUARRY TO SLOW THE RATE OF THE STORM WATER RUNOFF INTO THE MINE PIT. THE PURPOSE OF THESE BERMS IS TO PREVENT A "SURGE" OF WATER FROM ENTERING THE MINE PIT AND INUNDATING OUR STONE PROCESSING EQUIPMENT AND WATER PUMPS. THIS WATER SEEPS THROUGH THE CRUSHED STONE BERMS AND ENTERS THE MINE PIT AT A RATE THAT ALLOWS OUR PUMPS TO KEEP UP WITH THE INFLOW RATE.

LOCATION DAVIS QUARRY

PROJECT

DATE 10 JUNE '13

BY DANIEL E. BECKER

DEPT.

CHECKED BY

SUBJECT CALCULATE DIRECT RAINFALL ENTERING THE FRESH WATER LAKE, EVAPORATION FROM FRESH WATER LAKE, AND RECHARGE TO THE ASA.

(IMPOUNDMENT F01)

AREA OF F.W.L. (AVERAGE FOR 1 QTR 13)

$$\text{AREA}_{\text{JAN}} + \text{AREA}_{\text{FEB}} + \text{AREA}_{\text{MAR}} = \left(\frac{\text{AREA}_{\text{TOTAL}}}{3} \right) = \text{AREA}_{\text{1 QTR 13}}$$

$$25.92 + 26.10 + 26.87 = \frac{78.89}{3} = 26.30 = \text{AREA}_{\text{1 QTR 13}}$$

RAIN GAUGE MEASUREMENT TOTAL FOR 1 QTR 13

= 7.41 INCHES FOR 1 QTR 13.

CALCULATE VOLUME OF DIRECT RAINFALL ENTERING F.W.L.

$$(26.30 \text{ ACRES}) \left(\frac{7.41 \text{ INCHES}}{1 \text{ QTR 13}} \right) \left(\frac{1 \text{ FT}}{12 \text{ IN}} \right) = 16.24 \text{ AC-FT}$$

CALCULATE AMOUNT OF EVAPORATION DURING 1 QTR 13

$$(26.30 \text{ ACRES}) \left(\frac{8.21 \text{ INCHES}}{1 \text{ QTR 13}} \right) \left(\frac{1 \text{ FT}}{12 \text{ IN}} \right) = 17.99 \frac{\text{AC-FT}}{1 \text{ QTR 13}} \quad \text{--- EXEMPT ---}$$

(RECHARGING LAKE)

CALCULATE AMOUNT OF "RECHARGE" TO ASA FROM FWL

FWL RECHARGES AT THE RATE OF 0.0061 FT/DAY (BASED ON ACTUAL MEASUREMENTS)

$$\left(\frac{0.0061 \text{ FT}}{\text{DAY}} \right) (26.30 \text{ ACRES}) = 0.1604 \frac{\text{AC-FT}}{\text{DAY}}$$

DETERMINE AMOUNT OF RECHARGE DURING 1 QTR 13

$$\left(\frac{0.1604 \text{ AC-FT}}{\text{DAY}} \right) (90 \text{ DAYS}) = 14.44 \frac{\text{AC-FT}}{1 \text{ QTR 13}}$$

LOCATION DAVIS QUARRY

PROJECT

BY DANIEL E. BECKER

DEPT.

CHECKED BY

SUBJECT CALCULATE AMOUNT OF STORM WATER RUNOFF ENTERING F.W.L.

WATERSHED OF FRESH WATER LAKE (F.W.L) MINUS AREA OF FWL

$$\text{WATERSHED} = 78.55 \text{ AC} - A_{\text{FWL}} = A_{\text{WATERSHED ONLY}}$$

1QTR13 1QTR13

$$= 78.55 \text{ AC} - 26.30 \text{ AC} = 52.25 \text{ AC} = A_{\text{WATERSHED ONLY}}$$

1QTR13

TOTAL RAINFALL FOR 1QTR13 = 7.41 INCHESTOTAL RUNOFF FOR 1QTR13 = 1.81 INCHESCALCULATE SW RUNOFF DURING 1QTR13 INTO FWL

$$\left(\begin{array}{l} 1.81 \text{ INCHES OF} \\ \text{RUNOFF} \end{array} \right) \left(\frac{1 \text{ FT}}{12 \text{ IN}} \right) (52.25 \text{ AC}) = 7.88 \text{ AC-FT}$$

LOCATION DAVIS QUARRY

PROJECT

DATE 10 JUN '13

BY DANIEL E. BECKER

DEPT.

CHECKED BY

SUBJECT CALCULATE DIRECT RAINFALL ENTERING THE SETTLING POND, SW RUNOFF INTO FWL, EVAP. FROM SETTLING POND, AND RECHARGE TO ASA.

AREA OF SETTLING POND

$$\text{AREA} = 10.31 \text{ ACRES}$$

S.P.

AMOUNT OF DIRECT RAINFALL

RAINGAUGES MEASURED 7.41 INCHES FOR 1 QTR 13

CALCULATE VOLUME OF DIRECT RAINFALL ENTERING SETTLING POND

$$\left(10.31 \text{ ACRES}\right) \left(\frac{7.41 \text{ INCHES}}{1 \text{ QTR 13}}\right) \left(\frac{1 \text{ FT}}{12 \text{ IN}}\right) = 6.37 \text{ AC-FT}$$

CALCULATE VOLUME OF SW RUNOFF ENTERING SETTLING POND

$$\left(1.81 \text{ INCHES}\right) \left(\frac{1 \text{ FT}}{12 \text{ IN.}}\right) \left(\frac{19.18 \text{ AC} - 10.31 \text{ AC}}{\text{(WATERSHED} \begin{matrix} \text{\&POND} \end{matrix} \text{) (POND)}}\right) = 1.33 \text{ AC-FT}$$

CALCULATE EVAPORATION FROM SETTLING POND

- POND TYPICALLY HAS VERY LITTLE WATER IN IT, AND POND WAS DRY DURING THE THREE MONTHLY INSPECTIONS DURING 1 QTR 13. THE WATER PLACED IN THIS POND RETURNS TO THE FWL QUICKLY.
- EVAPORATION IS ASSUMED TO BE NEGLIGIBLE FOR 1 QTR 13.

CALCULATE RECHARGE OF WATER INTO ASA

- IT IS DIFFICULT TO CALCULATE RECHARGE INTO ASA BECAUSE THE POND HAS BEEN DRY FOR MOST OF THE QUARTER.
- UNTIL MORE WATER IS PLACED IN THIS POND, THE RECHARGE WILL BE ASSUMED TO BE NEGLIGIBLE FOR 1 QTR 13.

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DESIGNED TO WORK FOR YOU

Magnifying Rain Gauge

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- Easy to Read
- Easy to Mount
- Water Magnifies Numbers Over 35%

- Fácil Lectura
- Fácil Instalación
- El Agua Magnifica Números Sobre el 35%

Directions:

Designed for magnified readings of over 35% when filled with water, this accurate, versatile rain gauge is graduated in tenths of an inch and in centimeters. It can be mounted on a fence or into the ground. For accurate readings, always place gauge in open area away from buildings, trees or other obstructions.

Instrucciones:

Diseñado para lecturas amplificadas de más del 35% cuando está lleno de agua, este preciso y versátil medidor de lluvia está graduado en décimas de pulgada y en centímetros. Puede montarse sobre una valla o en el suelo. Para lecturas precisas, coloque siempre el medidor en un área abierta lejos de edificios, árboles u otras obstrucciones.

Limited One Year Warranty

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Limitado a Un Año de Garantía

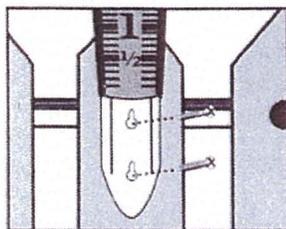
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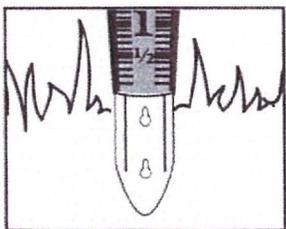
Teléfono Línea de atención al cliente: 877-221-1252

Correo Electrónico: Info@chaney-inst.com

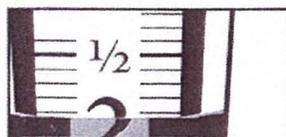
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Side mount
Montaje lateral



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Montaje de tierra



Water magnifies numbers over 35%

El agua magnifica

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DESIGNED TO WORK FOR YOU

Magnifying Rain Gauge



LOCATION DAVIS QUARRY

PROJECT _____

DATE 14 JUN '13BY DANIEL E. BECKER

DEPT. _____

CHECKED BY _____

SUBJECT CONVERTING PAN EVAPORATION TO LAKE EVAPORATIONFORMULA:

$$E_{PAN} (0.70) = E_{LAKE}$$

WHERE

$$E_{PAN} = \text{PAN EVAPORATION (INCHES)}$$

$$E_{LAKE} = \text{LAKE EVAPORATION (INCHES)}$$

EXAMPLE:

$$E_{PAN} (0.70) = E_{LAKE}$$

→ ON 31 MARCH 2013, PAN EVAPORATION FROM SULPHUR, OKLAHOMA SHOWN ON MESONET.ORG EQUALED 0.21 INCHES.

- CONVERT TO LAKE EVAPORATION

$$E_{PAN} (0.70) = E_{LAKE}$$

$$(0.21)(0.70) = E_{LAKE}$$

$$0.147 \text{ INCHES} = E_{LAKE}$$

Evapotranspiration

- Short Crop (Etos) ET Map
- Tall Crop (Etrs) ET Map
- Seasonal Single Site ET Table
- Statewide Single Day ET Table

Seasonal Single Site ET Table

Share Tweet

SULPHUR Choose Options

						PAN EVAP(IN)	Print Table	LAKE EVAP(IN.)
2013-03-31	0.16	0.20	0.15	0.10	0.21		0.147	
2013-03-30	0.14	0.18	0.13	0.09	0.18		0.126	
2013-03-29	0.14	0.20	0.13	0.09	0.19		0.133	
2013-03-28	0.16	0.23	0.15	0.10	0.23		0.161	
2013-03-27	0.21	0.31	0.19	0.13	0.32		0.224	
2013-03-26	0.11	0.14	0.10	0.07	0.14		0.098	
2013-03-25	0.12	0.17	0.11	0.07	0.17		0.119	
2013-03-24	0.12	0.17	0.11	0.07	0.18		0.126	
2013-03-23	0.02	0.03	0.02	0.01	0.03		0.021	
2013-03-22	0.04	0.06	0.04	0.03	0.06		0.042	
2013-03-21	0.14	0.21	0.13	0.08	0.21		0.147	
2013-03-20	0.14	0.20	0.13	0.09	0.20		0.140	
2013-03-19	0.12	0.18	0.12	0.08	0.17			
2013-03-18	0.15	0.21	0.14	0.09	0.20			
2013-03-17	0.06	0.11	0.06	0.05	0.10			
2013-03-16	0.21	0.30	0.20	0.13	0.30			
2013-03-15	0.24	0.35	0.23	0.15	0.35			
2013-03-14	0.26	0.35	0.19	0.13	0.29			
2013-03-13	0.13	0.17	0.12	0.08	0.17			

— CONTINUED ON NEXT PAGE —

Date	Reference ET, Short [in]	Reference ET, Tall [in]	Cool Season Grass ET [in]	Warm Season Grass ET [in]	Pan Evaporation [in]	LAKE EMI (IN)
2013-03-19	0.12	0.18	0.12	0.08	0.17	0.119
2013-03-18	0.15	0.21	0.14	0.09	0.20	0.140
2013-03-17	0.08	0.11	0.08	0.05	0.10	0.070
2013-03-16	0.21	0.30	0.20	0.13	0.30	0.210
2013-03-15	0.24	0.36	0.23	0.15	0.36	0.252
2013-03-14	0.20	0.30	0.19	0.13	0.29	0.203
2013-03-13	0.13	0.17	0.12	0.08	0.17	0.119
2013-03-12	0.11	0.15	0.10	0.07	0.14	0.098
2013-03-11	0.11	0.14	0.10	0.07	0.14	0.098
2013-03-10	0.08	0.12	0.07	0.05	0.11	0.077
2013-03-09	0.06	0.08	0.05	0.03	0.07	0.049
2013-03-08	0.10	0.16	0.10	0.06	0.15	0.105
2013-03-07	0.21	0.32	0.19	0.13	0.33	0.231
2013-03-06	0.10	0.14	0.09	0.06	0.13	0.091
2013-03-05	0.14	0.21	0.13	0.09	0.22	0.154
2013-03-04	0.22	0.33	0.20	0.13	0.34	0.238
2013-03-03	0.19	0.29	0.17	0.12	0.29	0.203
2013-03-02	0.09	0.13	0.09	0.06	0.12	0.084
2013-03-01	0.08	0.11	0.08	0.05	0.11	0.077
2013-02-28	0.11	0.16	0.10	0.07	0.15	0.105
2013-02-27	0.10	0.14	0.09	0.06	0.13	0.091
2013-02-26	0.10	0.15	0.10	0.06	0.15	0.105
2013-02-25	0.04	0.06	0.04	0.03	0.06	0.042
2013-02-24	0.14	0.21	0.13	0.09	0.21	0.147
2013-02-23	0.07	0.09	0.06	0.04	0.08	0.056
2013-02-22	0.07	0.10	0.07	0.04	0.09	0.063
2013-02-21	0.07	0.11	0.07	0.05	0.10	0.070
2013-02-20	0.05	0.07	0.05	0.03	0.07	0.049
2013-02-19	0.10	0.14	0.09	0.06	0.14	0.098
2013-02-18	0.14	0.21	0.13	0.09	0.21	0.147
2013-02-17	0.19	0.29	0.17	0.12	0.28	0.196
2013-02-16	0.08	0.12	0.08	0.05	0.11	0.077
2013-02-15	0.09	0.13	0.08	0.05	0.12	0.084
2013-02-14	0.11	0.16	0.10	0.07	0.14	0.098
2013-02-13	0.08	0.11	0.07	0.05	0.10	0.070

					PAN EVAP. (IN.)	LAKE EVAP. (IN.)
2013-02-12	0.03	0.04	0.03	0.02	0.04	0.028
2013-02-11	0.11	0.16	0.10	0.07	0.15	0.105
2013-02-10	0.12	0.19	0.12	0.08	0.17	0.119
2013-02-09	0.05	0.07	0.05	0.03	0.07	0.046
2013-02-08	0.09	0.13	0.08	0.06	0.12	0.081
2013-02-07	0.06	0.09	0.06	0.04	0.08	0.056
2013-02-06	0.00	-0.01	0.00	0.00	0.00	0.001
2013-02-05	0.03	0.03	0.03	0.02	0.03	0.021
2013-02-04	0.12	0.18	0.11	0.08	0.17	0.119
2013-02-03	0.10	0.15	0.09	0.06	0.13	0.091
2013-02-02	0.09	0.14	0.09	0.06	0.12	0.084
2013-02-01	0.10	0.15	0.09	0.06	0.14	0.098
2013-01-31	0.13	0.20	0.12	0.08	0.17	0.119
2013-01-30	0.07	0.10	0.06	0.04	0.10	0.070
2013-01-29	0.05	0.08	0.05	0.03	0.07	0.049
2013-01-28	0.09	0.14	0.09	0.06	0.13	0.091
2013-01-27	0.04	0.06	0.04	0.03	0.06	0.042
2013-01-26	0.01	0.01	0.01	0.01	0.01	0.007
2013-01-25	0.05	0.07	0.05	0.03	0.07	0.049
2013-01-24	0.06	0.08	0.05	0.03	0.07	0.049
2013-01-23	0.09	0.12	0.08	0.05	0.11	0.077
2013-01-22	0.07	0.11	0.07	0.05	0.10	0.070
2013-01-21	0.09	0.14	0.08	0.06	0.13	0.091
2013-01-20	0.08	0.12	0.07	0.05	0.10	0.070
2013-01-19	0.09	0.15	0.09	0.06	0.12	0.084
2013-01-18	0.09	0.13	0.08	0.05	0.12	0.084
2013-01-17	0.07	0.11	0.07	0.04	0.09	0.063
2013-01-16	0.05	0.07	0.05	0.03	0.06	0.042
2013-01-15	0.04	0.05	0.03	0.02	0.05	0.035
2013-01-14	0.07	0.10	0.06	0.04	0.09	0.063
2013-01-13	0.05	0.07	0.04	0.03	0.07	0.049
2013-01-12	0.09	0.15	0.09	0.06	0.13	0.091
2013-01-11	0.11	0.17	0.10	0.07	0.15	0.105
2013-01-10	0.04	0.06	0.04	0.03	0.05	0.035
2013-01-09	0.02	0.02	0.02	0.01	0.02	0.014
2013-01-08	0.05	0.07	0.04	0.03	0.06	0.042
2013-01-07	0.06	0.09	0.05	0.04	0.07	0.049

					PAN EVAP. (IN.)	LAKE EVAP. (IN.)
2013-01-06	0.07	0.11	0.07	0.04	0.09	0.063
2013-01-05	0.05	0.07	0.04	0.03	0.06	0.042
2013-01-04	0.04	0.06	0.04	0.02	0.05	0.035
2013-01-03	0.04	0.06	0.04	0.02	0.05	0.035
2013-01-02	0.03	0.05	0.03	0.02	0.04	0.028
2013-01-01	0.02	0.02	0.02	0.01	0.02	0.014
2012-12-31	0.01	0.01	0.01	0.01	0.02	8.21"
2012-12-30	0.04	0.06	0.03	0.02	0.05	FOR
2012-12-29	0.04	0.06	0.04	0.03	0.05	1QTR!
2012-12-28	0.02	0.02	0.02	0.01	0.02	
2012-12-27	0.02	0.02	0.01	0.01	0.02	
2012-12-26	0.03	0.05	0.03	0.02	0.04	
2012-12-25	0.03	0.04	0.03	0.02	0.04	
2012-12-24	0.07	0.11	0.07	0.04	0.09	
2012-12-23	0.06	0.08	0.05	0.04	0.07	
2012-12-22	0.12	0.20	0.11	0.07	0.18	
2012-12-21	0.09	0.14	0.08	0.05	0.12	
2012-12-20	0.10	0.17	0.10	0.06	0.17	
2012-12-19	0.11	0.17	0.10	0.07	0.15	
2012-12-18	0.08	0.12	0.07	0.05	0.10	
2012-12-17	0.06	0.08	0.05	0.03	0.07	
2012-12-16	0.12	0.19	0.11	0.07	0.16	
2012-12-15	0.10	0.17	0.10	0.06	0.15	
2012-12-14	0.09	0.15	0.09	0.06	0.13	
2012-12-13	0.14	0.22	0.13	0.08	0.20	
2012-12-12	0.09	0.14	0.08	0.05	0.12	
2012-12-11	0.05	0.07	0.04	0.03	0.06	
2012-12-10	0.05	0.07	0.04	0.03	0.06	
2012-12-09	0.04	0.06	0.04	0.03	0.06	
2012-12-08	0.03	0.04	0.03	0.02	0.03	
2012-12-07	0.02	0.03	0.02	0.02	0.03	
2012-12-06	0.08	0.13	0.08	0.05	0.11	
2012-12-05	0.07	0.10	0.06	0.04	0.09	
2012-12-04	0.13	0.21	0.12	0.08	0.19	
2012-12-03	0.13	0.21	0.13	0.08	0.19	
2012-12-02	0.12	0.18	0.11	0.07	0.16	
2012-12-01	0.13	0.20	0.12	0.08	0.18	

DOLESE

PAGE 1 OF

LOCATION DAVIS QUARRY

PROJECT _____

DATE 02 JAN '13BY DANIEL E. BECKER

DEPT. _____

CHECKED BY _____

SUBJECT DIMENSIONS OF "MINE PIT" ON 02 JANUARY 2013
& OTHER PONDS

MINE PIT -

02 JANUARY 2013

SHAPE OF MINE PIT : IRREGULAR

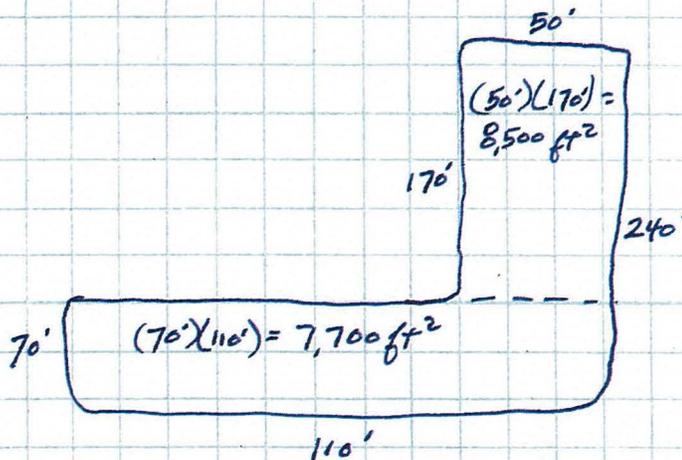
LENGTH OF MINE PIT : SEE SKETCH

WIDTH OF MINE PIT : SEE SKETCH

PRESENT AT SITE

DAN BECKER

ART FAULKNER

NOTE:SHAPE WAS SIMPLIFIED
FOR CALCULATION PURPOSES.

$$8,500 \text{ ft}^2 + 7,700 \text{ ft}^2 = 16,200 \text{ ft}^2 \left(\frac{1 \text{ acre}}{43,560 \text{ ft}^2} \right) = 0.37 \text{ ACRES}$$

IMPONDMENT FO1 - (RECHARGE LAKE)

• 25.92 ACRES

(USED PLANIMETER)

ELEVATION \approx 1,021.19'

IMPONDMENT FO2 -

• DRY, NO SIGNS OF WATER

IMPONDMENT FO3 -

• ESSENTIALLY DRY, EXCEPT FOR ONE SMALL MUDHOLE.

SETTLING POND -

• ESSENTIALLY DRY.

LOCATION DAVIS QUARRY PROJECT _____DATE 04 FEB '13BY DANIELE BECKER DEPT. _____ CHECKED BY _____SUBJECT DIMENSIONS OF "MINE PIT" ON 01 FEBRUARY 2013
& OTHER PONDS.PRESENT AT SITEDAN BECKERART FAULKNEREARL COLLMINE PIT -01 FEBRUARY 2013SHAPE OF MINE PIT: IRREGULARLENGTH OF MINE PIT: ≈ 180 FEETWIDTH OF MINE PIT: ≈ 35 FEETSURFACE AREA OF WATER = 6,300 SQUARE FEET = 0.145 ACRESIMPOUNDMENT F01 - (RECHARGE LAKE)• 26.10 ACRESELEVATION ≈ 1,021.50'(USED GRAPH) - (ESSENTIALLY THE SAME WATER SURFACE AREA AS LAST MTH.)IMPOUNDMENT F02 -• DRY, NO SIGNS OF WATERIMPOUNDMENT F03 -• ESSENTIALLY DRY, EXCEPT FOR ONE SMALL MUD HOLE.SETTLING POND -• ESSENTIALLY DRY.

LOCATION DAVIS QUARRY

PROJECT

DATE 01 MAR '13

BY DANIEL E. BECKER

DEPT.

CHECKED BY

SUBJECT DIMENSIONS OF MINE PIT ON 01 MARCH 2013
& OTHER PONDS01 MARCH 2013

SHAPE OF MINE PIT = IRREGULAR

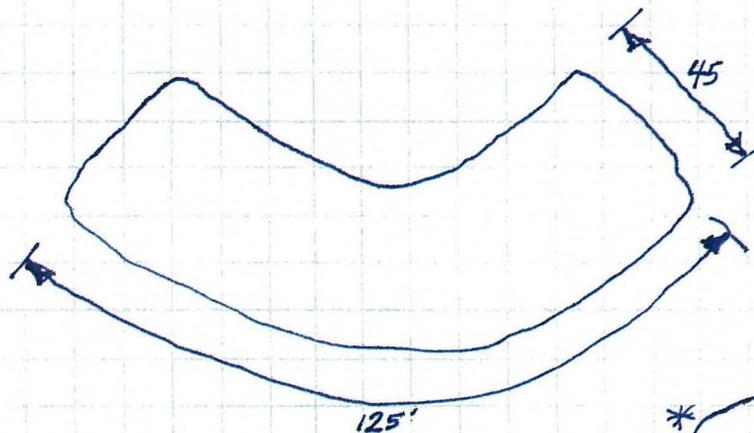
WIDTH OF MINE PIT = SEE SKETCH

LENGTH OF MINE PIT = SEE SKETCH

PRESENT AT SITE

DAN BECKER

ART FAULKNER

NOTE:SHAPE WAS
SIMPLIFIED FOR
CALCULATION
PURPOSES.* EXCEPT FOR 23-27 FEB '13
WHEN SURFACE AREA WAS
APPROX. 225' X 300' = 1.55 AC
FOR 5 DAYS.

$$(125')(45') = 5,625 \text{ FT}^2 \left(\frac{1 \text{ ACRE}}{43,560 \text{ FT}^2} \right) = \underline{0.129 \text{ ACRES}}$$

IMPOUNDMENT F01 - (RECHARGE LAKE)

- 26.87 ACRES @ ELEVATION 1,022.68'
- (SEE ATTACHED AERIAL PHOTO - USED PLANIMETER)

IMPOUNDMENT F02 -

- SEE ATTACHED PAGES

IMPOUNDMENT F03 -

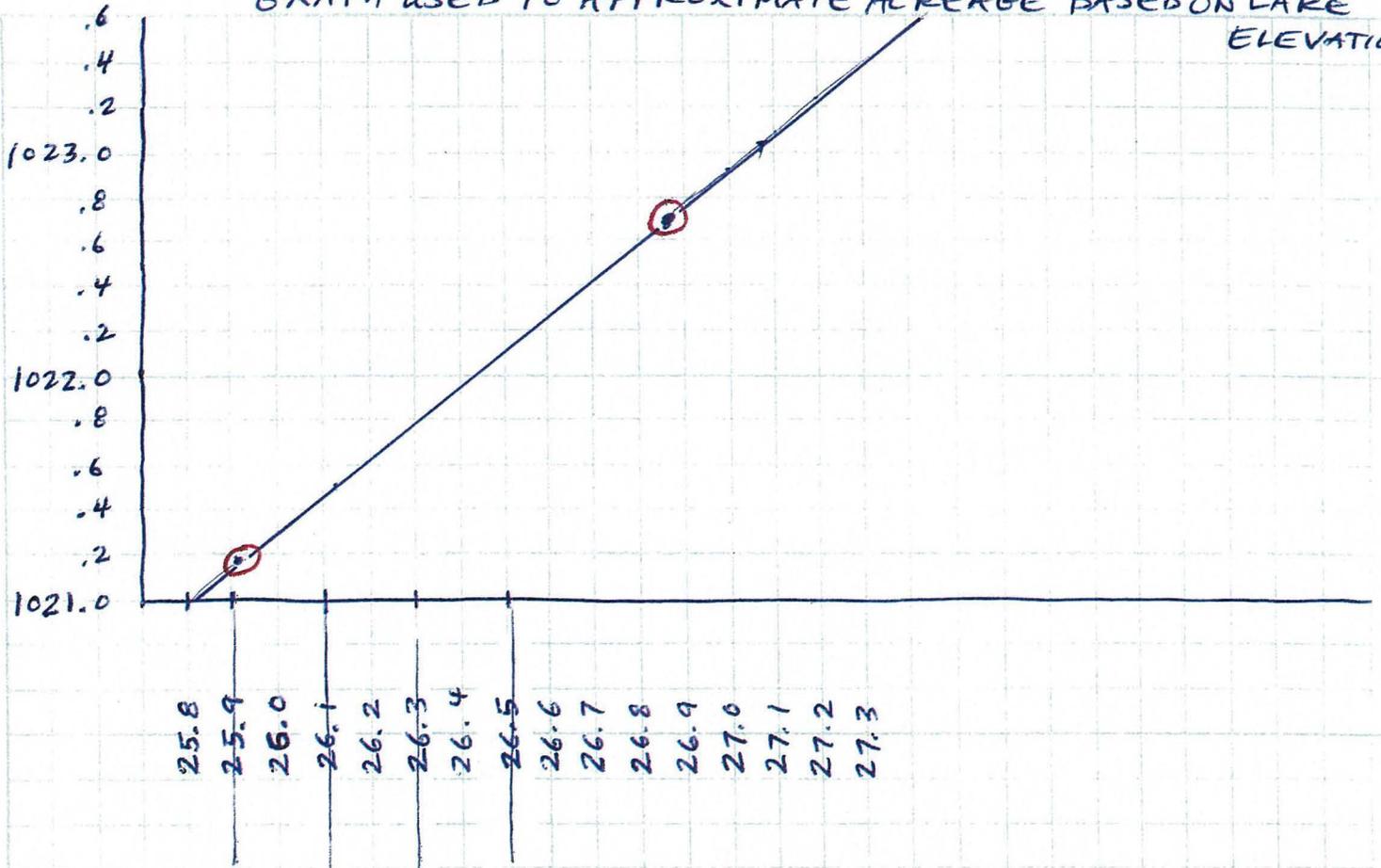
- SEE ATTACHED PAGES

SETTLING POND -

- ESSENTIALLY DRY.

LOCATION DAVIS QUARRYPROJECT DATE 23 MAY '13BY DANIEL E. BECKERDEPT. CHECKED BY SUBJECT

GRAPH USED TO APPROXIMATE ACREAGE BASED ON LAKE ELEVATION



Adjust this graph
over time as you get
more data points.

- Every time they fly the quarries you can shoot elevation, and run the planimeter around the lake — and then plot another data point.

LOCATION DAVIS QUARRY PROJECT _____ DATE 14 MAR '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT CALIBRATION OF POLYSONICS ULTRASONIC FLOWMETER MODEL UFM-PD

TYPE OF FLOW METER USED TO DETERMINE PIPE FLOW RATES

- POLYSONICS ULTRASONIC FLOWMETER - MODEL UFM-PD

INSTALLATION AND OPERATION OF MODEL UFM-PD FLOWMETER

- THE INSTALLATION AND OPERATING MANUAL WAS USED AND FOLLOWED AS A GUIDE TO PROPERLY USE THIS INSTRUMENT.

CALIBRATION OF INSTRUMENT

- IN ORDER TO CALIBRATE THIS INSTRUMENT, WATER WAS PUMPED INTO A TANK OF KNOWN VOLUME WHILE USING THE FLOW METER TO DETERMINE THE VELOCITY OF THE WATER. THEN, THE AMOUNT OF TIME IT TOOK TO FILL THE TANK WAS USED TO DETERMINE THE NUMBER OF GALLONS PER MINUTE OF THE PUMP. AND, LASTLY, THE FLOW RATE DETERMINED WITH THE INSTRUMENT WAS ADJUSTED TO REFLECT THE ACTUAL AMOUNT BEING PUMPED.

CALIBRATION CALCULATIONS

- PUMP TO BE CALIBRATED = PUMP #2
- DESCRIPTION OF DISCHARGE END OF PUMP
= 3" PUMP MEASURED AT 4" I.D. OUTPUT PIPE
- DATA & CALCULATIONS USING ULTRASONIC FLOWMETER

$$\text{FLOWRATE} = 65\% \text{ OF } 10 \text{ F.P.S.} = 6.5$$

$$\text{GPM} = (\text{PIPE ID})^2 (V) (2.45)$$

$$= (4.026)^2 (6.5) (2.45) = 258 \text{ GPM}$$

4" DISCHARGE PIPE

= 4.026" I.D. FOR SCHEDULE 40

- CONTINUED ON NEXT PAGE -

LOCATION DAVIS QUARRY

PROJECT _____

DATE 13 MAR 13

BY _____

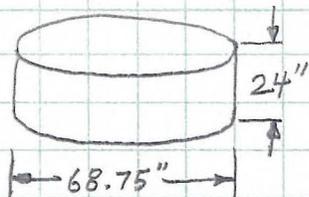
DEPT. _____

CHECKED BY _____

SUBJECT _____

• CALCULATION OF FLOWRATE USING TANK OF KNOWN VOLUME

— TANK DIMENSIONS & VOLUME



$$\begin{aligned}
 V &= \pi R^2 H \\
 &= \pi \left(\frac{68.75}{12} \right)^2 (2') \\
 &= 51.558 \text{ ft}^3 \left(\frac{7.48 \text{ gal}}{1 \text{ ft}^3} \right) \\
 &= 385.66 \text{ gal}
 \end{aligned}$$

— TIME TO FILL TANK

$$\text{TIME} = 1 \text{ MINUTE } 17 \text{ SECONDS} = 77 \text{ SECONDS}$$

— DETERMINE FLOWRATE IN GALLONS PER MINUTE

$$\frac{385.66 \text{ GAL}}{77 \text{ SEC}} = \frac{x \text{ GAL}}{60 \text{ SEC}} \quad (\text{RATIO})$$

$$x = 300.51 \frac{\text{GAL}}{\text{MIN}}$$

— DETERMINE CALIBRATION FACTOR FOR FLOWMETER (ADJUSTMENT FACTOR)

$$\frac{300.51}{258} = 1.16$$

NOTE: ALL FLOWS MEASURED BY THE ULTRASONIC FLOW METER WILL BE MULTIPLIED BY 1.16 TO GET THE ADJUSTED (CALIBRATED) FLOWRATE.

POLYSONICS PORTABLE
GENERAL INSTRUCTIONS

INSTALLATION AND OPERATING
MANUAL

MODEL UFM-P and UFM-PT
with UFM-PD Supplement

POLYSONICS FLOWMETER

P. O. Box 22428 3230 Mercer
Houston, Texas 77027

TABLE OF CONTENTS

- I. BASIC THEORY
- II. MEASUREMENT IN WATER
- III. MEASUREMENT IN OTHER LIQUIDS
- IV. SELECTING THE SENSOR LOCATION
- V. PIPE PREPARATION AND TRANSDUCER POSITIONING
- VI. START UP AND OPERATIONAL CHECKS
FLOW VELOCITY ONLY
- VII. FLOW VELOCITY WITH TOTALIZER OPTION
- VIII. FIELD TROUBLESHOOTING

WARRANTY

BATTERY (DC) CHECK: Connect DC supply. Press test Button. Light glows if supply OK.
(UFM-P)
Meter now ready to operate.

NOTE: Test light will not glow if DC voltage low or polarity reversed.

SECTION I

BASIC THEORY

The Polysonics Flowmeter is designed to measure the flow of liquids in pipes of most diameters or wall thickness.

The system incorporates solid state circuitry using the "Doppler Shift" principle as its basis of operation.

Twin crystals are epoxy-encapsulated in a transducer housing. One crystal is the transmitter and the other the receiver.

The twin crystal transducer is bonded to the outside of the pipe, which can be of metal or plastic construction.

The transmitter produces a pulse of controlled electrical frequency which, when reflected by particles of entrained air or solids in the liquid, produces a reflected pulse to the receiver.

When the liquid is stationary, the reflected pulse is received at the transmitted frequency.

If the liquid is moving, the reflected pulse is received as a modified frequency because of the "Doppler Effect".

This modified frequency is a linear function of the flow rate which is conditioned in the circuitry to produce a highly stable, repeatable and linear indication of flow rate.

The "Doppler Effect" is present with flow in either direction of the fluid. The Polysonics Flowmeter can be used as a unidirectional or bi-directional meter with equal accuracy.

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SECTION II

MEASUREMENT IN WATER

The Polysonics Flowmeter is designed to measure the flow of water as long as a small continuing quantity of entrained air or solids is present. Without the presence of air or solids, the transmitted pulse is not reflected back to the receiver and the flowmeter will indicate an erratic reading or a zero reading.

The Polysonics Flowmeter will indicate the flow rate on any water based liquid containing an amount of air bubbles or solids such as those found in the water and waste treatment plants or treated wastes from chemical or petrochemical plants.

2030407947

SECTION III

MEASUREMENT IN OTHER LIQUIDS

Complete data has been established in engineering handbooks to define the sound properties of water at various temperatures which is the basis of operation for the Polysonics Flowmeter. Therefore, the resultant accuracies for water are predictable under most conditions.

The measurement of liquids other than water is being made with the Polysonics Flowmeter even though the sound properties of other liquids have not been compiled to cover all combinations, concentrations and temperatures found in industry.

Usually, a successful flow measurement can be made where the liquid has the ability to transmit sound, contains solids or bubbles and is flowing under non-laminar or turbulent conditions.

Other fluid properties are known to distort sound transmission, so the easiest method in all cases is to test the flowmeter under actual flowing conditions. On site calibration under known process conditions will determine if sonic flowmetering will provide a valuable operating tool.

The initial response from the properly installed Polysonics Flowmeter will immediately indicate its ability to track the flow.

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SECTION IV

SELECTING THE SENSOR LOCATION

When selecting a pipe with flowing liquid, there are a few points to keep in mind.

1. The transducer head temperature limits are -300°F to $+300^{\circ}\text{F}$. Higher temperatures are allowed for short periods of test if care is taken to prevent the pipe heat from distorting the transducer.
2. The pipe can be of any rigid material (steel, plastic, glass and etc.). Pipes with liners must be tested on an individual application basis. An air gap between the pipe and liner is not acceptable. Flexible pipes or hoses may be tested also.
3. Many liquids have entrained particules of solids or vapors flowing within the pipe even though the liquid may appear clear or clean in a beaker. The Polysonics meter relies on these particles or bubbles for readings of flow. Readings will be obtained with any continuing amount present in a flowing liquid without adversely affecting the meters operation.
4. Measurements are made on straight pipe runs with the transducer attached to the side or bottom of horizontal runs and anywhere on vertical runs. Best linear readings are made where the transducer is attached with about 5 pipe diameters straight run up and downstream of the measuring point. Flow readings will probably be obtained wherever you can attach the head but these readings should be used as reference readings when sensing flow next to bends or valves in the line. Field testing is the only rule in these cases.
5. A new user of Polysonics Flowmeter should first read the instructions supplied with the instrument. Then he should take a few trial readings to familiarize himself with the controls and response of the flowmeter.

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SECTION V

PIPE PREPARATION AND TRANSDUCER POSITIONING

1. PIPE PREPARATION

Start with a small cleaned area of the pipe. Remove all rust, scale, paint and grease from the pipe surface and finally wipe dry. To make sonic contact between the transducer head and the pipe, a wetting agent is used. This wetting agent may be ordinary vaseline for dirty liquid streams for short period tests or the wetting agent may have to be an epoxy bond for streams having very few bubbles or solids entrained in the liquid. On site testing is the only sure method to determine the bonding required for your fluids.

NOTE: Unfilled silicone type grease is recommended for all general tests.
DO NOT USE SILICONE RUBBER COMPOUNDS.

As you become familiar with the responses and operation of the meter, most test sites will not require a thorough cleaning of the pipe surface to obtain desired readings.

A layer of paint will normally not affect the meters operation. Even rust sometimes has no effect. Continued experience is required for proficiency. The transducer head flat surface should be kept in the condition received when new to maintain best sensitivity.

2. TRANSDUCER POSITIONING

Select a location to the side or bottom of the pipe where liquid will always be present on the inner pipe wall.

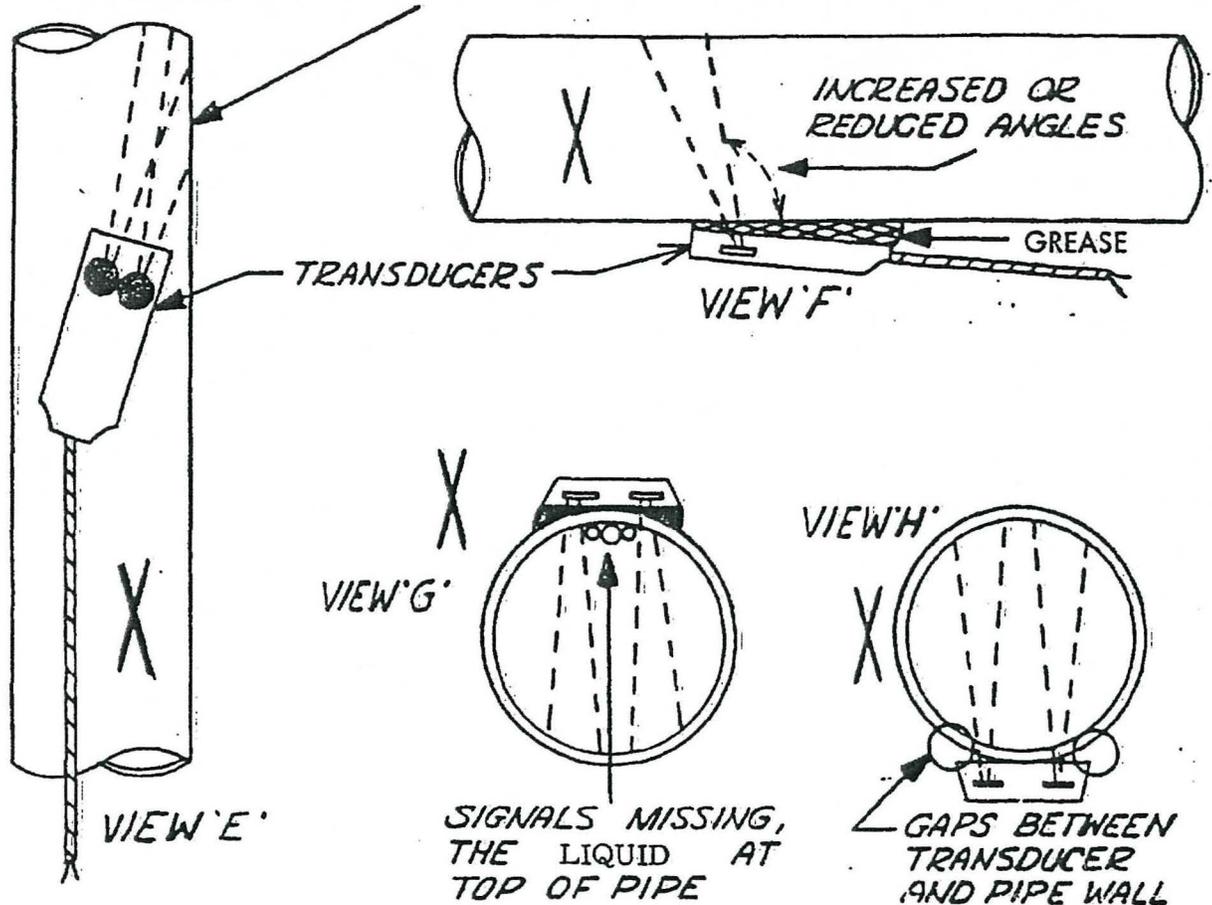
Apply wetting agent to flat surface of the transducer head and press firmly to the pipe wall. Use following illustrations as guide to proper positioning.

The transducer may be taped or banded to the pipe with an adjustable strap for extended tests or while viewing meter.

NOTE: If the transducer is loose or vibrating on the pipe, erratic readings will occur. Keep the transducer firmly banded to the pipe during all readings.

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NOTE: BAD CROSS COUPLING AND ANGLE OF INCIDENCE



NOTE: VIEW 'E' BAD CROSS COUPLING OF TRANSMISSION SIGNALS. RESULTS WILL BE INACCURATE READINGS.

VIEW 'F' CHANGED ANGLE OF SIGNAL INCIDENCE TO PIPE WALL. RESULTS IN OVER OR UNDER VELOCITY READINGS DEPENDING ON DIRECTION OF FLOW OR MOUNTING.

VIEW 'G' TOP MOUNTING CAN RESULT IN NO READINGS WHERE MARGINAL AMOUNTS OF BUBBLES EXIST. ie. SLOW FLOW CONDITIONS ETC.

VIEW 'H' AIR GAPS BETWEEN THE TRANSDUCER FACE AND THE PIPE WALL CAN RESULT IN SIGNAL DISSIPATION, ERRATIC READINGS AND LOW MECHANICAL BONDS BETWEEN PIPE AND TRANSDUCER.

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8

SECTION VIIa

THE POLYSONICS PORTABLE MODEL UFM-PD

DESCRIPTION

The Polysonics Portable uses the same doppler shift principle found in the dedicated (UFM) model. The versatility of the portable unit allows on-site flow readings through any size pipe from 1" and larger. These flow readings are shown as velocity in feet per second (FPS) and by knowing the pipe ID, you can read GPM by the formula:

$$\text{GPM} = (\text{ID}^2 \times \text{V (FPS)} \times 2.45$$

The portable Polysonics Model UFM-PD is housed in a fiberglass carrying case complete with batteries and weighs about 15 pounds.

The transducer assembly and AC power cord are coiled and stored in the case cover along with a tube of silicone grease.

All necessary controls and meters are clearly marked on the panel. The right side panel over the battery compartment has a convenient four function calculator and the required range setting tables.

DESCRIPTION OF CONTROLS AND METERS

1. Rate Meter
Indicates velocity (FPS) of liquid being measured.
2. Signal Strength Meter
Indicates amplitude of signals being amplified and processed to rate meter.
3. Sensitivity Control
Attenuates signals seen on the Signal Strength Meter.
4. Damping Control
Adjusts the time constant of signals presented to Rate Meter and to the MA output terminals.

5. Range Switch:
Expands the upper and lower adjustability of the calibration control.
6. Calibration Control
Selects discreet full scale velocity (FPS) calibration.
7. Resettable Counter
Indicates gallons per pulse proportional to Rate Meter (FPS) determined by pipe size and count factor chart.
8. DC Status Pushbutton & LED
Indicates sufficient battery level to operate flowmeter. Should be tested only when Power Switch is in DC on position.

OPERATING INSTRUCTIONS

After selecting the measurement site and properly mounting the transducer, set the desired range on the controls. Turn the sensitivity control to minimum (CCW) and the damping control to mid range. Apply power to the flow meter. Ideal conditions for doppler signals will now drive the signal strength meter pointer to the green area and the rate meter will be on scale (adjust range controls if necessary).

NOTE: The Signal Strength Meter will enable the user to optimize the flowmeter under various field conditions.

In some cases it will allow him to distinguish between low energy noise pulses and true doppler signals that relate to flow. By observing the Signal Strength Meter and the Flow Rate (FPS) Meter, the experienced user will be able to optimize his doppler flowmeter.

Useable doppler signals will be when the pointer is in the yellow area and unuseable signals will be when the pointer is in the red area.

EXAMPLE #1

In the ideal case where the sensitivity control is minimum and the pointer is in the green area, increasing the sensitivity control should have little effect on the rate (FPS) meter. (Note: Over adjustment of the sensitivity control may introduce unwanted noise into the rate meter.)

EXAMPLE #2

In the useable case where the sensitivity control is minimum and the pointer is in the yellow area, it is now necessary to increase the sensitivity control

so the pointer is in the green area. You may notice an increased reading of the rate (FPS) meter which should stabilize when the pointer is in the green area.

EXAMPLE #3

In the unuseable case where the sensitivity is minimum and the pointer is in the red area, increasing the sensitivity control is now allowing the flowmeter electronics to be sensitive to unwanted noise from within the pipe and any readings of FPS should not be used. Recheck the transducer mounting and location. Also, if there is no flow in the pipe, no doppler is produced. Be sure liquid is flowing before determining doppler signal strength.

Overadjustment of the sensitivity control in this example may drive the FPS rate meter full scale and the signal strength meter may show low readings. This is an indication of noise pulses triggering the circuitry and not doppler signals.

NOTE: To avoid excessive drainage of battery supply -

1. Leave MA terminals open when external recording not required.
2. Operate unit from AC supply on all but short test requirements.
3. Keep power switch in off position when unit not in service.

SECTION VIII

FIELD TROUBLESHOOTING

The most consistent causes of problems in the field are incorrectly mounted transducers or bad site selection which generally result in non-repeatability or erratic meter readings. See below list of possible symptoms, causes and cures.

1. Erratic Meter Readings

Cause - Soft bonding materials on transducer face.

Cure - Remove, clean pipe and transducer faces and reapply recommended silicone grease. NOTE: DO NOT USE SILICONE RUBBER COMPOUNDS.

Cause - Misaligned transducer in relation to pipe (See Views E, F, G, and H).

Cure - Remount transducer as specified.

Cause - Lack of solids or bubbles in the pipe or bursts of bubbles or solids rather than the required steady flow.

Cure - Re-examine this particular application. Re-examine transducer sitting. Introduce an artificial bubble flow.

Cause - Sensitivity control set too low.

Cure - Increase sensitivity control. Watch for steady readings.

Cause - High local physical noise level.

Cure - Decrease sensitivity control and recheck accuracy of reading. If reading is still erratic or low, relocate unit or remove cause of noise.

Note: In the above case, local physical noise would be hammering of the pipe or severe vibration. As erratic readings due to noise generally occur when a low signal strength exists, decreasing the sensitivity may increase the problem. Check the results with full sensitivity before relocating.

4. Meter Reading When Flow Stopped

Cause - Leaky valves in plant.

Cure - Repair valves.

Cause - Local electrical noise.

Cure - Reduce sensitivity control. Suppress noise at source.
Proper grounding.

LIMITED WARRANTY

The equipment herein is fully guaranteed to meet the specifications under which it is sold.

POLYSONICS products are warranted to be free from defects in material and workmanship at the time of shipment and for one year thereafter. Any claimed defects in POLYSONICS' products must be reported within the warranty period. POLYSONICS shall have the right to inspect such products at buyer's plant or to require buyer to return such products to POLYSONICS' plant. In the event POLYSONICS requests return of its products, buyer shall ship with transportation charges paid by the buyer to POLYSONICS' plant. Shipment of repaired or replacement goods from POLYSONICS' plant shall be FOB POLYSONICS' plant. A shop charge may apply for alignment and calibration service.

POLYSONICS shall be liable only to replace, or repair, at its option, free of charge, products which are found by POLYSONICS to be defective in material or workmanship and which are reported to POLYSONICS within the warranty period as provided above. This right to replacement shall be buyer's exclusive remedy against POLYSONICS. POLYSONICS shall not be liable for labor charges, or other losses or damages of any kind or description, including but not limited to incidental special or consequential damages caused by defective products.

This warranty shall be void if recommendations provided by POLYSONICS, or its sales representatives, are not followed concerning methods of operation, usage and storage or exposure to corrosive conditions.

Materials and/or products furnished to POLYSONICS by other suppliers shall carry no warranty except such suppliers' warranties as to materials and workmanship, and POLYSONICS disclaims all warranties, express or implied, with respect to such products. Glass lenses, meter movements, counters or calculators supplied as a part of the purchased item shall be warranted for a period of 30 days from time of shipment.

EXCEPT AS OTHERWISE AGREED TO IN WRITING BY POLYSONICS THE WARRANTIES GIVEN ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES. EXPRESS OR IMPLIED AND POLYSONICS HEREBY DISCLAIMS ALL OTHER WARRANTIES INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR PURPOSE

Pipe Data (cont.)

Nominal Pipe Size Inches	Outside Diam. Inches	Identification			Wall Thickness (t) Inches	Inside Diameter (d) Inches	Area of Metal Square Inches	Transverse Internal Area		Moment of Inertia (I) Inches ⁴	Weight of Pipe Pounds per foot	Weight of Water Pounds per foot of pipe	External Surface Sq. Ft. per foot of pipe	Section Modulus ($\frac{I}{c}$)
		Steel		Stainless Steel Sch. No.				(a)	(b)					
		Iron Pipe Size	Sched. No.											
3/2	4.000	...	...	5S	.083	3.834	1.021	11.545	.08017	1.960	3.48	5.08	1.047	.9796
		...	...	10S	.120	3.760	1.463	11.104	.07711	2.755	4.97	4.81	1.047	1.378
		STD	40	40S	.226	3.548	2.680	9.886	.06870	4.788	9.11	4.29	1.047	2.394
		XS	80	80S	.318	3.364	3.678	8.888	.06170	6.280	12.50	3.84	1.047	3.190
4	4.500	...	...	5S	.083	4.334	1.152	14.75	.10245	2.810	3.92	6.39	1.178	1.249
		...	...	10S	.120	4.260	1.651	14.25	.09898	3.963	5.61	6.18	1.178	1.761
		STD	40	40S	.237	4.026	3.174	12.73	.08840	7.233	10.79	5.50	1.178	3.214
		XS	80	80S	.337	3.826	4.407	11.50	.07986	9.610	14.98	4.98	1.178	4.271
		...	120	...	.438	3.624	5.595	10.31	.0716	10.65	19.00	4.47	1.178	5.178
		...	160	...	.531	3.438	6.621	9.28	.0645	13.27	22.51	4.02	1.178	5.898
...	...	...	.674	3.152	8.101	7.80	.0542	15.28	27.54	3.38	1.178	6.791		
5	5.563	...	...	5S	.109	5.345	1.868	22.44	.1558	6.947	6.36	9.72	1.456	2.498
		...	...	10S	.134	5.295	2.285	22.02	.1529	8.425	7.77	9.54	1.456	3.029
		STD	40	40S	.258	5.047	4.300	20.01	.1390	15.16	14.62	8.67	1.456	5.451
		XS	80	80S	.375	4.818	6.112	18.19	.1263	20.67	20.78	7.88	1.456	7.431
		...	120	...	.500	4.563	7.953	16.35	.1136	25.73	27.04	7.09	1.456	9.250
		...	160	...	.625	4.313	9.696	14.61	.1015	30.03	32.96	6.33	1.456	10.796
...	...	...	.750	4.063	11.340	12.97	.0901	33.63	38.55	5.61	1.456	12.090		
6	6.625	...	...	5S	.109	6.407	2.231	32.24	.2239	11.85	7.60	13.97	1.734	3.576
		...	...	10S	.134	6.357	2.733	31.74	.2204	14.40	9.29	13.75	1.734	4.346
		STD	40	40S	.280	6.065	5.581	28.89	.2006	28.14	18.97	12.51	1.734	8.496
		XS	80	80S	.432	5.761	8.405	26.07	.1810	40.49	28.57	11.29	1.734	12.22
		...	120	...	.562	5.501	10.70	23.77	.1650	49.61	36.39	10.30	1.734	14.98
		...	160	...	.719	5.187	13.32	21.15	.1469	58.97	45.35	9.16	1.734	17.81
...	...	...	.864	4.897	15.64	18.84	.1308	66.33	53.16	8.16	1.734	20.02		
8	8.625	...	...	5S	.109	8.407	2.916	55.51	.3855	26.44	9.93	24.06	2.258	6.131
		...	...	10S	.148	8.329	3.941	54.48	.3784	35.41	13.40	23.61	2.258	8.212
		...	20	...	.250	8.125	6.57	51.85	.3601	57.72	22.36	22.47	2.258	13.39
		...	30	...	.277	8.071	7.26	51.16	.3553	63.35	24.70	22.17	2.258	14.69
		STD	40	40S	.322	7.981	8.40	50.03	.3474	72.49	28.55	21.70	2.258	16.81
		...	60	...	.406	7.813	10.48	47.94	.3329	88.73	35.64	20.77	2.258	20.58
		...	80	80S	.500	7.625	12.76	45.66	.3171	105.7	43.39	19.78	2.258	24.51
		...	100	...	.594	7.437	14.96	43.46	.3018	121.3	50.95	18.83	2.258	28.14
		...	120	...	.719	7.187	17.84	40.59	.2819	140.5	60.71	17.59	2.258	32.58
		...	140	...	.812	7.001	19.93	38.50	.2673	153.7	67.76	16.68	2.258	35.65
		...	...	...	.875	6.875	21.30	37.12	.2578	162.0	72.42	16.10	2.258	37.56
		...	...	...	.906	6.813	21.97	36.46	.2532	165.9	74.69	15.80	2.258	38.48
10	10.750	...	...	5S	.134	10.482	4.36	86.29	.5992	63.0	15.19	37.39	2.814	11.71
		...	...	10S	.165	10.420	5.49	85.28	.5922	76.9	18.65	36.95	2.814	14.30
		...	20	...	.250	10.250	8.24	82.52	.5731	113.7	28.04	35.76	2.814	21.15
		...	30	...	.307	10.136	10.07	80.69	.5603	137.4	34.24	34.96	2.814	25.57
		STD	40	40S	.365	10.020	11.90	78.86	.5475	160.7	40.48	34.20	2.814	29.90
		...	60	80S	.500	9.750	16.10	74.66	.5185	212.0	54.74	32.35	2.814	39.43
		...	80	...	.594	9.562	18.92	71.84	.4989	244.8	64.43	31.13	2.814	45.54
		...	100	...	.719	9.312	22.63	68.13	.4732	286.1	77.03	29.53	2.814	53.22
		...	120	...	.844	9.062	26.24	64.53	.4481	324.2	89.29	27.96	2.814	60.32
		...	140	...	1.000	8.750	30.63	60.13	.4176	367.8	104.13	26.06	2.814	68.43
		...	...	...	1.125	8.500	34.02	56.75	.3941	399.3	115.64	24.59	2.814	74.29
		12	12.75	5S	.156	12.438	6.17	121.50	.8438	122.4	20.98	52.65	3.338	19.2
...	...			10S	.180	12.390	7.11	120.57	.8373	140.4	24.17	52.25	3.338	22.0
...	20			...	.250	12.250	9.82	117.86	.8185	191.8	33.38	51.07	3.338	30.2
...	30			...	.330	12.090	12.87	114.80	.7972	248.4	43.77	49.74	3.338	39.0
STD	40			40S	.375	12.000	14.58	113.10	.7854	279.3	49.56	49.00	3.338	43.8
...	40			...	.406	11.938	15.77	111.93	.7773	300.3	53.52	48.50	3.338	47.1
...	...			80S	.500	11.750	19.24	108.43	.7528	361.5	65.42	46.92	3.338	56.7
...	60			...	.562	11.626	21.52	106.16	.7372	400.4	73.15	46.00	3.338	62.8
...	80			...	.688	11.374	26.03	101.64	.7058	475.1	88.63	44.04	3.338	74.6
...	100			...	.844	11.062	31.53	96.14	.6677	561.6	107.32	41.66	3.338	88.1
...	120			...	1.000	10.750	36.91	90.76	.6303	641.6	125.49	39.33	3.338	100.7
...	140			...	1.125	10.500	41.08	86.59	.6013	700.5	139.67	37.52	3.338	109.9
...	...	...	1.312	10.126	47.14	80.53	.5592	781.1	160.27	34.89	3.338	122.6		

Wall thickness and weights are extracted from ANSI B36.10 and B36.19. The notations STD and XES indicate Standard, Extra Strong, and Double Extra Strong pipe respectively.

Transverse internal area values listed in "square feet" also represent volume in cubic feet per foot of pipe length.

LOCATION DAVIS QUARRY

PROJECT

DATE 12 JUN '13

BY DANIEL E. BECKER

DEPT.

CHECKED BY

SUBJECT PUMP VOLUMES CALCULATIONS FOR 1 QTR 13

NOTE:

ALL "HOUR" READINGS ARE TAKEN FROM AN HOUR METER

PUMP #1

$$\text{HOURS} = 1,822.90 \text{ HRS} - 1368 \text{ HRS} = 454.9 \text{ HRS}$$

$$\text{RATE} = 2,536 \frac{\text{GAL}}{\text{MIN}} (1.16) = 2942 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{2,536 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{1 \text{ HR}} \right) \left(454.9 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) (1.16) = \boxed{246.43 \frac{\text{AC-FT}}{1 \text{ QTR } 13}}$$

CALIBRATION FACTOR

PUMP #2

$$\text{HOURS} = 563.20 \text{ HRS} - 0.0 \text{ HRS} = 563.20 \text{ HRS}$$

$$\text{RATE} = 300.5 \frac{\text{GAL}}{\text{MIN}} \quad (\text{MEASURED BY PUMPING WATER INTO A TANK WITH A KNOWN VOLUME.})$$

$$\left(\frac{300.5 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) \left(563.2 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) = \boxed{31.17 \frac{\text{AC-FT}}{1 \text{ QTR } 13}}$$

PUMP #3

$$\text{HOURS} = 1,580.0 \text{ HRS} - 1,232 \text{ HRS} = 348 \text{ HRS}$$

$$\text{RATE} = 3,337 \frac{\text{GAL}}{\text{MIN}} (\text{AVG.}) (1.16) = 3,871 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{3,337 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{1 \text{ HR}} \right) \left(348 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) (1.16) = \boxed{248.10 \frac{\text{AC-FT}}{1 \text{ QTR } 13}}$$

PUMP #4

$$\text{HOURS} = 424.90 \text{ HRS} - 0.00 \text{ HRS} = 424.90 \text{ HRS}$$

$$\text{RATE} = 535 \frac{\text{GAL}}{\text{MIN}} (1.16) = 621 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{535 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) \left(424.9 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) (1.16) = \boxed{48.56 \frac{\text{AC-FT}}{1 \text{ QTR } 13}}$$

LOCATION DAVIS QUARRY PROJECT _____ DATE 12 JUNE '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT PUMP VOLUME CALCULATIONS FOR 1 QTR 13

PUMP #5

HOURS = 0.0 HRS
 RATE = N/A

PUMP #5 WAS NOT REQUIRED TO ASSIST IN THE MINE DEWATERING OF THE MINE PIT BECAUSE OF THE LOW AMOUNT OF RAINFALL DURING 1 QTR 13.

PUMP #6

HOURS = 0.0 HRS
 RATE = N/A

PUMP #6 WAS NOT REQUIRED TO ASSIST IN THE MINE DEWATERING OF THE MINE PIT BECAUSE OF THE LOW AMOUNT OF RAINFALL DURING 1 QTR 13.

PUMP #7

$$\text{HOURS}_{\text{PUMP A}} = 888 \text{ HRS} - 833 \text{ HRS} = 55 \text{ HRS}$$

$$\text{RATE}_{\text{PUMP A}} = \frac{524 \text{ GAL}}{\text{MIN}} (1.16) = 607.84 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{524 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) (55 \text{ HRS}) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43560 \text{ FT}^2} \right) (1.16) = \frac{6.15 \text{ AC-FT}}{1 \text{ QTR 13}} \text{ (SUB-TOTAL)}$$

$$\text{HOURS}_{\text{PUMP B}} = 252.4 \text{ HRS} - 0.0 \text{ HRS} = 252.4 \text{ HRS}$$

$$\text{RATE}_{\text{PUMP B}} = \frac{325 \text{ GAL}}{\text{MIN}} (1.16) = 377 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{325 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) (252.4 \text{ HRS}) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43560 \text{ FT}^2} \right) (1.16) = \frac{17.52 \text{ AC-FT}}{1 \text{ QTR 13}} \text{ (SUB-TOTAL)}$$

$$\text{SUB-TOT}_1 + \text{SUB-TOT}_2 = \frac{6.15 \text{ AC-FT}}{1 \text{ QTR 13}} + \frac{17.52 \text{ AC-FT}}{1 \text{ QTR 13}} = \frac{23.67 \text{ AC-FT}}{1 \text{ QTR 13}}$$

LOCATION DAVIS QUARRY

PROJECT _____

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BY DANIEL E. BECKER DEPT. _____

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SUBJECT PUMP VOLUME CALCULATIONS FOR 1 QTR 13

PUMP #8

$$\text{HOURS} = 1,617 \text{ HRS} - 1,257 \text{ HRS} = 360 \text{ HRS}$$

$$\text{RATE} = 3,480 \frac{\text{GAL}}{\text{MIN}} (1.16) = 4,036.80 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{3,480 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) \left(360 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) (1.16) = \boxed{267.61 \text{ AC-FT}} \\ \text{1 QTR 13}$$

PUMP #9

$$\text{HOURS} = 266.9 \text{ HRS} - 0.00 \text{ HRS} = 266.9 \text{ HRS}$$

$$\text{RATE} = 950 \frac{\text{GAL}}{\text{MIN}} (1.16) = 1,102 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{950 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) \left(266.9 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) (1.16) = \boxed{54.16 \text{ AC-FT}} \\ \text{1 QTR 13}$$

PUMP #10

$$\left. \begin{array}{l} \text{HOURS} = 0.0 \text{ HRS} \\ \text{RATE} = \text{N/A} \end{array} \right\} \text{PUMP \#10 DID NOT OPERATE DURING 1 QTR 13.}$$

PUMP #11

$$\text{HOURS} = 1,619.0 \text{ HRS} - 1,267 \text{ HRS} = 352 \text{ HRS}$$

RATE = NOT NECESSARY TO DETERMINE OVERALL WATER FLOW AT THE FACILITY BECAUSE THE PURPOSE OF THIS PUMP IS TO AGITATE THE FINES AT THE SAND PLANT.

LOCATION DAVIS QUARRY

PROJECT _____

DATE 12 JUN '13BY DANIELE, BECKER

DEPT. _____

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SUBJECT PUMP VOLUME CALCULATIONS FOR 1 QTR 13.PUMP #12

$$\text{HOURS} = 602.90 \text{ HRS} - 0.00 \text{ HRS} = 602.90 \text{ HRS}$$

RATE = NOT NECESSARY TO DETERMINE OVERALL WATER FLOW AT THE FACILITY BECAUSE ALL OF THE WATER PUMPED TO THE SAND PLANT EITHER ENTERS THE SLURRY TANK/MUD PIT (WHERE IT IS PUMPED TO THE SETTLING POND OR GRAVITY FLOWS INTO THE FRESH WATER LAKE); OR, IT ADHERES TO THE SAND (AND COUNTED AS A CONSUMPTIVE USE).

PUMP #13

$$\text{HOURS} = 21.70 \text{ HRS} - 0.00 \text{ HRS}$$

RATE = $83 \frac{\text{GAL}}{\text{MIN}}$ (MEASURED BY PUMPING WATER INTO A BARREL MIN OF KNOWN VOLUME.)

$$\left(\frac{83 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) \left(21.70 \text{ HRS} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) = 0.33 \frac{\text{AC-FT}}{1 \text{ QTR } 13}$$

PUMP #14

$$\text{HOURS} = 79.0 \text{ HRS} - 0.00 \text{ HRS} = 79.0 \text{ HRS}$$

RATE = VARIES CONSIDERABLY.

NOTE: PUMP RATE NOT IMPORTANT TO DETERMINING THE CONSUMPTIVE USE AT THE SITE BECAUSE THE WATER PUMPED BY PUMP #14 EITHER COOLS THE 42" CRUSHER AND SOAKS INTO THE QUARRY FLOOR, OR IT IS APPLIED TO THE CRUSHED STONE AS DUST CONTROL — AND THIS WATER IS ACCOUNTED FOR AS A CONSUMPTIVE USE IN OUR MATERIAL MOISTURE CONTENT CALCULATIONS. REGARDLESS, THE 42" CRUSHER COOLING WATER ESTIMATE IS SHOWN ON THE NEXT PAGE — SO THAT THE AMOUNT THAT SOAKS INTO THE QUARRY FLOOR WILL BE KNOWN.

LOCATION DAVIS QUARRY PROJECT _____ DATE 13 JUN '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT PUMP VOLUME CALCULATIONS FOR 1 QTR 13

— CONTINUED FROM PREVIOUS PAGE —

$$\frac{\text{CRUSHER COOLING WATER FLOWRATE}}{\text{FOR 42" CRUSHER}} = \frac{5 \text{ GALLONS}}{8 \text{ SECONDS}} \quad (\text{MEASURED WITH 5 GAL BUCKET})$$

$$\left(\frac{5 \text{ GAL}}{8 \text{ SEC}}\right) \left(\frac{60 \text{ SEC}}{1 \text{ MIN}}\right) = 37.5 \frac{\text{GAL}}{\text{MIN}}$$

$$\left(\frac{37.5 \text{ GAL}}{\text{MIN}}\right) \left(\frac{60 \text{ MIN}}{\text{HR}}\right) \left(\frac{79 \text{ HRS}}{1 \text{ QTR 13}}\right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}}\right) \left(\frac{1 \text{ ACRE}}{43,560 \text{ FT}^2}\right) = 0.55 \frac{\text{AC-FT}}{1 \text{ QTR 13}}$$

ESTIMATE OF WATER USED FOR DUST CONTROL ON PRIMARY PLANT
 (THIS AMOUNT, WHEN ADDED TO THE WATER USED TO COOL THE 42" CRUSHER, WILL TOTAL THE AMOUNT PUMPED BY PUMP #14.)

- WE PUMPED 119,040 GALLONS OF WATER THAT WAS USED FOR DUST SUPPRESSION ON THE PRIMARY PLANT DURING 1 QTR 13. THIS WATER IS A PORTION OF THE MOISTURE THAT ADHERES TO THE CRUSHED STONE. THIS WATER WILL BE COUNTED WHEN WE PERFORM THE MATERIAL MOISTURE CONTENT CALCULATIONS.

— EACH DAY, WE MONITOR HOW MANY NOZZLES ARE USED, HOW MANY GALLONS PER MINUTE THE NOZZLES ARE SPRAYING, AND HOW MANY HOURS THE NOZZLES SPRAY EACH DAY.

$$\left(\frac{119,040 \text{ GALLONS}}{7.48 \text{ GAL}}\right) \left(\frac{1 \text{ FT}^3}{43,560 \text{ FT}^2}\right) = 0.37 \frac{\text{AC-FT}}{1 \text{ QTR 13}}$$

$$0.55 \text{ AC-FT} + 0.37 \text{ AC-FT} = 0.92 \text{ AC-FT}$$

PUMP #14

LOCATION DAVIS QUARRY PROJECT _____ DATE 13 JUN '13BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____SUBJECT CRUSHER COOLING WATER RECIRCULATION VOLUMES & VOLUME OF WATER LAND APPLIED TO ROADWAYS FOR DUST SUPPRESSIONCRUSHER COOLING WATER VOLUMES:

$$\text{HOURS} = 310.4 \text{ HRS}$$

$$\text{RATE} = 177 \frac{\text{GAL}}{\text{MIN}} \text{ (MEASURED WITH A WEIR)}$$

$$\left(\frac{177 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) (310.4 \text{ HRS}) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) = 10.11 \frac{\text{AC-FT}}{\text{1 QTR 13}}$$

VOLUME OF WATER LAND APPLIED TO ROADWAYS

TWO (2) WATER TRUCKS WERE USED TO LAND APPLY THE WATER TO THE ROADS. ONE WAS A SMALL TRUCK WITH A 3,000 GALLON TANK ON IT, AND THE OTHER IS A 12,000 GALLON TRUCK.

$$\begin{array}{rcl} 2 \text{ LOADS @ } 3,000 \text{ GALLONS} & = & 6,000 \text{ GALLONS} \\ 199 \text{ LOADS @ } 12,000 \text{ GALLONS} & = & 2,388,000 \text{ GALLONS} \\ & & \hline & & 2,394,000 \text{ GALLONS} \\ & & \text{1 QTR 13} \end{array}$$

$$\left(\frac{2,394,000 \text{ GAL}}{\text{1 QTR 13}} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ ACRE}}{43,560 \text{ FT}^2} \right) = 7.35 \frac{\text{AC-FT}}{\text{1 QTR 13}}$$

LOCATION DAVIS QUARRY

PROJECT _____

DATE 13 JUN '13

BY DANIEL E. BECKER

DEPT. _____

CHECKED BY _____

SUBJECT CALCULATE VOLUME PUMPED THROUGH HIGH RISER AND SPREAD ON TRAVELWAYS WITH WATER TRUCK

CALCULATE FLOW OF HIGH RISER THAT FILLS WATER TRUCK:

- SIZE OF TANK ON TRUCK = 12,000 GAL
- TIME REQUIRED TO FILL TANK = 7.5 MIN

$$\frac{12,000 \text{ GAL}}{7.5 \text{ MIN}} = 1,600 \frac{\text{GAL}}{\text{MIN}}$$

CALCULATE NUMBER OF HOURS PUMP #1 OPERATED DURING 1 QTR 13:

$$1,822.9 \text{ HRS} - 1,368 \text{ HRS} = 454.9 \text{ HRS} \quad (\text{NOTE: THE WATER RISER USED TO FILL THE WATER TRUCK FLOWS IN A RECIRCULATORY LOOP WHEN PUMP #1 IS RUNNING.})$$

CALCULATE TOTAL VOLUME OF WATER FILLED DURING 1 QTR 13:

$$\begin{aligned} 2 \text{ LOADS @ } 3,000 \text{ GAL} &= 6,000 \text{ GAL} \\ 199 \text{ LOADS @ } 12,000 \text{ GAL} &= 2,388,000 \text{ GAL} \\ \hline &= 2,394,000 \text{ GAL} \end{aligned}$$

CALCULATE TOTAL TIME SPENT FILLING WATER TRUCK WITH WATER DURING 1 QTR 13:

$$\frac{\left(\frac{2,394,000 \text{ GAL}}{1 \text{ QTR 13}} \right)}{\left(\frac{1,600 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right)} = 24.94 \text{ HRS}$$

CALCULATE NUMBER OF HOURS WATER FROM HIGH RISER WAS FLOWING BACK INTO FRESH WATER LAKE:

$$\begin{array}{rcl} (454.9 \text{ HRS}) - (24.94 \text{ HRS}) & = & 429.96 \text{ HRS} \\ \text{TOTAL HRS HIGH} & \text{TOTAL HRS HIGH} & \text{TOTAL HRS HIGH} \\ \text{RISER OPERATED} & \text{RISER WAS FILLING} & \text{RISER WAS RECIRCULATING} \\ & \text{WATER TRUCKS} & \text{WATER BACK TO FWL.} \end{array}$$

CALCULATE TOTAL VOLUME OF WATER RETURNED TO FRESH WATER LAKE

$$(429.96 \text{ HRS}) \left(\frac{1,600 \text{ GAL}}{\text{MIN}} \right) \left(\frac{60 \text{ MIN}}{\text{HR}} \right) \left(\frac{1 \text{ FT}^3}{7.48 \text{ GAL}} \right) \left(\frac{1 \text{ AC}}{43,560 \text{ FT}^2} \right) = 134.03 \text{ AC-FT}$$

Davis Quarry

1Qtr13

Material Moisture Content of Material Sold

29-May-13

Daniel E. Becker

	Tons Sold in 1Qtr13	Estimated Material Moisture Content (in percent)	Dry or Wet?	
3/8" non spec chips - 18.05	18.05	0.5	D	0.000066423
Agstone 70 dry - 899.39	1091.19	0.5	D	0.004015548
3/8" pucm - 75.20	211.87	1.66	W	0.002588523
3/8" #2 cover - 5929.24	9492.08	1.66	W	0.115969545
5/8" #3 cover - 13984.81	22224.05	0.5	D	0.081783875
5/8" #3-c cover - 6242.07	6242.07	0.5	D	0.022970641
3/4" #1 cover - 519.87	913.36	0.5	D	0.003361139
1" #67 - 16777.84	36070.14	0.5	D	0.132737095
1" tbsc type a - 426.26	653.08	0.5	D	0.002403316
1 1/2" odot base type a - 11903.45	20407.34	0.5	D	0.075098434
1 1/2" odot base type b - 4977.69	5590.72	0.5	D	0.020573691
1 1/2" #57 - 60107.07	105212.28	0.5	D	0.387178214
1 1/2" coarse stone - 5811.50	9838.9	0.5	D	0.036206874
2" mill run #9 - 3175.27	3175.27	0.5	D	0.011684904
2" astm size #4 - 70.83	770.74	0.7	W	0.003970822
2" coarse stone - 1721.42	1974.61	0.5	D	0.007266509
4" odot filer blanket - 1039.24	1109.55	0.5	D	0.004083113
3/8" #2 cover washed - 5089.98	5814.17	1.66	W	0.071034657
5/8" #3 cover washed - 1433.99	2536.99	1.66	W	0.030995691
Washed 5/8" astm size #7 - 25.13	25.13	1.66	W	0.000307026
Washed 1" #67 - 3072.74	4863.84	0.7	W	0.025058311
Washed 1 1/2" #57 - 2938.44	4995.7	0.7	W	0.025737649
Washed 1 1/2" coarse stone - 690.11	825.74	0.7	W	0.004254180
3" surge - 4768.67	8288.21	0.5	D	0.030500378
6" surge - 1282.33	2999.46	0.5	D	0.011037928
8" gabion stone - 553.63	933.66	0.5	D	0.003435842
12" rip rap - 2552.48	3977.07	0.5	D	0.014635505
18" rip rap 661.78	2127.27	0.5	D	0.007828293
24" rip rap 743.26	743.26	0.5	D	0.002735176
3/8" coarse screenings - 22.35	22.35	0.5	D	0.000082247
Hot mix screenings - 24125.34	35928.49	0.5	D	0.132215827
1" crusher run - 14084.46	22681.05	0.5	D	0.083465622
1 1/2" crusher run - 82868.92	141008.92	0.5	D	0.518908837
2 1/2" crusher run - 16285.57	33740.11	0.5	D	0.124162650
3 1/2" crusher run - 6187.43	10002.88	0.5	D	0.036810315
Rinsed 3/8" shot - 1443.56	2646.01	1.94	W	0.037780499
Stone sand - 17222.53	28102.04	3.99	W	0.825249404 - SAND PLANT
1" #67 to asphalt plant - 1428.92	2534.48	0.5	D	0.009326815
3/8" #2 cover to asphalt plant - 1744.71	3043.09	0.5	D	0.011198485
5/8" #3 cover to asphalt plant - 588.47	1171.28	0.5	D	0.004310277
Hot mix screenings to asphalt plant - 761.80	1593.66	0.5	D	0.005864624
Stone sand to asphalt plant - 3036.52	5331.51	3.99	W	0.156566052 - SAND PLANT

3.09 Acre-Feet

- 0.98 ACRE-FEET (SAND PLT)

2.11 ACRE-FEET (OTHER)

0.98

Davis Quarry
 Water Monitoring Plan
 8-Mar-13
 Daniel E. Becker

Material Moisture Content Analysis

14-Dec-11

Type of Material	Wet Weight	Dry Weight	Weight of Water	Percent Water (%)	Running Average Moisture Content throughout Series of Tests	
Stone Sand (Washed)	23.53	22.39	1.14	4.84	4.84	
Shot (Washed)	16.32	15.89	0.43	2.63	2.63	
5/8" Chips (Washed)	31.46	31.11	0.35	1.11	1.11	

20-Apr-12

Type of Material	Wet Weight	Dry Weight	Weight of Water	Percent Water (%)	Running Average Moisture Content throughout Series of Tests	
1-1/2" #57 (Dry)	9011.1	8960.8	50.3	0.56	0.56	

16-Oct-12

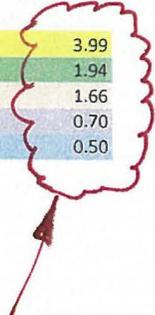
Type of Material	Wet Weight	Dry Weight	Weight of Water	Percent Water (%)	Running Average Moisture Content throughout Series of Tests	
1-1/2" #57 (Dry)	11465	11389.7	75.3	0.66	0.61	

23-Oct-12

Type of Material	Wet Weight	Dry Weight	Weight of Water	Percent Water (%)	Running Average Moisture Content throughout Series of Tests	
Stone Sand (Washed)	23.8	23.32	0.48	2.02	3.43	
Shot (Washed)	32.9	32.4	0.5	1.52	2.08	
5/8" Chips (Washed)	32.56	32.15	0.41	1.26	1.19	
1-1/2" #57 (Washed)	32.73	32.39	0.34	1.04	1.04	
1-1/2" #57 (Dry)	30.5	30.42	0.08	0.26	0.49	

8-Mar-13

Type of Material	Wet Weight	Dry Weight	Weight of Water	Percent Water (%)	Running Average Moisture Content throughout Series of Tests	
Stone Sand (Washed)	28.64	27.18	1.46	5.10	3.99	
Shot (Washed)	22.39	22.02	0.37	1.65	1.94	
5/8" Chips (Washed)	30.58	29.95	0.63	2.06	1.66	
1-1/2" #57 (Washed)	35.22	35.09	0.13	0.37	0.70	
1-1/2" #57 (Dry)	21.09	21.03	0.06	0.28	0.50	



USED THESE MATERIALS AS STANDARDS.

Dan Becker

From: Art Faulkner
Sent: Friday, March 08, 2013 8:21 AM
To: Dan Becker

Stone Sand 28.64 before and 27.18 after drying.
Shot 22.39 before and 22.02 after drying
5/8 washed before and 29.95 after drying
1 1/2 #57 21.09 before and 21.03 after drying
1 1/2 #57 washed 35.22 before and 35.09 after drying

STONE SAND

$$\frac{28.64 - 27.18}{28.64} = 0.051 = 5.1\%$$

SHOT

$$\frac{22.39 - 22.02}{22.39} = 0.017 = 1.7\%$$

5/8" WASHED

$$\frac{30.58 - 29.95}{30.58} = 0.021 = 2.1\%$$

1 1/2 #57 WASHED

$$\frac{35.22 - 35.09}{35.22} = 0.0037 = 0.37\%$$

1 1/2 #57 DRY

$$\frac{21.09 - 21.03}{21.09} = 0.0028 = 0.28\%$$

Davis Quarry
Water Well Usage of Two (2) Wells

1Qtr13

29-May-13

Daniel E. Becker

Well Name	Well Meter Reading on 01 January 2013	Well Meter Reading on 31 March 2013	Total Gallons Used	Total Acre-Feet Used
North Well	596,600	990,500	393,900	1.21
South Well	796,000	871,000	75,000	0.23

LOCATION DAVIS QUARRY

PROJECT

DATE 17 JUNE '13

BY DANIEL E. BECKER

DEPT.

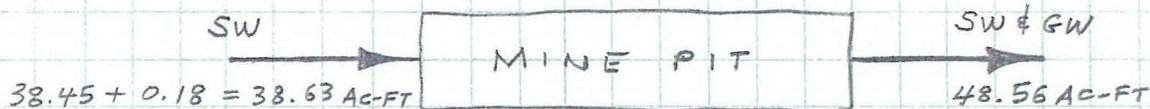
CHECKED BY

SUBJECT MINE PIT WATER COMPOSITION

CALCULATE THE COMPOSITION OF GW & SW IN THE MINE PIT

THE WATER IN THE MINE PIT IS COMPRISED OF STORM WATER ENTERING THE MINE PIT AND GROUNDWATER ENTERING THE MINE PIT.

THE METHOD USED TO DETERMINE THE COMPOSITION OF THE MINE PIT WATER IS AS FOLLOWS. SUBTRACT THE AMOUNT OF STORM WATER ENTERING THE PIT FROM THE COMBINED AMOUNT OF S.W. & G.W. PUMPED FROM THE PIT TO RESULT IN THE TOTAL AMOUNT OF GROUNDWATER REMOVED FROM THE PIT. THEN, THE AMOUNT OF GROUNDWATER REMOVED FROM THE PIT DIVIDED BY THE TOTAL AMOUNT OF WATER REMOVED FROM THE PIT YIELDS THE PERCENTAGE OF GROUNDWATER IN THE MINE PIT WATER.



$$\begin{array}{r}
 48.56 \text{ AC-FT} \quad (\text{SW \& GW}) \\
 - 38.63 \text{ AC-FT} \quad (\text{SW}) \\
 \hline
 9.93 \text{ AC-FT} \quad (\text{GW})
 \end{array}$$

$$\frac{9.93 \text{ AC-FT}}{48.56 \text{ AC-FT}} = 0.2045 = 20.45\% \quad (\text{GW PORTION})$$

$$79.55\% \quad (\text{SW PORTION})$$

LOCATION DAVIS QUARRY PROJECT _____ DATE 17 JUN '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT FRESH WATER LAKE WATER COMPOSITION

THE FRESH WATER LAKE IS COMPRISED OF STORM WATER ENTERING THE MINE PIT, GROUND WATER ENTERING THE MINE PIT, STORM WATER ENTERING THE FRESH WATER LAKE, GROUND WATER ENTERING THE FRESH WATER LAKE, STORM WATER ENTERING THE SETTLING POND, AND GROUND WATER ENTERING THE SETTLING POND

INFLOW QUANTITIES	}	S.W. ENTERING MINE PIT = $38.45 \text{ AC-FT} + 0.18 = 38.63 \text{ AC-FT}$
		G.W. ENTERING MINE PIT = $48.56 - (38.45 + 0.18) = 9.93 \text{ AC-FT}$
		S.W. ENTERING F.W.L. = $16.24 + 7.88 = 24.12 \text{ AC-FT}$
		G.W. ENTERING F.W.L. = $-0-$ (RECHARGING LAKE) = $-0-$ AC-FT
		S.W. ENTERING SETTLING POND = $6.37 + 1.33 = 7.70 \text{ AC-FT}$
		G.W. ENTERING SETTLING POND = $-0-$ = $-0-$ AC-FT

$$\text{G.W. TOTAL} = 9.93 \text{ AC-FT}$$

$$\text{S.W. TOTAL} = 70.45 \text{ AC-FT}$$

CALCULATE THE COMPOSITION OF GW & SW IN THE FWL.

$$\boxed{\text{G.W.}} \quad \frac{9.93}{(70.45 + 9.93)} = 0.1235 = 12.35\% \text{ (GROUNDWATER PORTION)}$$

$$\boxed{\text{S.W.}} \quad \frac{70.45}{(70.45 + 9.93)} = 0.8765 = 87.65\% \text{ (STORM WATER PORTION)}$$

LOCATION DAVIS QUARRY PROJECT _____DATE 24 JUN '13BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____SUBJECT COMPARE THE BALANCE OF ESTIMATED INFLOWS & OUTFLOWS AT THE FRESH WATER LAKE

COMPARE THE BALANCE OF ESTIMATED INFLOWS & OUTFLOWS AT THE FRESH WATER LAKE (F.W.L.). (THE FRESH WATER LAKE IS THE MAIN WATER SUPPLY FOR NEARLY ALL PLANT ACTIVITIES.)

<u>INFLOWS</u>	<u>OUTFLOWS</u>
48.56	246.43
134.03	248.10
243.64	31.17
23.67	14.44
61.86	17.99
16.24	<u>558.13 AC-FT</u>
<u>7.88</u>	
535.88 AC-FT	

NOTE:

WE WOULD HAVE EXPECTED THE INFLOWS TO HAVE EXCEEDED THE OUTFLOWS BECAUSE THE FRESH WATER LAKE GAINED ABOUT 1.87 FEET IN ELEVATION DURING THE QUARTER. INSTEAD, THE OUTFLOWS EXCEEDED THE INFLOWS. PERCENTAGE-WISE, THOUGH, THESE FIGURES SEEM QUITE ACCEPTABLE.

LOCATION DAVIS QUARRY PROJECT _____ DATE 24 JUN '13
 BY DANIEL E. BECKER DEPT. _____ CHECKED BY _____
 SUBJECT CONSUMPTIVE USE SUMMARY — 1 QTR 13

CONSUMPTIVE USE SUMMARY FOR 1QTR13.

<u>ACTIVITY/LOCATION</u>	<u>AMOUNT OF PIT WATER USED</u>	<u>GROUNDWATER COMPONENT</u>
① NORTH WATER WELL	0.00 AC-FT	(ALL GW) 1.21 AC-FT
② SOUTH WATER WELL	0.00 AC-FT	(ALL GW) 0.23 AC-FT
③ MATERIAL MOISTURE HAULED FROM SITE	3.09 AC-FT	$\frac{12.35\%}{\text{GW}} * (0.1235) = 0.38 \text{ AC-FT}$
④ LAND APPLICATION FOR ROADWAY DUST SUPPRESSION	7.35 AC-FT	$\frac{12.35\%}{\text{GW}} * (0.1235) = 0.91 \text{ AC-FT}$
⑤ EVAPORATION FROM MINE PIT	0.20 AC-FT	$\frac{20.45\%}{\text{GW}} * (0.2045) = 0.04 \text{ AC-FT}$

TOTAL GROUNDWATER CONSUMPTION FOR 1QTR13 = 2.77 AC-FT
 AT THE DAVIS QUARRY 1 QTR 13

LOCATION DAVIS QUARRY

PROJECT _____

DATE 24 JUN '13BY DANIEL E. BECKER

DEPT. _____

CHECKED BY _____

SUBJECT DETERMINATION OF GROUNDWATER RIGHTS AT THE DAVIS QUARRY
BOTH ON THE ASA, AND OFF THE ASA

← (- SEE ENCLOSED AERIAL PHOTO SHOWING ASA SUBCROP -) →

- GROUNDWATER RIGHTS ON THE ARBUCKLE SIMPSON AQUIFER
AT THE DAVIS QUARRY LOCATION

$$\left(1,083 \text{ ACRES} \right) \left(\frac{0.2 \text{ AC-FT}}{\text{ACRE}} \right) = 216.6 \text{ AC-FT } \underline{\underline{\text{ON ASA}}}$$

- GROUNDWATER RIGHTS OFF THE ARBUCKLE SIMPSON AQUIFER
AT THE DAVIS QUARRY LOCATION

$$\left(937 \text{ ACRES} \right) \left(\frac{2.0 \text{ AC-FT}}{\text{ACRE}} \right) = 1,874 \text{ AC-FT } \underline{\underline{\text{OFF ASA}}}$$