Water Right Conditions Tracking Slip

Groundwater/Hydrology Section

FILE ## 15983

ROUTED TO: WATER RIGHTS

TOWNSHIP/
RANGE-SECTION: 37S / 6W-13

CONDITIONS ATTACHED? [X] yes [ ] no

REMARKS OR FURTHER INSTRUCTIONS:

Reviewer: IKG

Water Resources Department

MEMO JUNE 9, 2003

TO **Application G-** 15983

FROM **GW:** IVAN GALL
(Reviewer's Name)

SUBJECT **Scenic Waterway Interference Evaluation**

RECEIVED
JUN 23 2003
WATER RESOURCES DEPT.
SALEM, OREGON

☒ Yes
☐ No

The source of appropriation is within or above a Scenic Waterway

☒ Yes
☐ No

Use the Scenic Waterway condition (Condition 7J).

PREPONDERANCE OF EVIDENCE FINDING: (Check box only if statement is true)

☒ At this time the Department is unable to find that there is a preponderance of evidence that the proposed use of ground water will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway in quantities necessary for recreation, fish and wildlife.

FLOW REDUCTION: *(To be filled out only if Preponderance of Evidence box is not checked)*

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

TO: Water Rights Section JUNE 18, 2003

FROM: Ground Water/Hydrology Section IVAN GALL
Reviewer's Name

SUBJECT: Application G- 15983 Supersedes review of N/A
Date of Review(s)

PUBLIC INTEREST PRESUMPTION: GROUNDWATER

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525.* Department staff review ground water applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. **This review is based upon available information and agency policies in place at the time of evaluation.**

A. GENERAL INFORMATION:

Applicant's Name: NEW HOPE CHRISTIAN SCHOOLS INC

A1. Applicant(s) seek(s) 0.156 cfs from 7 well(s) in the ROGUE Basin, APPLEGATE RIVER subbasin Quad Map: MURPHY

A2. Proposed use: IRRIGATION (SEASONAL) Seasonality: YEAR ROUND QUASI-MUNI.

A3. Well and aquifer data **(attach and number logs for existing wells; mark proposed wells as such under logid)**:

Well	Logid	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, example: 2250' N, 1200' E fr NW cor S 36
1	JOSE 6328	BEDROCK?	0.004	37S/06W-13 bb	362'S, 750'E fr NW cor S13
2	JOSE 19520	N/A	0.034		636'S, 362'E fr NW cor S13
3	JOSE 1597	BEDROCK	0.012		175'S, 512'E fr NW cor S13
4	JOSE 6325	BEDROCK	0.008		475'S, 1300'E fr " " "
5	JOSE1280/10033	BEDROCK	0.085		825'S, 1100'E fr " " "

* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval	Casing Intervals	Liner Intervals	Perforations Or Screens	Well Yield	Draw Down	Test Type
1	1060	—	18	9.21.59	115	—	0-106'	—	—	25	75	BAILER
2	1050	—	25	9.7.62	100	18	0-82'	—	70-79'	13	40	BAILER
3	1050	—	35	6.29.63	145	20	0-140'	—	50-140'	20	95	BAILER
4	1075	—	5	7.22.68	140	20	0-120'	—	115-120'	20	16	" "
5	1070	—	95	8.21.80	305	30	0-161'	—	156-161	15	—	AIR
6	1075	76	10	12.20.83	120	25	+1-73	—	—	20	—	AIR

Use data from application for proposed wells.

(See next page for well #7.

A4. Comments: All of the wells appear to be producing ground water from either the decomposed granite, or underlying fractured granitic bedrock.

A5. ☐ Provisions of the ROGUE Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☐ **are**, *or* ☒ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments: SEE OAR 690-515-0030(1)a
690-515-0030(3)a ?? Minimum flows appear to be met most years.

A6. ☐ Well(s) # _____, _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction.
Name of administrative area: _____
Comments: _____

TO: Water Rights Section JUNE 18, 2003

FROM: Ground Water/Hydrology Section IVAN GALL
Reviewer's Name

SUBJECT: Application G- 15983 Supersedes review of N/A
Date of Review(s)

PUBLIC INTEREST PRESUMPTION; GROUNDWATER

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A2. Proposed use: IRRIGATION (SEASONAL) Seasonality: YEAR ROUND QUASI-MUNI,

A3. Well and aquifer data (**attach and number logs for existing wells; mark proposed wells as such under logid**):

Well	Logid	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, example: 2250' N, 1200' E fr NW cor S 36
6	JOSE 11473	BEDROCK	0.003	37S/06W-13bb	150'S, 1250'E fr NW cor S13
7	JOSE 12352	BEDROCK	0.003	37S/06W-13bb	475'S, 1100'E fr NW cor S13

* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval	Casing Intervals	Liner Intervals	Perforations Or Screens	Well Yield	Draw Down	Test Type
7	1070	81	10	4.29.86	160	0-30'	+1-79'	—	—	17	—	AIR

Use data from application for proposed wells.

A4. Comments:

A5. ☐ Provisions of the _____ Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☐ **are**, *or* ☐ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments:

A6. ☐ Well(s) # _____, _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction.
Name of administrative area:
Comments:

Application G- 15983 continued JUNE 18, 2003

B. GROUND WATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130 (b) (c)

B1. Based upon available data, I have determined that ground water for the proposed use:

a. ☐ **is** over appropriated, ☐ **is not** over appropriated, *or* ☒ **cannot be determined to be** over-appropriated during any period of the proposed use;

b. ☐ **will not** *or* ☐ **will** likely be available in the amounts requested without injury to prior ground water rights;

c. ☐ **will not** *or* ☐ **will** likely to be available within the capacity of the ground water resource; or

d. ☒ **will, if properly conditioned**, avoid injury to existing ground water rights or to the ground water resource:
   i. ☒ The permit should contain condition #(s) 7B, 7C, 7F, 7J, * ;
   ii. ☐ The permit should be conditioned as indicated in item 2 below.
   iii. ☒ The permit should contain special condition(s) as indicated in item 3 below;

B2. a. ☐ **Condition** to allow ground water production from no deeper than _____ ft. below land surface;

b. ☐ **Condition** to allow ground water production from no shallower than _____ ft. below land surface;

c. ☐ **Condition** to allow ground water production only from the _____ ground water reservoir between approximately _____ ft. and _____ ft. below land surface;

d. ☐ **Well reconstruction** is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Ground Water Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): _____

B3. Ground water availability remarks: There are over 1,800 well logs within one mile of the applicant's wells. of these 226, or 15%, are listed as deepenings. That is a high density of wells, and appears to be a large number of deepenings, suggesting that the gw resource may be stressed.

State obs. well #1137 (Espey Road) water level data suggest that some water level decline has occurred in the Allen CR basin, ~ 2 miles from the applicants wells. The geology for both areas is similar (Grant's Pass pluton).

* Require permittee to install and maintain properly functioning totalizing flow meters on each well.

Application G- 15983 continued JUNE 18, 2003

C. GROUND WATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040

C1. **690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1,2,3	DECOMPOSED GRANITE AND FRACTURED BEDROCK	☐	☒
4,5,6	↓	☐	☒
7	↓	☐	☒

Basis for aquifer confinement evaluation: Static water levels fairly shallow first water only 76 feet for well 6 and 81 feet for well 7. Annual recharge for this system based on hydrographs in area (SOW#1137).

C2. **690-09-040 (2) (3):** Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source.

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected? YES	NO	ASSUMED	Potential for Subst. Interfer. Assumed? YES	NO
1	1	APPLEGATE RIVER	1042	960	3,700	☒	☐	☐	☐	☒
2	1	↓	1025	↓	3,100	☒	☐	☐	☐	☒
3	1	↓	1015	↓	3,500	☒	☐	☐	☐	☒
4	1	↓	1070	↓	4,100	☒	☐	☐	☐	☒
5	1	↓	975	↓	3,700	☒	☐	☐	☐	☒
6	1	↓	1065	↓	4,400	☒	☐	☐	☐	☒
7	1	↓	1060	↓	4,100	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: Static water levels substantially higher than river stage. Applegate River incises local geology; river a local discharge area for ground water.

C3a. **690-09-040 (4):** Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. If Q is not distributed by well, use full rate for each well. If modeled, include description and model parameters in Comments (C3b). Any checked ☒ box indicates the well is assumed to have the potential to cause substantial interference with surface water.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	1	☐	☐	66612	120	☐	45.8	☐	5%	☐
2	1	☐	☐	↓	↓	☐	↓	☐	↓	☐
3	1	☐	☐	↓	↓	☐	↓	☐	↓	☐
4	1	☐	☐	↓	↓	☐	↓	☐	↓	☐
5	1	☐	☐	↓	↓	☐	↓	☐	↓	☐
6	1	☐	☐	↓	↓	☐	↓	☐	↓	☐
7	1	☐	☐	↓	120	☐	↓	☐	↓	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

Application G- 15983 continued JUNE 19, 2003

C3b. **690-09-040 (4):** Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells**. Otherwise same evaluation and limitations apply as in C3a above.

	SW #		Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
			☐			☐		☐		☐
			☐			☐		☐		☐
			☐			☐		☐		☐
			☐			☐		☐		☐

Comments: Used analytical model for stream depletion (Theis/Hantush). not all assumptions met, so aquifer K and S were adjusted to conservatively estimate impact on streams. K values from Domenico & Schwartz @ 7 gal/day/ft², assume S@ 0.005. See attached sheets

C4a. **690-09-040 (5):** Estimated impacts on surface water sources as percent or qualitative fraction* of proposed pumping rate. Limit evaluation to one year of pumping.

		L	L	L	VL	L	L	I	I	I	I	I	I
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	22%	18%	16%	2%	8%	15%	20%	25%	31%	31%	27%	25%
2	1	21	18	15	4	14	23	30%	35	40	40	32	26
3	1	22	19	16	2	10	18	24	30	34	36	31	26
4	1	22	19	17	1	5	11	17	22	26	29	28	25
5	1	22	19	16	1	8	15	22	27	31	34	30	26
6	1	21	19	17	0	4	9	14	19	23	26	26	24
~~7~~	~~1~~	~~21~~	~~19~~	~~17~~	~~0%~~	~~4~~	~~9~~	~~14~~	~~19~~	~~23~~	~~26~~	~~26~~	~~24~~
7	1	22	19	17	1%	5	11	17	22	26	29	28	25

*VL = Very Low (<5%), L = Low (5-25%), I = Intermediate (25-75%), H = High (>75%).

Basis for impact evaluation: Used same analytical model described above in C3b, with specific rate and distance to stream for each well. See attached sheets.

C4b. **690-09-040 (5):** Evaluation of paragraphs under subsection 5. A determination of ☒ **Low** denotes no connection or a very indirect connection between surface water and ground water; ☒ **High** denotes hydraulic connection that would likely reduce surface water availability in the first year of pumping. Do not equate "Low" and "High" between C4a and C4b.

(a) The potential to reduce surface water availability in Applegate River is ☐ **Low** *or* ☒ **High**
The potential to reduce surface water availability in _____ is ☐ **Low** *or* ☐ **High**
The potential to reduce surface water availability in _____ is ☐ **Low** *or* ☐ **High**
The potential to reduce surface water availability in _____ is ☐ **Low** *or* ☐ **High**

Basis: Static water levels in wells substantially higher than Applegate River stage. Applegate River incises into local geology and is a local/regional gw discharge area.

(b) **The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.**

Application G- 15983 continued JUNE 19, 2003

C4b. **690-09-040 (5):**. Evaluation of paragraphs under subsection 5 continued.

(c) The **percentage** of appropriation in the first year of use that will be at the expense of surface water 25-30%

Basis: Analytical modeling described above suggests that ~25-30% of the use will be at the expense of surface water.

(d) The timing of interference will be ☒ **immediate** (within one year), *or* ☐ **delayed**;

Basis: Analytical modeling described above.

(e) The potential for cumulative adverse impacts: A graphical distribution of POAs and summary of permitted rights ☐ **are** *or* ☒ **are not** available at this time of review.

Impacted stream	Impacted basin or sub-basin	Existing Ground Water Rights (cfs)

Comments:

C5. ☐ **If properly conditioned**, the surface water source(s) can be adequately protected from interference, and/or ground water use under this permit can be regulated if it is found to substantially interfere with surface water:

i. ☒ The permit should contain condition #(s) 7B, 7C, 7F, 7J, *;
ii. ☒ The permit should contain special condition(s) as indicated in "Remarks" below;
iii. ☐ The permit should be conditioned as indicated in item 6 below;

C6. ☐ **If the well is not reconstructed**, it will interfere with surface water. Well reconstruction, as follows, will adequately protect surface water from interference. If the ground water use under this permit is found to have the potential for substantial interference with surface water, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Ground Water Section.:

The well should be reconstructed as follows:

C7. **SW / GW Remarks** Given the hydraulic connection between the applicant's wells and the Applegate R., the only way to protect surface water is denial of the permit. However the potential for substantial interference is low for the first year of pumping.

* Require permittee to install and maintain a totalizing flow meter on each well, properly functioning,

Application G- 15983 continued JUNE 18, 2003

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** 1 **Logid:** JOSE 6328

D2. **THE WELL does not meet current well construction standards based upon:**

a. ☒ review of the well log;
b. ☐ field inspection by _____;
c. ☐ report of CWRE _____;
d. ☐ other: (specify) _____

D3. **THE WELL construction deficiency:**

a. ☒ constitutes a health threat under Division 200 rules;
b. ☐ commingles water from more than one ground water reservoir;
c. ☐ permits the loss of artesian head;
d. ☐ permits the de-watering of one or more ground water reservoirs;
e. ☐ other: (specify) _____

D4. **THE WELL construction deficiency is described as follows:** Based on a review of the well log, there does not appear to be a well seal on this well.

D5. **THE WELL**

a. ☐ **was**, *or* ☐ **was not** constructed according to the standards in effect at the time of original construction or most recent modification.

b. ☒ I don't know if it met standards at the time of construction.

D6. ☒ **Route to the Enforcement Section.** I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Enforcement Section and the Ground Water Section. / or withdraw this well from application?

THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

D7. ☐ Well construction deficiency has been corrected by the following actions: _____

_____ _____, 200____.
(Enforcement Section Signature)

D8. ☐ **Route to Water Rights Section (attach well reconstruction logs to this page).**

STATE OF OREGON

COUNTY OF JOSEPHINE

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

STATE OF OREGON
WATER RESOURCES DEPARTMENT
SALEM, OREGON 97310

confirms the right to use the waters of APPLEGATE RIVER, a tributary of the ROGUE RIVER, in the ROGUE RIVER BASIN to maintain an instream flow for the purpose of SUPPORTING AQUATIC LIFE.

The right is for flows to be maintained IN THE APPLEGATE RIVER AT USGS GAGE NO. 14369500, (SECTION 31, T 36 S, R 6 W, W.M.), NEAR WILDERVILLE AND MAINTAINED TO THE CONFLUENCE WITH THE ROGUE RIVER.

The right is established under Oregon Revised Statutes 537.346.

The date of priority is SEPTEMBER 17, 1982.

The right is limited to not more than the amounts during the time periods listed below:

Period	Flows (cubic feet per second)
OCT 1 - NOV 30	360
DEC 1 - FEB 29	300
MAR 1 - APR 30	340
MAY 1 - JUN 30	360
JUL 1 - JUL 31	120

The storage of water for irrigation and downstream enhancement of fish life as authorized by HD 566 (87th Congress, 2nd Session) and Public Law (PL) 87-874 shall not be affected by regulation for this instream water right.

This instream water right shall not have priority over domestic and livestock uses or irrigation of non-commercial gardens not to exceed one-half acre in area or waters legally released from storage.

Witness the signature of the Water Resources Director affixed AUGUST 12, 1991.

William H. Young
Water Resources Director

Recorded in State Record of Water Right Certificates number 66612.

MF249 15.APPLEGATE R. VOLUME 6 DISTRICT 14

Input Data:

Variable	Name	Minimum	"Best"	Maximum	Unit
Well Owner or Well Number	Well		G-15983		
X Coord. for X-Section (Head Distribution)	x		0		[ft]
Perpendicular Distance From Well to Stream	a		4,400		[ft]
Net Steady Pumping Rate	Q		10		[gpm]
Hydraulic Conductivity	K	7	7	7	[gpd/ft*ft]
Aquifer Thickness	b	100	200	300	[ft]
Well Depth	d		100		[ft]
Storativity	S		0.00500		
Effective porosity	n		0.00500		
Hydr. Grad. Perpend. to Stream (must be > 0)	i	0.03000	0.03000	0.03000	
Time Since Pumping Started	time		30.00		[days]

Well #6 furthest from river

Output Data:

General Output:						
Transmissivity	T	700	1,400	2,100	[gpd/ft]	= K*b
Hydraulic Conductivity	K	7	7	7	[gpd/ft*ft]	
		1	1	1	[ft/day]	
		3.28E-06	3.28E-06	3.28E-06	[m/s]	
Average linear velocity	ALV	5.61	5.61	5.61	[ft/day]	= K*i/n
		2,050.87	2,050.87	2,050.87	[ft/yr]	
Ambient Flux at River per Foot	dQ	0.0146	0.0292	0.0438	[gpm/ft]	= K*b*i
Transient Stream Depletion Output:						
k	SDTr_k	8.6198	4.3099	2.8733		= ((a^2*S)/(4Tt))*7.48
Transient Stream Depletion (Theis/Jenkins)	SDTr	0%	0%	2%		= erfc SQRT(a*a*S)/4Tt)
Transient Induced Infiltration (Theis/Jenkins)	IITr					
Steady-State Stream Depletion:						
Dimensionless Pumping Rate (ß >= 1 ==> velocity divide has reached stream)	Beta, ß	0.05	0.02	0.02		= Q/(K*b*i**a)
SQRT(Beta-1)		0.00	0.00	0.00		
Critical pumping rate	Qc	202	403	605	[gpm]	= K*b*i**a
Dist. fr Well to Velocity Divide at Steady State	rvd	111	55	37	[ft]	= a-(a*SQRT(1-ß))
Steady-State Stream Depletion (Wilson & Linderfelt)		100%	100%	100%		
Steady-State Induced Infiltration (Wilson & Linderfelt)		0%	0%	0%		= (2/)*{-SQRT(ß-1)/ß+ATAN[(

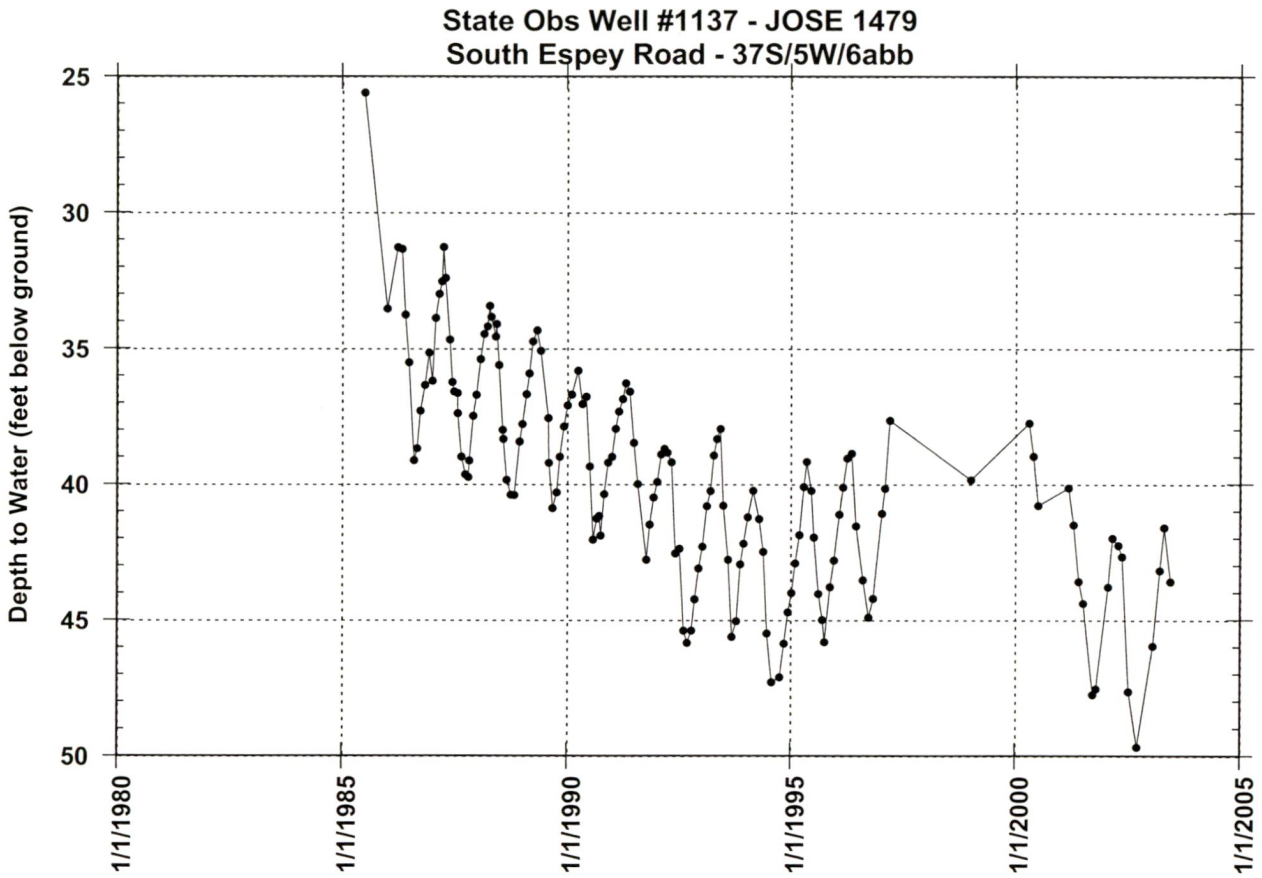
Input Data:

Variable	Name	Minimum	"Best"	Maximum	Unit
Well Owner or Well Number	Well		G-15983		
X Coord. for X-Section (Head Distribution)	x		0		[ft]
Perpendicular Distance From Well to Stream	a		3,100		[ft]
Net Steady Pumping Rate	Q		10		[gpm]
Hydraulic Conductivity	K	7	7	7	[gpd/ft*ft]
Aquifer Thickness	b	100	200	300	[ft]
Well Depth	d		100		[ft]
Storativity	S		0.00500		
Effective porosity	n		0.00500		
Hydr. Grad. Perpend. to Stream (must be > 0)	i	0.03000	0.03000	0.03000	
Time Since Pumping Started	time		30.00		[days]

well #2 closest to river

Output Data:

General Output:						
Transmissivity	T	700	1,400	2,100	[gpd/ft]	= K*b
Hydraulic Conductivity	K	7	7	7	[gpd/ft*ft]	
		1	1	1	[ft/day]	
		3.28E-06	3.28E-06	3.28E-06	[m/s]	
Average linear velocity	ALV	5.61	5.61	5.61	[ft/day]	= K*i/n
		2,050.87	2,050.87	2,050.87	[ft/yr]	
Ambient Flux at River per Foot	dQ	0.0146	0.0292	0.0438	[gpm/ft]	= K*b*i
Transient Stream Depletion Output:						
k	SDTr_k	4.2787	2.1394	1.4262		= ((a^2*S)/(4Tt))*7.48
Transient Stream Depletion (Theis/Jenkins)	SDTr	0%	4%	9%		= erfc SQRT(a*a*S)/4Tt)
Transient Induced Infiltration (Theis/Jenkins)	IITr					
Steady-State Stream Depletion:						
Dimensionless Pumping Rate (ß >= 1 ==> velocity divide has reached stream)	Beta, ß	0.07	0.04	0.02		= Q/(K*b*i**a)
SQRT(Beta-1)		0.00	0.00	0.00		
Critical pumping rate	Qc	142	284	426	[gpm]	= K*b*i**a
Dist. fr Well to Velocity Divide at Steady State	rvd	111	55	37	[ft]	= a-(a*SQRT(1-ß))
Steady-State Stream Depletion (Wilson & Linderfelt)		100%	100%	100%		
Steady-State Induced Infiltration (Wilson & Linderfelt)		0%	0%	0%		= (2/)*{-SQRT(ß-1)/ß+ATAN[(


State Obs Well #1137 - JOSE 1479
South Espey Road - 37S/5W/6abb
Depth to Water (feet below ground)
25
30
35
40
45
50
1/1/1980
1/1/1985
1/1/1990
1/1/1995
1/1/2000
1/1/2005

Domenico & Schwartz, 1990

Table 3.2
Representative values of hydraulic conductivity for various rock types

Material	Hydraulic conductivity (m/sec)
SEDIMENTARY	
Gravel	3×10^{-4} –3×10^{-2}
Coarse sand	9×10^{-7} –6×10^{-3}
Medium sand	9×10^{-7} –5×10^{-4}
Fine sand	2×10^{-7} –2×10^{-4}
Silt, loess	1×10^{-9} –2×10^{-5}
Till	1×10^{-12}–2×10^{-6}
Clay	1×10^{-11}–4.7×10^{-9}
Unweathered marine clay	8×10^{-13}–2×10^{-9}
SEDIMENTARY ROCKS	
Karst and reef limestone	1×10^{-6} –2×10^{-2}
Limestone, dolomite	1×10^{-9} –6×10^{-6}
Sandstone	3×10^{-10}–6×10^{-6}
Siltstone	1×10^{-11}–1.4×10^{-8}
Salt	1×10^{-12}–1×10^{-10}
Anhydrite	4×10^{-13}–2×10^{-8}
Shale	1×10^{-13}–2×10^{-9}
CRYSTALLINE ROCKS	
Permeable basalt	4×10^{-7}–2×10^{-2}
Fractured igneous and metamorphic rock	8×10^{-9}–3×10^{-4}
Weathered granite	3.3×10^{-6}–5.2×10^{-5}
Weathered gabbro	5.5×10^{-7}–3.8×10^{-6}
Basalt	2×10^{-11}–4.2×10^{-7}
Unfractured igneous and metamorphic rocks	3×10^{-14}–2×10^{-10}

To convert meters per second to	Multiply by
cm/sec	10^2
(gal/day)/ft^2	2.12×10^6
ft/sec	3.28
ft/yr	1×10^8
darcy	1.04×10^5
ft^2	1.1×10^{-6}
cm^2	1×10^{-3}
To convert any of the above to meters per second	Divide by the appropriate number above

06/19/2003 #48
G-15983
New Hope School

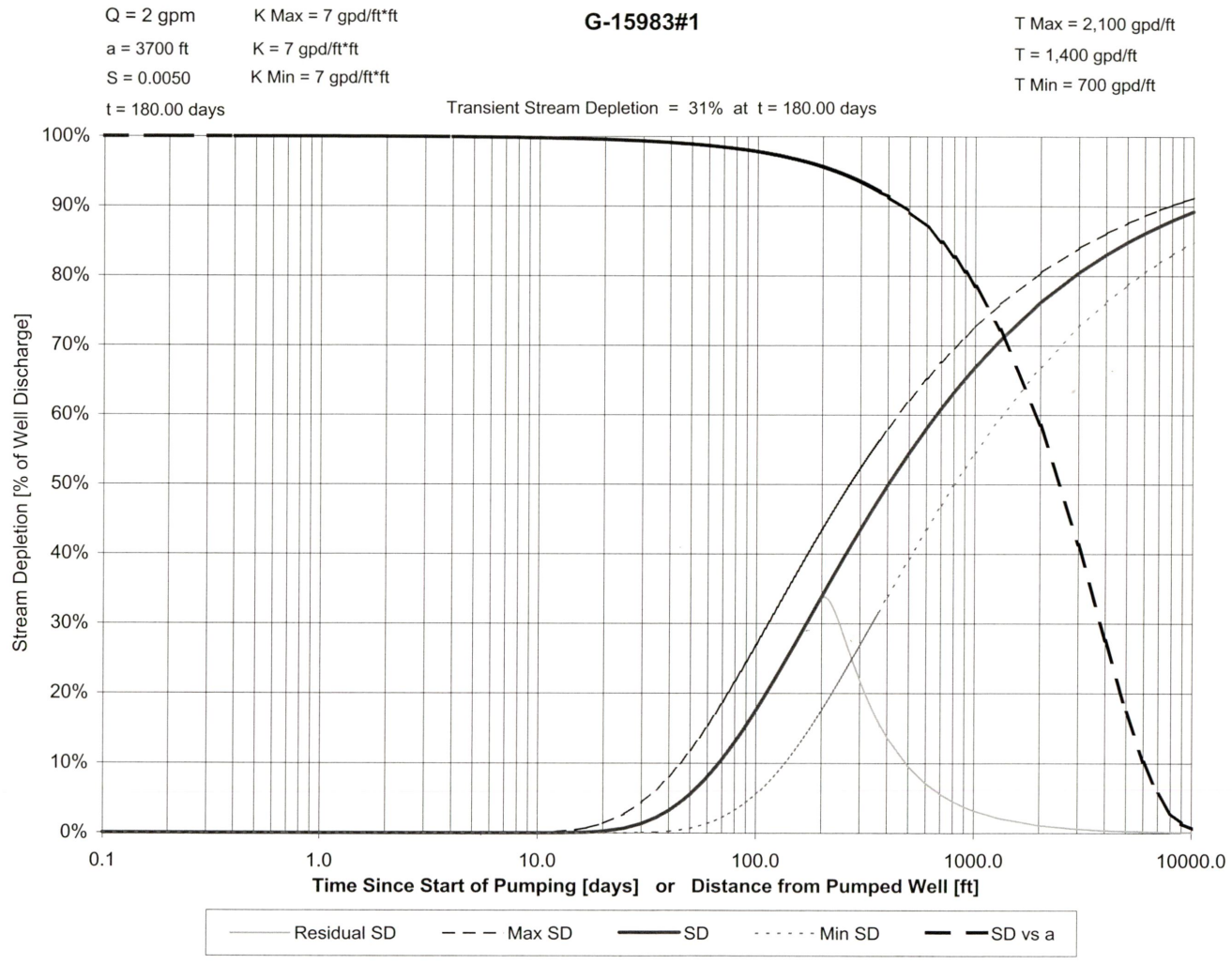
SPEC. CAPAC.

GAL

Assume 3.3×10^{-6}
Errs on the low side for weathered granite,

Assume Storativity = 0.005 conservatively high for fractured bedrock, good estimate for weathered granite

$(3.3 \times 10^{-6})(2.12 \times 10^{6}) = 6.996 \sim 7$ gal/day/ft^2


Q = 2 gpm
a = 3700 ft
S = 0.0050
t = 180.00 days
K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft
G-15983#1
T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft
Transient Stream Depletion = 31% at t = 180.00 days
Stream Depletion [% of Well Discharge]
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.1
1.0
10.0
100.0
1000.0
10000.0
Time Since Start of Pumping [days] or Distance from Pumped Well [ft]
Residual SD
Max SD
SD
Min SD
SD vs a

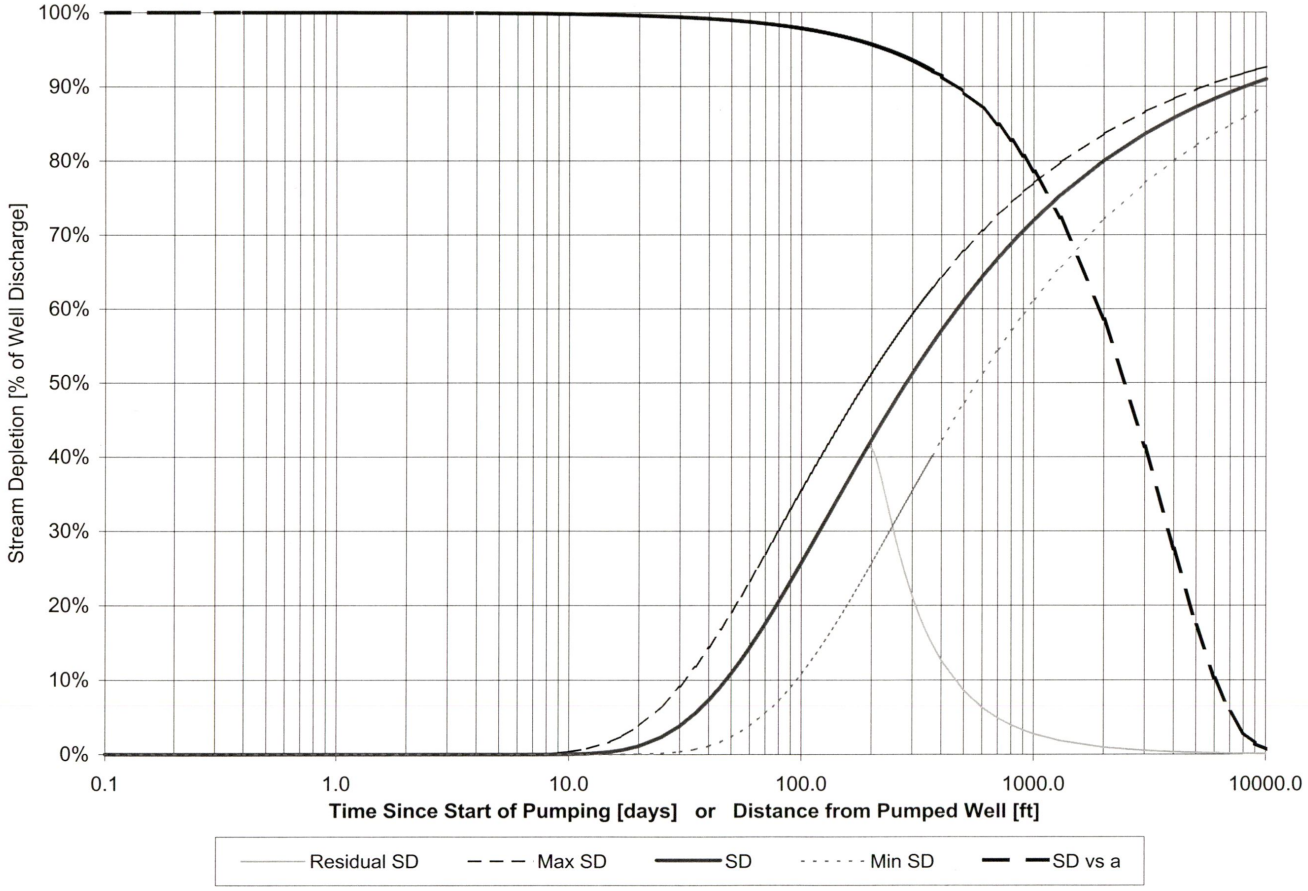
Q = 15 gpm
a = 3100 ft
S = 0.0050
t = 180.00 days

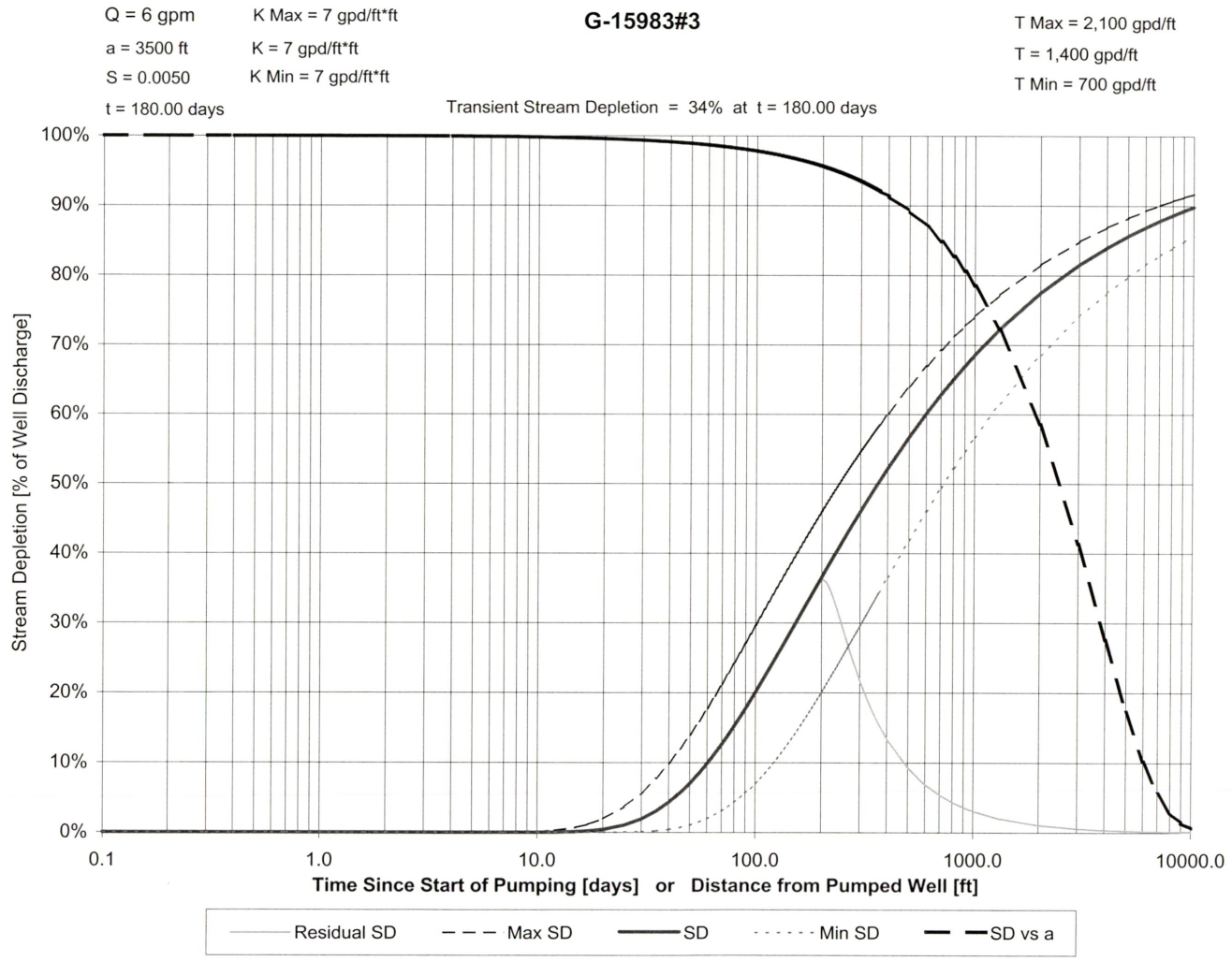
K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft

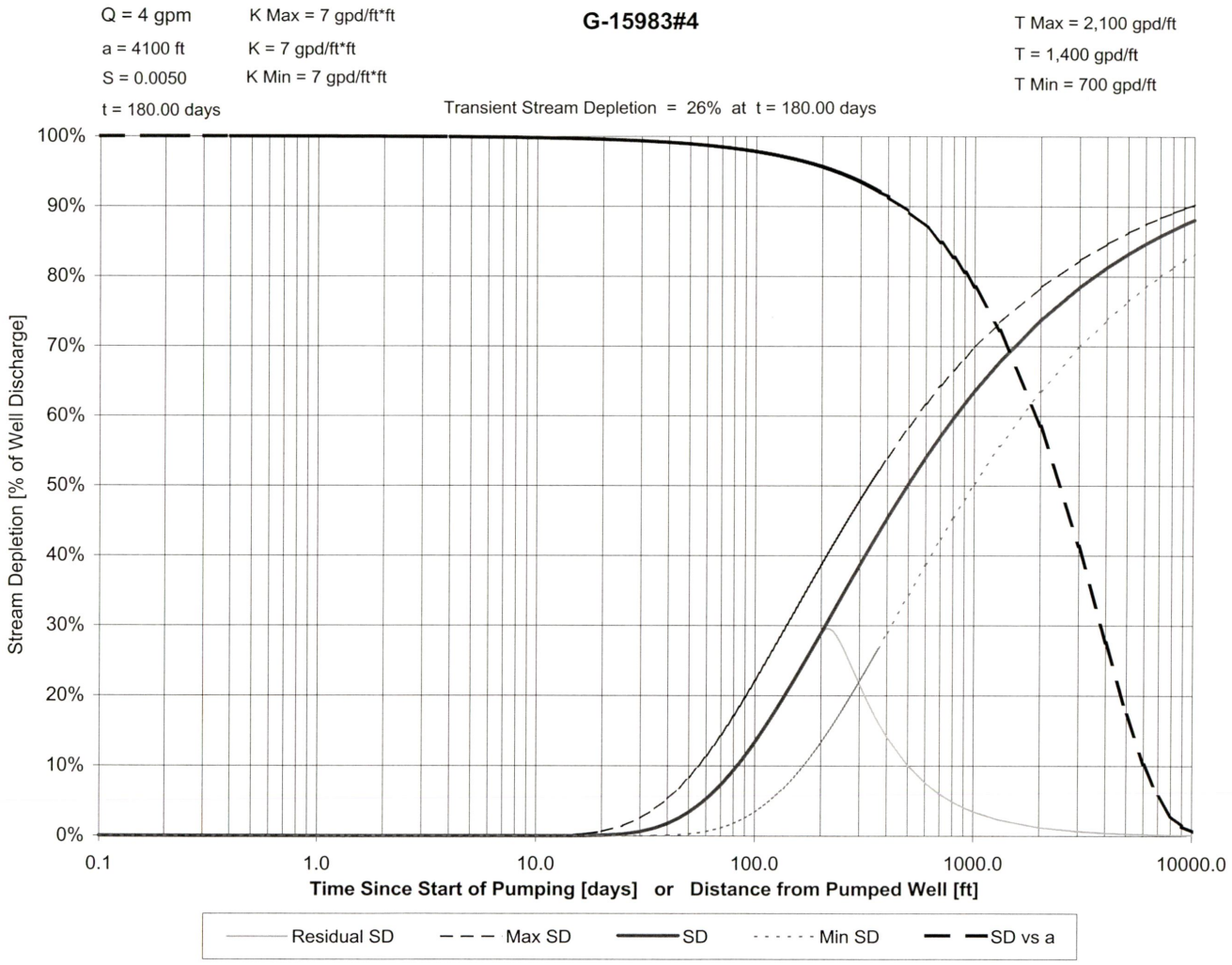
G-15983#2

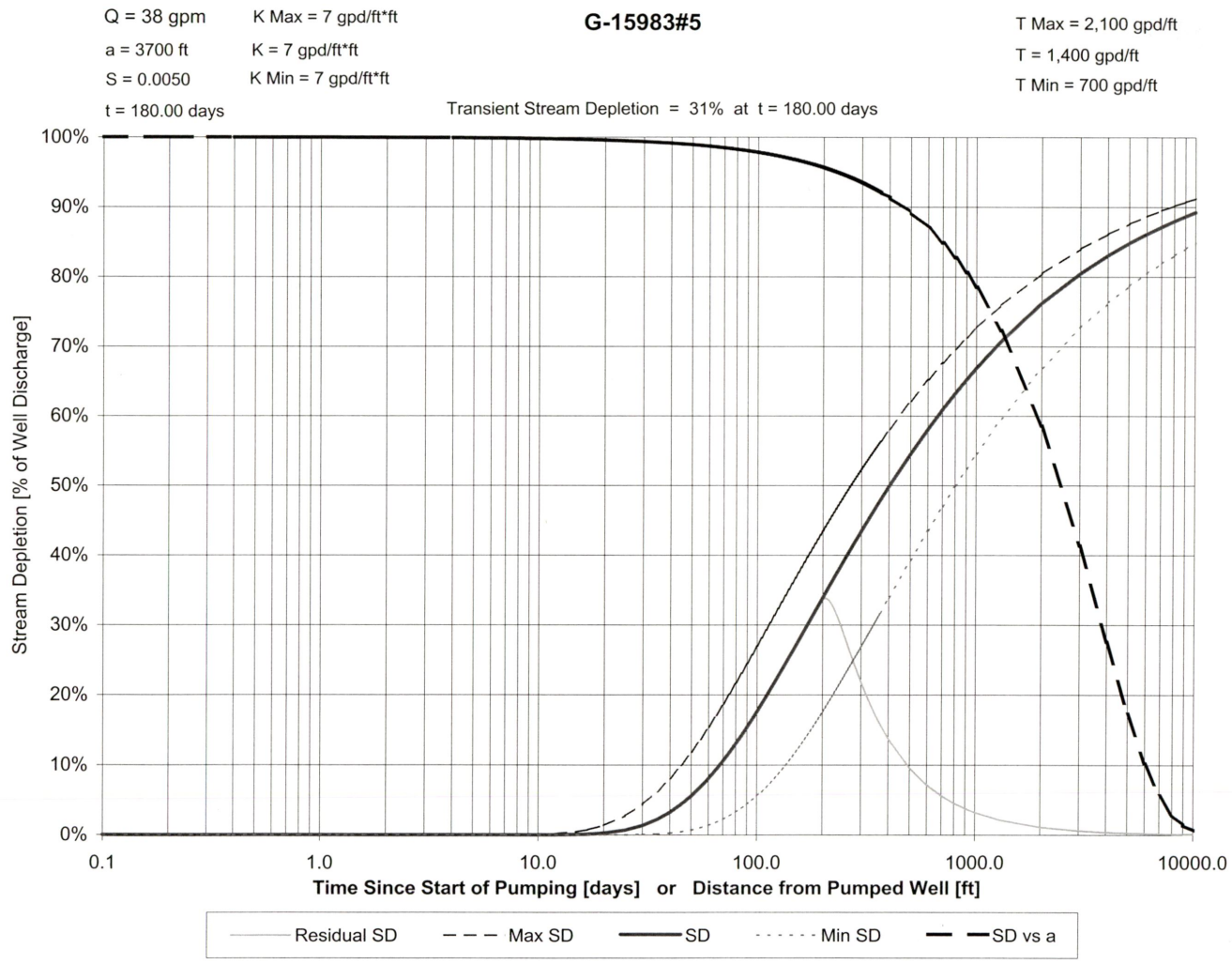
T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft

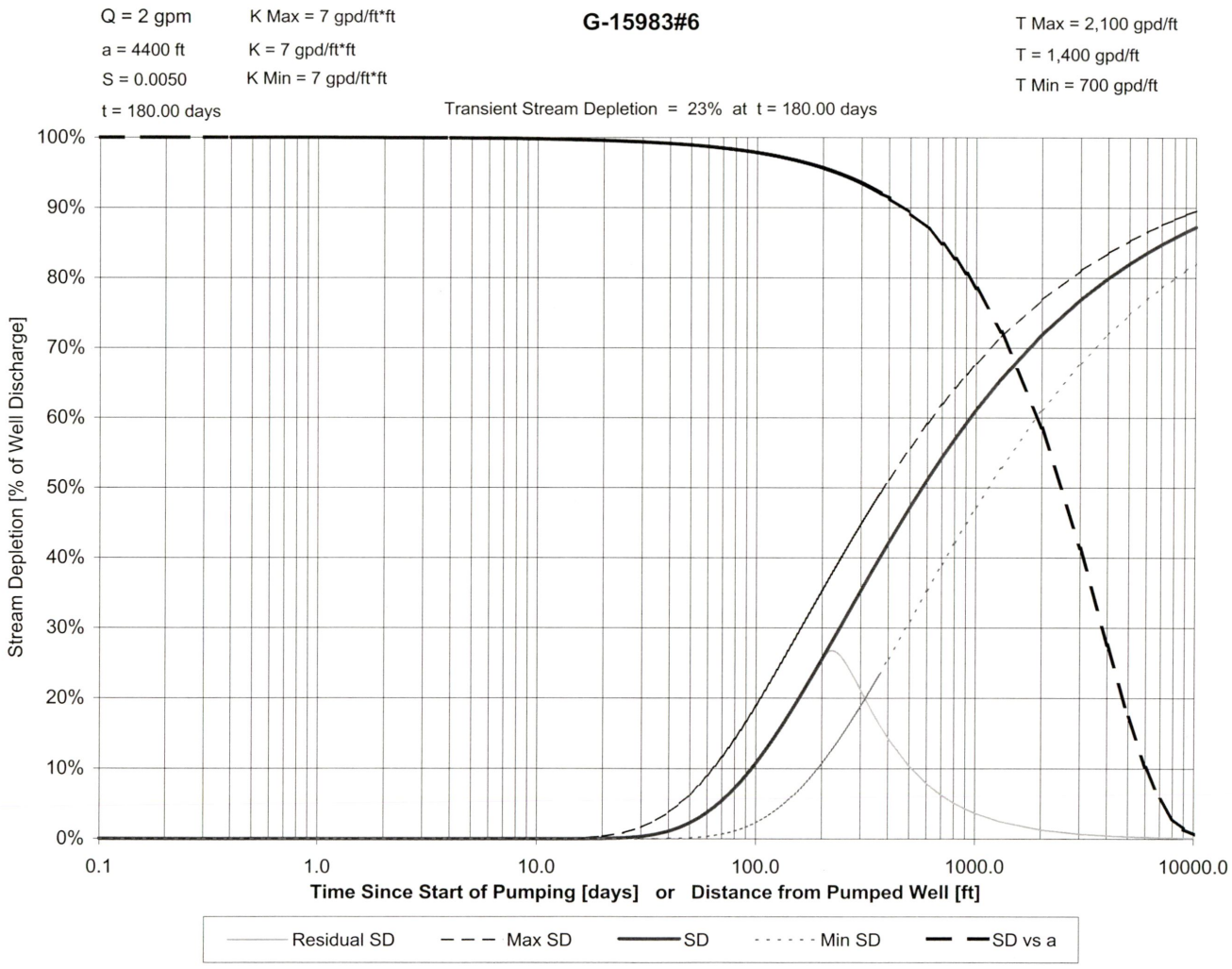
Transient Stream Depletion = 40% at t = 180.00 days




Q = 6 gpm
a = 3500 ft
S = 0.0050
t = 180.00 days
K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft
G-15983#3
T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft
Transient Stream Depletion = 34% at t = 180.00 days
Stream Depletion [% of Well Discharge]
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.1
1.0
10.0
100.0
1000.0
10000.0
Time Since Start of Pumping [days] or Distance from Pumped Well [ft]
Residual SD
Max SD
SD
Min SD
SD vs a


Q = 4 gpm
a = 4100 ft
S = 0.0050
t = 180.00 days
K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft
G-15983#4
T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft
Transient Stream Depletion = 26% at t = 180.00 days
Stream Depletion [% of Well Discharge]
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.1
1.0
10.0
100.0
1000.0
10000.0
Time Since Start of Pumping [days] or Distance from Pumped Well [ft]
Residual SD
Max SD
SD
Min SD
SD vs a


Q = 38 gpm
a = 3700 ft
S = 0.0050
t = 180.00 days
K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft
G-15983#5
T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft
Transient Stream Depletion = 31% at t = 180.00 days
Stream Depletion [% of Well Discharge]
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.1
1.0
10.0
100.0
1000.0
10000.0
Time Since Start of Pumping [days] or Distance from Pumped Well [ft]
Residual SD
Max SD
SD
Min SD
SD vs a


Q = 2 gpm
a = 4400 ft
S = 0.0050
t = 180.00 days
K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft
G-15983#6
T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft
Transient Stream Depletion = 23% at t = 180.00 days
Stream Depletion [% of Well Discharge]
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.1
1.0
10.0
100.0
1000.0
10000.0
Time Since Start of Pumping [days] or Distance from Pumped Well [ft]
Residual SD
Max SD
SD
Min SD
SD vs a

Q = 2 gpm
a = 4100 ft
S = 0.0050
t = 180.00 days

K Max = 7 gpd/ft*ft
K = 7 gpd/ft*ft
K Min = 7 gpd/ft*ft

G-15983#7

T Max = 2,100 gpd/ft
T = 1,400 gpd/ft
T Min = 700 gpd/ft

Transient Stream Depletion = 26% at t = 180.00 days