

November 1, 2005

STATE WATER RESOURCES CONTROL BOARD

2005 NOV -3 PM 3:06

DIVISION OF WATER RIGHTS SACRAMENTO

Hand Delivered, Copy by U.S. Mail

Victoria Whitney, Chief  
Division of Water Rights  
State Water Resources Control Board  
Post Office Box 2000  
Sacramento, California 95812-2000

Re: Amendment to Water Right Application 30166 of James J. Hill III for diversion of water from the underflow of the Big Sur River, Monterey County, California

Dear Ms. Whitney:

I request that the following changes be made to my Application No. 30166 (changes are shown in bold italics):

1. Please amend the table under Item 4(a) to read as follows:

PURPOSE OF USE (irrigation, domestic, etc.)	QUANTITY		SEASON OF DIVERSION	
	RATE (CFS)	AMOUNT (acre-foot/year)	Beginning date (Mo. & Day)	Ending date (Mo. & Day)
Irrigation	<b><i>Not to exceed 5.34 cfs on 30-day running average</i></b>	<b><i>** (See supplement, below)</i></b>	January 1 <b><i>(See Item 5(a), below)</i></b>	December 31 <b><i>(See Item 5(a), below)</i></b>

**\*\* Supplement to Item 4(a):**

***By this Application, Applicant requests approval to divert water for the described Purpose of Use within the described Place of Use only in quantities that are required by the conditions prevailing from time to time; e.g., weather (including rainfall, soil saturation, evapotranspiration) and similar conditions (including data reported to the SWRCB annually as may be required by the permit (herein "Water Uses Regulated by Conditions"), it being intended that diversions for "Water Uses Regulated by Conditions" as requested by this application will comply with the California Constitution Article X, Sec. 2 which requires that "the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use" be prevented and that the conservation of such waters is to be exercised with the "view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare."***

**The amount of water diverted annually for "Water Uses Regulated by Conditions" will not exceed an average of 1200 acre feet per year for the Most Recent Twenty-Year Period, determined each year to include the last 20 calendar years ending with the most recent December 31. (Refer to Item 6 and Item 10 below);"**

2. Please amend Item 4(b) to read as follows:

**Total amount taken by direct diversion during any one year for "Water Uses Regulated by Conditions" will be no more than 1615 acre-feet (refer to Item 4(a) and Supplement thereto, Item 6 and Item 10). The quantity of water to be diverted for the Purpose of Use pursuant to the requested Permit will be applied only to "Water Uses Regulated by Conditions" on a net 267 acres within the 292-acre Place of Use.**

3. Please amend the text above the table in Item 5(a) to read as follows:

**Maximum area to be irrigated in any one year under any permit issued pursuant to this Application is a net 267 acres within the 292-acre Place of Use.**

4. Please amend the table in Item 5(a) to read as follows:

CROP	ACRES	METHOD OF IRRIGATION	ACRE FEET PER YEAR	NORMAL* SEASON	
Coastal grasses and legumes	Any 267 Acres within the 292 Acre Place of Use**	Flooding from underground irrigation system	(See Item 4(a) and Supplement and 4(b), above)	1/1	12/31

\* Diversions generally occur between 4/1 and 1 1/30, but in some years occur as early as 1/1 or as late as 12/31.

\*\* As described in Item 4(a) and Supplement thereto and Item 6, the 292 acre Place of Use includes 25 Acres as to which Applicant claims an existing right. (Refer to Item 6 and Item 10.)

5. Please amend Item 6 "Place of Use" to add the following thereto:

***The Place of Use is the 292 Acres designated on the Map submitted with original Application No. 30166. No more than 267 Acres of the Place of Use will be irrigated at any time. The specific net acreage irrigated within the Place of Use may vary from time to time. The Place of Use includes approximately 25 acres as to which applicant claims an existing right; i.e., riparian rights to divert from the Big Sur River. (Refer to Item 10 below.)***

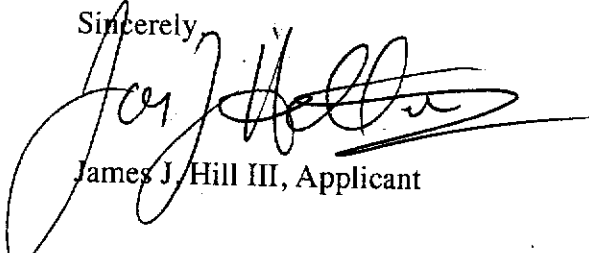
6. Please add the following text as a supplement to Item 10:

***Applicant claims a riparian right to the use of a portion of the water diverted at the existing points of diversion for "Water Uses Regulated by Conditions" on approximately 25 acres of riparian land, which are included within the Place of Use described in Item 6. The source of the water subject to the riparian right is the Big Sur River system including but not limited to its underflow. The year of first riparian use was no later than 1951. The Purpose of Use made in the past, is irrigation. The season of the use is described in Item 5 a. The location of the existing points of diversion is described in Item 3 b. The 25 Acres lie within the watershed of the Big Sur River. Approximately 23 acres of the 25 acres are currently irrigated pasture. Nothing set forth in this Application shall be interpreted to transfer, modify, or in any way limit Applicant's riparian rights or any part thereof. The Applicant reserves the right to contend that additional lands are riparian to the Big Sur River. The total quantity and rate of water diversion requested under this Application for "Water Uses Regulated by Conditions" includes Applicant's claimed existing riparian diversion right. The exercise of the existing riparian rights shall not result in diversions that exceed the "Water Uses Regulated by Conditions" requirements therefor. If the Applicant's claimed existing right is quantified at some later date as a result of an adjudication or other legally binding proceeding, the quantity and rate of diversion and use allowed under the requested Permit shall be the net of the face value of the Permit less the amounts of water available under the existing right.***

Thank you for your assistance in recording these amendments. It would be appreciated if you would send me a copy of the amended application for verification of accuracy. If you have any questions, you may contact:

Janet Goldsmith, Esq.  
Kronick, Moskovitz, Tiedemann & Girard  
Water and Natural Resources Section  
400 Capitol Mall, 27<sup>th</sup> Floor  
Sacramento, California 95814  
Telephone: 916-321-4500

Sincerely,



James J. Hill III, Applicant

2076816.6

cc: L. Moeller, P. Murphey, J. Farwell, R. Floerke, B. Torgan, J. Crenshaw, W. Hearn

~~LIWA/PGWA~~

FILE 30166

December 24, 2005

2005 Dec 1 - 3 P: 12: 24

Div. of Water Rights  
Sacramento

VIA FEDERAL EXPRESS

Victoria Whitney, Chief  
Division of Water Rights  
State Water Resources Control Board  
Post Office Box 2000  
Sacramento, CA 95812-2000

Re: Second Amendment to Water Right Application 30166 of James J. Hill III for diversion of water from the underflow of the Big Sur River, Monterey County, California

Dear Ms. Whitney:

Please refer to my letter to you of November 1, 2005, regarding the Amendment (first) to the above Application.

I request that the following change be made to the table under Item 4(a) of the Application which is set forth on page one of the November 1 letter to you:

In the second column of the said table, under the heading "Rate (CFS)"

Please change the wording to read:

"Not to exceed 5.34 cfs on 30 day running average and not to exceed 5.84 cfs at any time."

The new wording included in the above is:

"and not to exceed 5.84 cfs at any time".

This as restated to include the new wording, the table in Item 4(a) will appear

PURPOSE OF USE (irrigation, domestic, etc.)	QUANTITY		SEASON OF DIVERSION	
	RATE (CFS)	AMOUNT (acre-foot/year)	Beginning date (Mo. & Day)	Ending date (Mo. & Day)
Irrigation	<i>Not to exceed 5.34 cfs on 30-day running average and not to exceed 5.84 cfs at any time"</i>	** (See supplement, below)	January 1 (See Item 5(a), below)	December 31 (See Item 5(a), below)

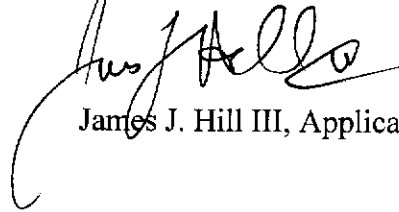
\*\* Supplement to Item 4(a): (For the content of the latter Supplement, refer to page 1 of the November 1 letter.)

Chief Division of Water Rights  
December 24, 2005  
Page 2

Again, thank you for your assistance in recording these amendments. It would be appreciated if you would send me a copy of the amended application for verification of accuracy. If you have any questions, you may contact:

Janet Goldsmith, Esq.  
Kronick, Moskowitz, Tiedemann & Girard  
Water and Natural Resources Section  
400 Capitol Mall, 27<sup>th</sup> Floor  
Sacramento, California 95814  
Telephone: 916-321-4500

Sincerely,



James J. Hill III, Applicant

cc: L. Moeller  
P. Murphey  
Janet Goldsmith

2076816.7

RECEIVED

OCT 27 2006

JANET K. GOLDSMITH

(916) 321-4500  
jgoldsmith@kmtg.com

COPY

October 17, 2006

Victoria Whitney, Chief  
Division of Water Rights  
State Water Resources Control Board  
1101 I Street  
Post Office Box 2000  
Sacramento, California 95812-2000

Re: Application 30166;  
Third Amendment

Dear Ms. Whitney:

Application 30166 has already been amended to seek no more than a twenty-year average diversion of 1200 acre-feet, and an absolute limit of 1615 acre-feet in any single year, as more particularly stated in the Amendment. The maximum diversion rate of 5.84 cfs has previously been clarified to further limit the diversion rate to 5.34 cfs on a 30-day running average, as more particularly stated in the prior Amendment and below.

The Applicant now requests the following additional changes to Water Right Application 30166:

1) **Seasonal Limitation:** Item 4(a) should be changed to reflect a seasonal limitation of 735 acre-feet on the total amount of water that may be diverted during the period from July 1 through October 31, inclusive, each year. July through October is the period of lowest flows in the Big Sur River. This limitation is derived from the calculated irrigation requirements set forth in Table 5 of the memorandum accompanying this Third Amendment and is based on the monthly climatological data recorded at the ESR Weather Station. An explanation of the methodology used to derive the seasonal limitation is provided as an attachment to that memorandum, submitted under separate cover.

The limitation will also include a monthly maximum of 230 acre-feet in any calendar month from July 1 through October 31, in addition to the limit on the diversion rate to 5.34 cfs on a 30-day running average.

PURPOSE OF USE (irrigation, domestic, etc.)	RATE (CFS)	AMOUNT (acre-foot/year)	Beginning date (Mo. & Day)	Ending date (Mo. & Day)
Irrigation of pasture crops in accordance with the Operational Limitations described below.	5.84 cfs instantaneous; limited to 5.34 cfs on 30-day running average	Up to 1615 afy but no more than 1200 afy on a 20-year running average; and no more than 735 af from July 1-October 31; and no more than 230 af in any calendar month from July 1 through October 31	January 1	December 31

2) **Operational Limitations:** The Application should be further amended to limit water diversion and use under any permit issued to operational principles and practices consistent with the following:

- a) **Crops:** Crops grown will be limited to pasture crops, primarily grasses and legumes such as have historically been grown, suitable for forage by cattle. Species historically grown on the pastures have been orchard grass, fescue, harding grass, clover, birdsfoot trefoil, and other native weeds and grasses.
- b) **Irrigation System:** The irrigation system will consist of the irrigation facilities historically used, which are depicted on Figure 1 attached hereto and, in essential attributes, are described as follows:
  - i) Two wells located within the underflow of the River at the Points of Diversion, the first having been constructed prior to 1955 (the "Old Well") and the second having been placed in service in 1984 (the "New Well") (The maximum diversion rate of the Old Well was 4.5 cfs.) The two wells and pumps have the capability to irrigate the entire pasture; however, for energy efficiency with the current pumps, the Old Well has been used primarily to irrigate the upper portion of the pasture and New Well has been used primarily to supply the middle and lower pastures.
  - ii) Transmission pipelines transmitting water from the River-level pumps to the system of distribution laterals located at the higher elevation pastures of the place of use.
  - iii) Pipeline laterals that carry water from the transmission lines across the head; i.e., the upper elevation boundary, of each pasture field to facilitate irrigation thereof.



- iv) Borders that lead down-gradient through the fields from the laterals a distance of 500 feet to 1,000 feet.
  - v) Adjustable valves located within the laterals to discharge water into the borders.
  - vi) Borders designed to flow their tail water to the next down-gradient set of borders; tail water from the bottom set of borders being discharged to the tail water pond or to a water control structure to discharge water to the ocean.
  - vii) A tail water pond facility designed to facilitate the reuse of accumulated tail water or discharge the same to the ocean through a water control structure.
  - ix) A three- to four-week pasture rotation to satisfy the irrigation requirements of all of the fields, with temporary cessation if useful precipitation occurs.
- c) Continuing Operating Principles: The following operating principles will continue to be implemented, subject to the exercise of judgment by the irrigator as to the timing, order and extent of irrigation of the various pasture fields:
- i) Frequency of irrigation of each field adjusted in accordance with its soil conditions and topography (e.g., the Pump House field has more porous soil and therefore needs shorter, higher velocity flows than other fields).
  - ii) Adjustment of irrigation schedule due to unscheduled outages and/or scheduled outages for maintenance of the irrigation system.
  - iii) Adjustment of irrigation timing and duration due to precipitation and other climatic conditions, including wind, temperature, humidity and solar radiation.
  - iv) Adjustment of diversion based on salinity readings at the pumps.
  - v) Adjustment of valves to equalize the down-gradient advances of water flows within certain of the borders.
  - vi) Controlled discharge of tail water to ocean and/or the reuse of certain quantities of water from the tail water pond.
  - vii) Adjustment for soil moisture condition of the fields at the beginning of an irrigation set,
  - viii) Adjustment of duration and timing of irrigation set due to the length, including grazing stages, of the grasses and legumes.

- ix) Adjustment of the operating rates of the pumps to take into account the elevation above the wells of the particular pasture fields being irrigated, and the limits on the rates of diversion set forth above.
- x) Adjustment of duration of irrigation set for daytime or nighttime irrigation and labor constraints.
- xi) Control of erosion by maintaining dense growth within the pasture fields, by maintaining drainage gullies, by controlling runoff into canyons, the bluff at the bottom of the pasture and the embankment at the tail water pond; and
- xii) Avoidance of greater diversions than the lesser of those required for the reasonable and beneficial irrigation use of the place of use or than permitted by the volumetric limitations of the permit.

Historic water use under these operating principles is estimated on Table 1, attached hereto.

- d) New Operating Principles: Based on the limitations in this Third Amendment, a new operating principle will be used in addition to the continuing operating principles set forth above:

Operations consistent with new limitations incorporated in this Third Amended Application.

- 3) **Riparian Rights:** Please add the following text as a supplement to Item 10 of the Application:

Applicant claims a riparian right to the use of a portion of the water diverted at the existing Points of Diversion for irrigation of approximately 25 acres of riparian land, which are included within the 292-Acre Gross Place of Use described in Item 6 of this Application, and lie within the watershed of the Big Sur River. The source of the water subject to the riparian right is the Big Sur River system including but not limited to its underflow. The year of first riparian use was no later than 1951. Approximately 23 acres of the 25 acres are currently irrigated pasture, as shown on Figure 1 attached hereto. Nothing set forth in this Application shall be interpreted to transfer, modify, or in any way limit Applicant's riparian rights or any part thereof. The Applicant reserves the right to contend that additional lands are riparian to the Big Sur River. The total quantity and rate of water diversion requested under this Application for use on the 267 Acre Net Place of Use includes Applicant's claimed existing riparian diversion right. If the Applicant's claimed existing right is

separately quantified at some later date as a result of an adjudication or other legally binding proceeding, the quantity and rate of diversion and use allowed under the requested Permit shall be the net of the face value of the Permit less the amounts of water available under the existing right.

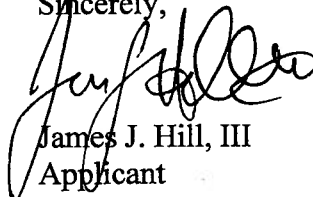
A map showing the riparian acreage is attached to this Third Amendment as Figure 1.

Please consider this Amendment as also furnishing additional information applicable to the "Environmental Information" section of the original Application

Thank you for your assistance in recording these amendments. It would be appreciated if you would send me and Ms. Goldsmith a copy of the amended application for verification of accuracy. If you have any questions, you may contact:

Janet Goldsmith, Esq.  
Kronick, Moskowitz, Tiedemann & Girard  
400 Capitol Mall, 27th Floor  
Sacramento, California 95814  
Telephone: 916-321-4500

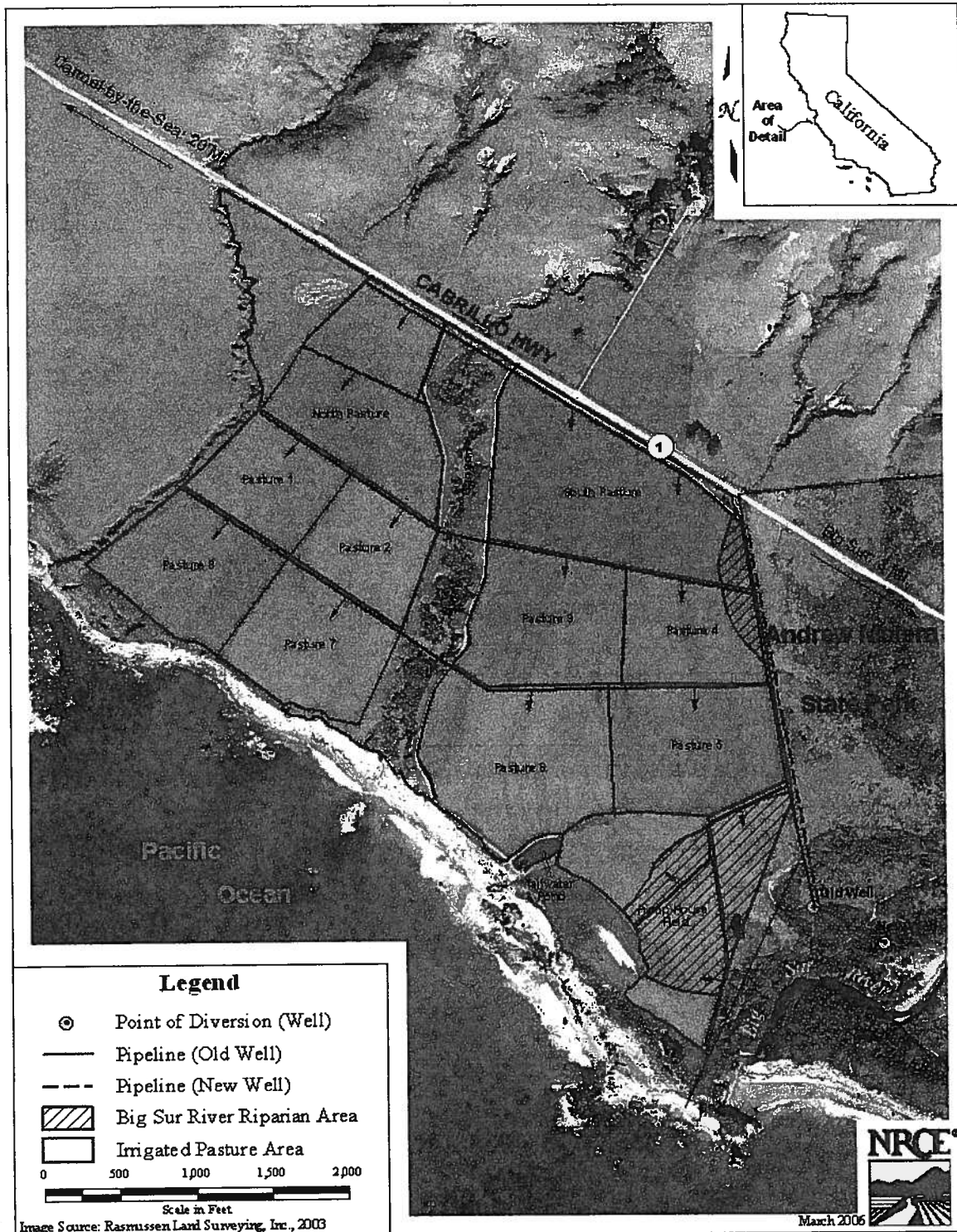
Sincerely,



James J. Hill, III  
Applicant

JKG/lll

cc: Les Grober  
Paul Murphey  
John Moynier  
Janet K. Goldsmith  
Robert Floerke  
Brad Torgen  
Larry Lindsey



**Table 1**  
**Estimated Historic Irrigation Diversion for the El Sur Ranch**  
**(acre-feet).**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1975	0	0	0	0	36	193	206	206	133	63	1	3	840
1976	3	34	48	58	212	186	190	201	189	40	51	0	1,212
1977	0	0	138	203	198	228	180	190	183	108	119	64	1,611
1978	0	0	0	0	164	153	125	125	221	153	0	0	940
1979	0	0	0	0	59	229	206	208	168	162	0	0	1,032
1980	0	0	0	0	23	226	196	188	186	75	107	37	1,037
1981	0	0	0	0	143	204	215	230	160	93	0	0	1,045
1982	0	0	0	0	120	200	202	184	203	136	1	0	1,046
1983	0	0	0	0	14	15	208	133	61	46	0	0	476
1984	30	0	0	241	262	262	253	301	177	213	0	0	1,737
1985	0	0	0	0	240	272	231	210	32	0	0	0	984
1986	0	0	0	0	105	339	189	199	127	0	52	0	1,012
1987	0	0	0	0	0	275	264	205	196	10	0	0	950
1988	0	0	0	239	21	265	68	71	99	215	76	0	1,054
1989	0	0	0	0	35	71	92	79	161	134	0	0	572
1990	0	0	0	50	143	62	60	173	269	199	64	0	1,021
1991	17	0	0	0	52	196	191	136	116	170	0	57	934
1992	0	0	0	0	267	257	116	99	241	119	0	0	1,099
1993	0	0	0	0	159	178	202	218	147	87	0	0	992
1994	0	0	0	0	111	139	102	102	182	33	0	0	669
1995	0	0	0	0	87	83	225	155	201	111	0	0	862
1996	0	0	0	0	129	164	170	184	190	128	8	0	973
1997	0	0	0	118	150	122	94	97	121	98	0	0	800
1998	0	0	0	0	0	20	140	123	109	71	5	0	468
1999	0	0	1	0	85	89	106	177	127	90	0	0	675
2000	0	0	0	0	37	206	129	116	191	35	0	0	714
2001	0	0	0	0	39	188	174	116	158	21	0	0	697
2002	0	0	0	0	161	174	135	104	105	88	0	0	767
2003	0	0	0	0	6	144	205	125	142	102	37	0	760
2004	0	0	0	94	253	199	156	161	177	96	0	0	1,136
Avg.	2	1	6	33	110	178	168	161	159	96	17	5	937

Memorandum Accompanying Filing of Third Amendment to  
Water Rights Application 30166 of James J. Hill III

---

**Application Amendment Considerations**

This memorandum describes elements of the Third Amendment to Water Rights Application 30166 of James J. Hill III (El Sur Ranch water right application) for diversion of water from the underflow of the Big Sur River, Monterey County, California. The description provides the basis for changes that have occurred since the application was filed in July 1992, updated with an amendment in November 2005, and the accompanying Third Amendment to the El Sur Ranch water right application. Additional data are presented to support the changes being requested in the application and the amount of water being requested.

The considered elements of the Third Amendment are based on calculated crop irrigation diversion requirements updated using the weather data obtained at the El Sur Ranch irrigated pasture from August 2004 through August 2006 and historical diversions. As used in this memorandum, the terms “calculated crop irrigation diversion requirement”, “calculated crop water need” and their derivatives are based on a 65 percent irrigation efficiency and 10 percent leaching requirement. The maximum annual diversion requirement is based on historical estimated diversions.

Calculated crop water needs and historical pumping are the best guide available to set the maximum limits contained in the Third Amended Application for the following reasons:

a. Historically, in most years the operator does not divert the full crop irrigation diversion requirement to optimize forage production for reasons described in this memorandum. That is to say, in many years the operator irrigates less than that required for optimal crop production. The ranch foremen have described the historic levels of irrigation as being generally adequate for irrigation of the pasture for ordinary grazing purposes, because in most years optimal forage production is not required. While future diversion volumes in most years are likely to continue to be less than the calculated crop irrigation requirement, nonetheless the Applicant is entitled to apply for a permit to divert the volume required to provide “optimum forage production”, in those years when it is reasonably required to provide suitable forage;

b. It is not reasonable for the Applicant (regardless of water reasonably needed in order to provide suitable forage) to expect to divert a volume of water significantly greater than

that required for the growth of the “optimal forage production” and therefore that the latter requirement is reasonably suited as a limit or a cap;

c. While in a few instances annual diversions have historically exceeded crop irrigation diversion requirements, such occurrences are rare, although they can be reasonably expected to occur again from time to time.

d. Because the monthly and annual amount of irrigation water needed to supplement that provided by precipitation and other climatic factors, cannot be known in advance, and the historical irrigation diversions provide a range of irrigation needs based on unique conditions that existed, but do not necessarily provide a reliable forecast of irrigation needs in the future, the Applicant seeks a maximum amount based on both maximum calculated need and historical diversions.

### **Summary of Changes in Application 30166**

Table 1 provides a summary of the principal changes to the El Sur Ranch water right application since July 1992. The changes have been based on additional information obtained since the original application was filed and provide more detailed information to assist in evaluation of the water right application and potential environmental impacts. The changes provide an absolute limit on the amount of water that may be diverted from July 1 through October 31 of each year and a specific cap on monthly diversions during that period. This “seasonal limit” is based on crop water needs for optimal forage production, and the monthly cap provides slightly more than that amount, to provide flexibility for unforeseen conditions such as pipeline breaks, labor disruptions and other unavoidable circumstances, without violating permit terms. Discussion concerning each item follows the table.

**Table 1 – Summary of Changes to the Original El Sur Ranch Water Right Application.**

	<b>Original (July 1992)</b>	<b>Amended (November 2005)</b>	<b>Third Amendment</b>
Place of Use (Irrigated Area)	292 acres	Any 267 of 292 acres	---
Riparian Area (acres)		25 of the 292	---
Crops	Coastal Grasses	--	Pasture Crops For Cattle
Total Annual (acre-feet)	1,800	1,615 Maximum, 1,200 Rolling Average (20 Yr.)	---
Period of Use	January 1 to December 31	---	---
Seasonal Limit	---	---	735 acre-feet (July 1 – October 31)
Monthly Limit	---	---	230 acre-feet each calendar month from July 1 through October.
Maximum Rate	5.84 cubic feet per second (cfs)	---	---
Average Thirty-Day Rate	---	5.34 cfs thirty-day running average	---
Operating Practices “Limit”	None (Reasonable Use Implied)	Reasonable Use (Express)	Enumerated Existing Practices; Reasonable Use (Express)

***Irrigated Area***

The place of use was modified in November, 2005 to reflect the net irrigated area on the El Sur Ranch. The original application was based on a map that included the 292-acre gross area of use, but did not exclude non-irrigated areas.

***Riparian Area***

Recent field topography survey and stereographic analysis of 1929 aerial photographs were used to delineate the portion of the irrigated pasture that is within the Big Sur River Basin. The analysis showed that 25 acres of pasture are riparian to the Big Sur River.

***Crop***

The crop remains the same as it has been for over 50 years. The third amendment to the application provides more specific information about the current crop and the intent to continue irrigation of pasture.

***Maximum Diversion Limit***

Request - Annual diversion limit of 1,615 acre-feet.

Basis - The annual maximum irrigation diversion of 1,615 acre-feet is based on historical estimated maximum diversions. The maximum historical diversions 1,611 and 1,737



acre-feet occurred in 1977 and 1984, respectively. Conditions that resulted in these diversions could well occur in the future. While all the circumstances that contributed to the diversions in 1977 and 1984 are not known, it is logical to assume that reduced forage production on the non-irrigated pasture may have been a factor contributing to a need for optimal forage production from the irrigated pastures in those years.

Implications –Historical diversions constitute a reasonable basis for the requested 1,615 acre-feet annual limit. According to the equation for determining the crop irrigation diversion requirement for optimal crop production, 1,440 acre-feet would be the calculated need for 1977. However, if years like 1977 and 1984 should repeat, including a repeat of the relative monthly allocation of precipitation, it would likely be difficult for the Applicant to provide reasonable forage with diversions limited to 1,440 acre-feet. In contrast to the annualized limit, when trying to ensure adequate crop production during the four month seasonal diversion limit of 735 acre-feet for July through October (described below), it would be practical to “bank” soil moisture by extra irrigation just ahead of July. Such “banking” ahead of a full calendar year; i.e., during the December preceding, would be difficult and probably ineffective.

#### *Annual Diversion Average*

Request - A 20-year rolling average of 1,200 acre-feet (4.5 acre-feet per acre). This average diversion is set forth in the November 2005 Amendment.

Basis - Although the 1,200 acre-feet per year long-term average is greater than historical averages it is needed to provide the potential for optimal forage production. The historical average diversions are less than crop irrigation diversion requirements because there have been times when the crop irrigation diversion requirements were not met because: 1) the irrigation system was not operational, 2) decisions were made to suspend or stop irrigation because the optimum forage produced from irrigation was not needed, 3) suspension of pumping due to spring tide induced high salinity (electrical conductivity greater than 1 mmho/cm) of water from the old well; 4) herd size was down; and/or 5) the pastures were being dried to accommodate calving of the mother cows. The requested maximum irrigation diversion limits are to provide potential for full irrigation for optimal production of forage on the irrigated pasture when required. The amount of irrigation diverted in the future will continue to be based on irrigation demands, forage needs, salinity of irrigation water, herd size, fire conditions, and other considerations consistent with the Ranch’s past and present operations.

### ***Period of Use***

The period of use remains the entire year. Although irrigations do not generally occur during the winter months, they can be needed in any month based on calculated crop water needs and precipitation patterns. Historically, irrigation has occurred in every month of the year.

### ***Seasonal Diversion Limit***

Request - Seasonal diversion limit of 735 acre-feet for July through October. July through October months have the lowest flows in the Big Sur River.

Basis - The seasonal diversion limit of 735 acre-feet is the maximum calculated diversion requirement for optimal forage production for July through October using 65 percent irrigation efficiency and 10 percent leaching requirement. Refer to "Determination" of "Limits" above.

Implications - The estimated July through October diversions have exceeded 735 acre-feet twice, in 1979 (744 acre-feet) and 1984 (943 acre-feet). As a measure of protection against the eventuality of these high demands occurring again, it may be helpful occasionally to fully irrigate the pasture prior to July to minimize the need to divert more than 735 acre-feet during July through October.

A seasonal limit has been included in the third amendment to regulate pumping during July through October; the months with the lowest flows in the Big Sur River (see Table 2 and Figure 1). The seasonal maximum irrigation diversion of 735 acre-feet is the maximum calculated diversion requirement for July through October using 65 percent irrigation efficiency and 10 percent leaching requirement based on the estimates of irrigation diversion requirements from 1975 through 2005.

### ***Monthly Diversion Limit***

Request - For the July through October period the maximum calendar month diversion shall be limited to 230 acre-feet. Subject to the Application of this monthly limit, the thirty day running average diversion limit of 318 acre-feet, based on an average pumping rate of not to exceed 5.34 cubic feet per second (cfs), shall continue to be applicable from July through October.

Basis - The 230 acre-feet monthly diversion limit is approximately the calculated maximum irrigation diversion requirement for optimal forage production in July. The monthly limit also provides the limit for analysis of potential environmental impacts. The limit is

particularly restrictive considering the potential difference in soil moisture from the beginning to the end of each month.

Implications - Estimates of historical records indicate that during the July through October period pumping during calendar months exceeded 230 acre-feet seven times.

The monthly estimated irrigation requirements are based on the assumption that the soil moisture is the same at the beginning and ending of the month. This condition seldom exists. For example, if the soil moisture is low at the beginning of the month it is desirable to apply more irrigation than the amount calculated based solely on crop ET. Thus the actual irrigation diversion in a month could be about 50 percent more than that calculated without wasteful use of water. A higher than calculated irrigation diversion in one month will normally be preceded or followed by a lower than calculated monthly irrigation diversion. Because of this variation, it is proposed that the maximum monthly diversion be limited to 230 acre-feet for the July through October period. This limit can also be characterized as the calculated average irrigation diversion requirement in July plus a "cushion" of approximately 37 acre-feet to allow for unanticipated variation in need. The 37 acre-feet flexibility allowance is less than one inch net irrigation, a very small amount considering the potential difference in soil moisture from the beginning to the end of the month. Estimates of historical records indicate that during the July through October period monthly pumping exceeded 230 acre-feet nine times from 1975 through 2005. Accordingly, the proposed maximum monthly limit represents a significant limitation of historic practices. Furthermore, the total diversion for the four-month period would be limited to 735 acre-feet regardless of the monthly amounts pumped. Throughout the year, but subject to the 230 acre-feet per calendar month limit for July through October, the thirty-day running average limit is 318 acre-feet based on an average pumping rate of 5.34 cubic feet per second (cfs).

***Rate – Thirty-Day Running Average Limit***

Request - Maximum running average diversion rate of 5.34 cfs for any thirty-day period. This diversion rate was added by the November 2005 Amendment.

Basis – The maximum thirty-day diversion rate is based on 50 acres per cfs for the irrigation of 267 acres (267 divided by 50). The 5.34 cfs thirty-day running average pumping rate limits the thirty-day diversion to 318 acre-feet. The July through October monthly maximum pumping is 3.87 cfs (230 acre-feet for each month).

**Maximum Diversion Rate**

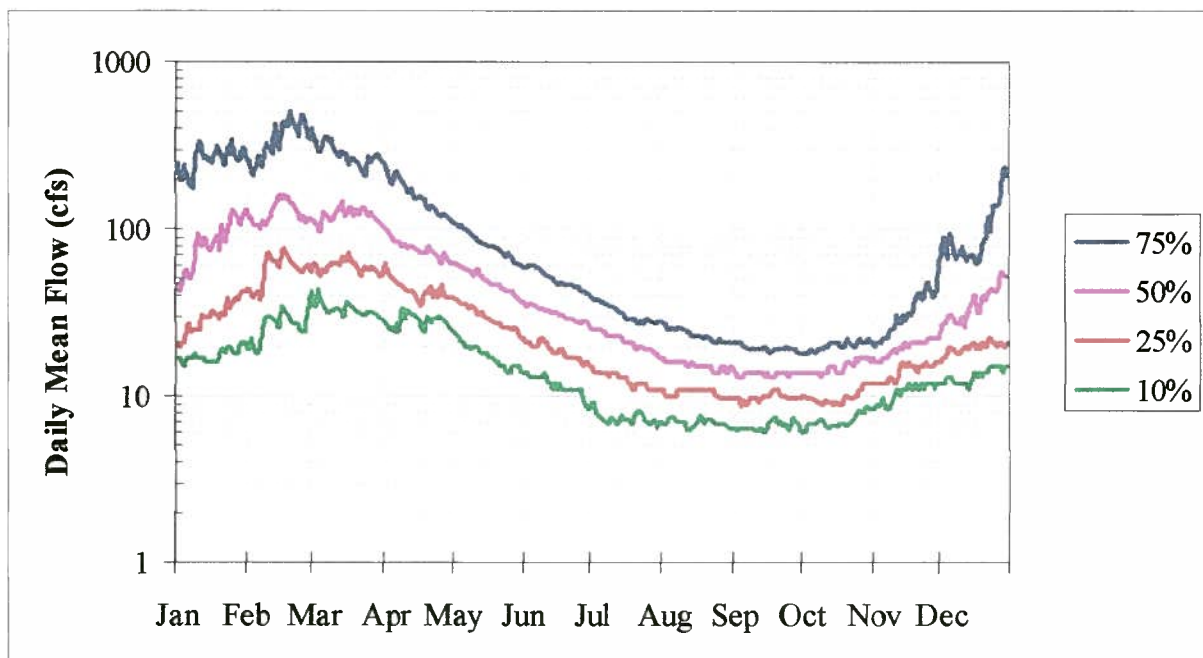
Request – A rate of flow not to exceed 5.84 cfs at any time.

Basis - The maximum rate of 5.84 in the 1992 application was based on 50 acres per cfs for the irrigation of 292 acres (292 divided by 50).

**Table 2 - Big Sur River exceedance for specified percentiles  
(average monthly flows in cfs)  
(i.e. monthly average flows exceed 18.2 cfs 90 percent of the time in May).**

Percentile	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10%	700.7	726.4	463.0	319.2	133.2	70.1	44.2	32.1	23.3	25.8	109.2	281.0
20%	402.0	505.4	349.6	174.3	88.7	52.8	33.8	24.2	20.4	23.1	58.9	184.9
30%	310.6	313.3	295.7	147.5	81.1	46.8	28.2	22.1	18.6	20.3	38.9	115.4
40%	166.7	224.6	233.0	112.0	66.2	41.9	26.1	18.8	17.0	18.4	26.9	92.7
50%	130.7	186.4	147.6	80.3	54.5	31.6	20.9	15.6	14.1	15.7	23.0	59.3
60%	105.5	114.5	102.6	62.4	39.8	25.7	17.3	12.9	11.9	13.9	20.1	43.7
70%	67.6	89.0	73.1	51.5	33.1	20.4	15.0	11.6	11.2	13.0	18.5	36.0
80%	38.08	79.50	65.72	40.47	26.51	16.59	11.67	9.59	9.32	10.10	14.53	24.66
90%	29.32	44.19	33.04	29.03	18.24	11.76	7.41	7.50	7.72	8.38	11.60	16.90
95%	24.56	26.98	27.85	24.11	15.34	9.95	6.38	5.80	6.09	7.51	10.12	13.81

**Figure 1 - Daily Mean Flows of Specified Non-exceedance Frequencies  
USGS Gage 11143000 Big Sur River near Big Sur, California.  
(E.g. 10% of the time, flows in October are 6 cfs or less)**



The maximum diversion rate of 5.84 requested in the 1992 application was based on the SWRCB's guidance document which set forth the estimated need of 1 cfs per 50 acres, for the irrigation of 292 acres (292 divided by 50). The November, 2005 application amendment incorporated a 30-day running average diversion rate of 5.34 cfs. Based on the 230-af monthly limit, average pumping rates should not normally exceed 3.87 cfs in any calendar month. The maximum pumping rate of 5.84 cfs is retained because it is close to the current combined pumping capacity of the two wells (one of which has a capacity substantially reduced from prior levels), and is needed on occasion.

### ***Operating Practices***

With the exception of the irrigated pasture operation information below, the operating practices have been described and included in the third amendment to the application. The basic operating practices are to remain essentially the same as they have been in the past, except that water quality exceeding 1.0 mmho/cm may occasionally be pumped from the Old Well in the future. As in the past, the operator will normally not irrigate to optimize forage production, but will do so only in response to the reasonable use considerations described in this memorandum.

El Sur Ranch's irrigated pastures are an integral part of the Ranch's cattle operation. The irrigated pastures provide a suitable location near the Ranch's headquarters and high quality forage for the calves when they are weaned from their mothers in May. The pastures are utilized by the weaned calves in the May through August period (the date the calves are moved from the pasture can vary based on the forage needs for the next group of cattle moved to the pasture). In August the pregnant cows are moved to the irrigated pasture for calving. The irrigated pastures provide good forage for the mother cows and the pastures are near the El Sur Ranch headquarters so the cows can be properly observed and assisted as needed during calving. The mother cows are left in the pastures for a few months or until the pastures become wet and muddy from winter rains. The cows are then put back on the non-irrigated pasture and range on the El Sur Ranch to preserve the irrigated pasture border dikes and maintain the pasture (prevent damage that can be caused by cattle traffic on wet soils). Additionally, during the entire year the irrigated pastures are used as needed for grazing of heifers or other cattle as needed.

The utilization and irrigation of the irrigated pasture varies from year-to-year based on the number of cattle on the Ranch, the condition of the non-irrigated pastures and range, and other circumstances, such as labor constraints, economics considerations, and irrigation system maintenance. The following two examples are used for illustration. First example: in 2006 the number of cattle on the Ranch has been lower than both the maximum and the average historical herd numbers and spring rains provided good forage in the non-irrigated pastures and range. Thus full irrigation of the pastures has not been needed to produce adequate forage. In addition, during 2006 the non-irrigated pastures and range have produced large amounts of forage

resulting in a need to graze this forage to reduce the fire hazard during the dry summer months. Second example: in 1977 there was a great need for high forage production on the irrigated pasture due to drought conditions and the number of cattle on the Ranch. As a result of these conditions the annual irrigation diversion was one of the highest. It was required to maximize the production of forage on the irrigated pastures in order to provide no more than that reasonably required for grazing. The irrigation for both of these examples was reasonable and beneficial in response to variable factors which can reasonably be expected to continue affecting irrigation requirements.

### **Technical Basis for Application and References**

**See Attachment "A".**

## Attachment A

### Technical Basis for the Application

**Reasonable and Beneficial Use** El Sur Ranch's water right application is for the irrigation of pasture, which is a beneficial use of water in California. Sub paragraph 2). c). xii) at page 4 of the Third Amendment filed herewith sets forth as one of the Operational Limitations the "avoidance of greater diversions than required for reasonable and beneficial irrigation use..." The State of California provides water rights for beneficial and reasonable use of water.

As stated by Chief Counsel's Office, all Applications to Appropriate Water by permit, such as Mr. Hill's Application No. 30166, are subject to the California Constitution, Article X, Sec. 2 which limits direct diversions to those needed for reasonable and beneficial uses; i.e., the amount required to supplement the irrigation naturally provided by precipitation and other climatic factors in order to provide reasonable quality and quantity of forage for Applicant's cattle operations. Since precipitation, climate and other factors vary, often considerably, from year to year, the diversions for reasonable and beneficial use will likewise vary, considerably, from year to year.

Therefore, it is necessary to assess the circumstances and conditions of the El Sur Ranch's pasture irrigation to determine the irrigation need. Among the unique circumstances of El Sur Ranch's proposed diversion is its location at the very bottom of the drainage, almost at the stream's mouth into the ocean. Another unique circumstance is the indirect method of diversion, by wells which draw from underflow, rather than directly impacting the stream's flow and its instream resources. Yet another circumstance is the contribution of irrigation return flow to the maintenance of endangered species and ecosystems in Swiss Canyon.

Thus by Application No. 30166, Applicant seeks a Permit to divert no more water than that needed for reasonable and beneficial uses during any year or a number of years at the Place of Use. Even though Applicant's reasonable and beneficial uses might at times require diversion at greater rates of flow or at greater volumes, nevertheless, water shall be diverted:

- I. At a rate of flow not to exceed 5.34 CFS on a thirty day running average at any time; and
- II. Not to exceed a rate of flow of 5.84 CFS at any time; and the volumes of diversions shall:
  1. Not to exceed 1,615 acre-feet in any one year;
  2. Not to exceed a twenty-year rolling average of 1,200 acre feet per year;

3. Not to exceed 735 acre-feet for the period of July 1 through October 31 of any year; and
4. Not to exceed 230 acre-feet during any of the calendar months from July through October of any year.

The bases for estimating irrigation requirements are reasonable irrigation efficiency, calculation of crop water requirement, effective precipitation, and leaching requirement.

### ***Irrigation Efficiency***

The calculation of irrigation efficiency is based on the following equation:

$$\text{Irrigation System Efficiency} = \frac{\text{Irrigation Water Beneficially Used}}{\text{Irrigation Water Supply}} \times 100$$

In this equation, the term '*beneficially used*' is a technical term and not the legal term used in defining a water right. Beneficial uses include crop water use, leaching requirement, and other special irrigation applications such as seedbed/land preparations, germination, and cooling. At El Sur Ranch, the beneficial uses of irrigation water for crop production are crop water needed to support the soil in preparation of and for growth of forage and leaching water needed for salinity control.

The literature generally provides a range of irrigation efficiency, due to the variability of conditions that impact surface irrigation. The following are some of the reported ranges: (1) Fangmeier and Biggs (1986) state that a well designed surface irrigation system is expected to have a range of efficiencies averaging between 60 to 70 percent; (2) USBR and the Bureau of Indian Affairs (1978) state that the overall on-farm efficiency for a well designed surface irrigation system with land leveling, delivery pipeline, and drainage system is typically about 70 percent; (3) Martin et al. (1990) provides a guide of estimated application efficiencies for various irrigation systems and gives an efficiency range of 50 to 85 percent for graded borders; and (4) the University of California, Division of Agriculture and Natural Resources, lists attainable application efficiency (farm irrigation efficiency) for border surface irrigation as ranging from 65 to 80 percent (University of California, 1989).

Reasonable or acceptable irrigation efficiencies vary based on a number of factors including crop, irrigation method, economics, uniformity and properties of soils, uniformity of water application, water supply, and weather conditions. The reasonable irrigation efficiency for the El Sur Ranch's irrigation can be estimated by considering the unique conditions on the El Sur



Ranch in comparison to attainable irrigation efficiencies. Attainable irrigation efficiencies are based on ideal conditions and operation that may not be reasonable in all circumstances.

As supported by the authorities cited above, in general, reasonable irrigation efficiencies for surface irrigation range from 50 to 85 percent. Typically, 50 percent irrigation efficiencies are associated with surface diversion irrigations with little control of flow rate or application time. High irrigation efficiencies near 85 percent are based on ideal conditions with precision-graded borders, uniform soils, and highly flexible water supply and delivery schedules; coupled with continuous monitoring of irrigation. These conditions do not exist on El Sur Ranch and are not practical to implement due to constraints on the irrigation system, water supply, land use regulatory constraints, and labor. For conditions on El Sur Ranch, irrigation efficiencies of 60 to 70 percent should be considered acceptable and reasonable. The irrigation efficiency on El Sur Ranch pasture is limited by the water supply, irrigation system, soils, labor constraints, regulatory constraints, and imperfect forecast of rainfall events. Table 3 briefly compares optimal conditions with those on El Sur Ranch.

**Table 3 - Criteria Affecting Reasonable Irrigation Efficiency on the El Sur Ranch.**

Criteria	Optimal	El Sur Ranch
Irrigation Method	Based on soils, crops, slopes, economic considerations.	Limited to border surface irrigation due to need to maintain natural view of the coast line, regulatory prohibitions on natural landform alteration, grazing requirements, and economics.
Slope	Based on soil border length, soils, crops, and water supply.	Limited to existing slope due to soil profile, regulatory prohibitions on natural landform alteration and the need to maintain natural view of coast line.
Border Flow Rates	Variable with the ability to apply water at optimal rates (i.e. generally order large flow rates for short durations of 1-2 days).	Limited to flow from two existing wells and spring tide constraints on the Old Well that can limit pumping.
Border Irrigation Set Times	Based on soil border length, soils, crops, and water supply.	Limited based on available ranch labor.
Labor	Full-time irrigator during irrigation that occurs over a few days at timely scheduled irrigation intervals.	Limited to periodic checking and two set changes per day, based on available ranch labor and herd size economics.
Irrigation Scheduling	Irrigation scheduling based on crop needs.	Limited based on water supply that limits the irrigation interval.
Tail water Recovery	Installed to capture and use tail water for irrigation.	May be limited due to regulatory, environmental and cost constraints on expanded tail water recovery.
Irrigation Efficiency	<b>75 to 85 percent</b>	<b>60 to 70 percent (65 percent typical)</b>

Based on these factors, a reasonable irrigation efficiency achievable on the El Sur Ranch is expected to be about 65 percent. The analysis of historical pumping indicates that irrigation

efficiencies on the El Sur Ranch have been both above and below this efficiency. Many times high irrigation efficiencies are an indication of under irrigation, which decreases crop production.

### ***Crop Water Use***

Potential crop water use is a function of the crop, crop health and vigor, and climate. The El Sur Ranch is located in an area with limited climate data. To provide additional site-specific data, the El Sur Ranch established one weather station on the irrigated pasture and one near the old well and Big Sur River. The May 2005 report prepared by NRCE on irrigation reasonable beneficial use stated the following (NRCE, 2005):

*In August 2004 an electronic weather station was set up on El Sur Ranch irrigated pasture to obtain site specific data that can be used to estimate crop water requirements using the FAO P-M method. In the future, when enough data are collected, they will be correlated with data from other weather stations to develop an extended climatic data set for El Sur Ranch. The weather station records maximum, minimum, and average temperatures, relative humidity, solar radiation, wind direction and speed, and precipitation, on an hourly basis. However, for the preliminary evaluation of water use on El Sur Ranch pasture, the existing long-term data were used. The evaluation can be updated when enough data are collected for correlation analysis. (Page 3-1)*

The additional weather data collected by the El Sur Ranch weather stations has helped to characterize the climatic conditions. The data indicate that the information used in the initial examination of climatic data under-estimated the crop irrigation requirement. The two primary climate parameters that contribute to the differences in crop water requirement are higher solar radiation and lower humidity at the El Sur Ranch than previously estimated.

Effective precipitation is that portion of the total precipitation that satisfies or reduces crop evapotranspiration (“ET”) requirements. The remainder of the rainfall is lost either by deep percolation below the root zone, surface runoff, or direct evaporation of water intercepted by the plant foliage. Therefore, the rainfall that can be effectively used by crops is dependent upon the amount, timing, and intensity of rainfall, by soil permeability, soil water-holding capacity, runoff characteristics, and the rate of crop ET. The method developed by Natural Resources Conservation Service was used to estimate effective precipitation (USDA, 1970).

The weather station installed on the El Sur Ranch records solar radiation, wind velocity, humidity, temperature, and precipitation on an hourly basis. Decades of analyses and research have provided methods to estimate crop water use from climate factors. NRCE has used a recognized and established method to estimate crop water needs and net irrigation requirements. Table 4 provides the average monthly crop ET, precipitation, effective precipitation, and net

irrigation requirements at the El Sur Ranch. The net irrigation requirement is the crop ET minus the effective precipitation.

The average annual calculated pasture water requirement for maximum production for 1975 through 2006 is 45.49 inches, with a maximum of 50.14 inches. This is consistent with average pasture water requirements reported from CIMIS reference ET in Monterey County that range from 34.65 (Zone 1) to 65.6 inches (Zone 16). The calculated pasture ET is reference crop ET times a crop coefficient of 1.05 for rotated pasture.

The average annual calculated net irrigation requirement for maximum production is 32.62 inches, with a maximum of 37.89 inches (1975-2005). The annual effective precipitation averaged 12.88 inches with a maximum amount of 20.55 inches and a minimum of 8.85 inches. Most of the precipitation occurs during the winter months when crop ET is the lowest.

**Table 4 –Calculated Average Monthly Crop ET, Precipitation, Effective Precipitation, and Net Irrigation Requirements at the El Sur Ranch.**

	Average Crop ET (1949-2004)	Average Precipitation (1949-2004)	Average Effective Precipitation (1975-2004)	Average Net Irrigation (1975-2004)
Jan	2.33	5.61	1.88	0.45
Feb	2.58	4.48	2.09	0.49
Mar	3.44	4.22	2.30	1.14
Apr	4.43	2.05	1.38	3.05
May	4.36	0.67	0.52	3.83
Jun	5.13	0.27	0.16	4.97
Jul	5.12	0.09	0.06	5.06
Aug	4.45	0.13	0.07	4.38
Sep	4.51	0.35	0.23	4.28
Oct	4.04	1.10	0.90	3.13
Nov	2.93	3.18	1.60	1.33
Dec	2.18	4.24	1.68	0.50
<b>Annual</b>	<b>45.49</b>	<b>26.41</b>	<b>12.88</b>	<b>32.61</b>

Table Notes: Crop water requirements are based on weather data obtained on El Sur Ranch irrigated pastures from August 2004 through August 2006. This site specific weather data was correlated with weather data from Monterey, California to calculate the irrigation diversion requirement for optimal pasture production for 1975 through 2005.

***Leaching Requirement***

Leaching is required when irrigating with water that has a salinity level that can, over time, have an impact on yield. Typically the leaching requirement is based on maintaining yields at 90 percent of potential yields. Methodology to estimate leaching requirements has been developed through considerable research and NRCE has estimated leaching requirements for the El Sur

Ranch based on these recognized methods. The leaching requirement varies based on the variable salinity of the water pumped from the wells, but is estimated to be about 10 percent.

Numerous steady-state leaching requirement models have been developed to estimate the fraction of infiltrated irrigation water required to maintain the desired average root zone salinity. However, the traditional leaching requirement equation is defined as (Rhoades, 1974):

$$LR = \frac{EC_{iw}}{(5 EC_e - EC_{iw})}$$

where:

LR = leaching requirement

EC<sub>iw</sub> = irrigation water salinity

EC<sub>e</sub> = average EC of the saturation extract for a given crop that produces a ten percent yield decrement

The salinity of the irrigation water supply for the El Sur Ranch is highly dependent on the well being used, with the water salinity from the new well being relatively stable and water from the old well often being higher in salinity as a result of spring tides. The leaching requirement is used to calculate the net overall requirement for irrigation based on the following equation:

$$Net\ Overall\ Requirement = \frac{NIR}{1 - LR}$$

A discussion in NRCE's May 2005 report on El Sur Ranch water use provides the basis for a leaching requirement of 11 percent (NRCE, 2005). For calculations of diversion requirements in the third amendment to the water right application a reasonable leaching requirement of 10 percent is used. The 10 percent is used as an approximate value taking into account the variability of the salinity of the water supply and the spatial variability of the soils.

### ***Diversion Requirement***

The irrigation diversion requirement is the net overall requirement divided by the irrigation efficiency. The net overall requirement includes the net irrigation requirement (crop ET minus effective precipitation) and water for leaching.

$$Irrigation\ Diversion = \frac{Net\ Overall\ requirement}{Irrigation\ Efficiency} \times 100$$

Table 5, below, lists the calculated irrigation diversion requirements for the years 1977 through 2005, based on historical climatological records, 65 percent irrigation efficiency and 10 percent leaching fraction. The irrigation values are based on average monthly crop ET and estimated precipitation for each month. Table 5 provides the information used in the amended application.

**Table 5- Estimated Irrigation Diversion Requirements on the El Sur Ranch  
(Based on 65 Percent Irrigation Efficiency and 10 Percent Leaching Fraction)**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
No Precip.	88	98	131	168	166	195	195	169	172	154	112	83	1,730
1975	34	0	0	99	152	183	193	147	167	98	92	62	1,227
1976	82	0	64	74	159	175	190	126	139	114	76	11	1,210
1977	37	63	57	150	120	213	197	177	148	157	111	0	1,430
1978	0	0	0	0	152	188	197	177	164	148	49	40	1,116
1979	0	0	11	142	171	196	176	170	188	89	11	0	1,153
1980	0	0	48	99	151	196	167	170	194	160	109	36	1,331
1981	0	40	3	141	147	188	205	153	167	85	0	46	1,176
1982	0	28	0	56	159	191	181	157	101	62	0	0	935
1983	0	0	0	25	144	175	182	164	120	136	0	0	946
1984	94	23	90	135	159	191	205	191	202	97	0	24	1,409
1985	49	49	14	121	162	171	212	170	204	84	0	25	1,262
1986	11	0	0	155	136	213	205	164	131	145	84	30	1,274
1987	0	14	51	144	163	204	190	157	155	106	57	0	1,242
1988	13	75	132	114	156	186	190	177	167	162	22	0	1,394
1989	35	33	43	141	147	196	197	177	124	82	58	74	1,307
1990	0	0	78	159	93	204	182	164	155	151	102	34	1,323
1991	62	11	0	160	159	204	205	175	174	106	113	0	1,369
1992	12	0	0	157	146	174	190	169	161	129	106	0	1,244
1993	0	0	38	173	155	178	222	170	174	169	65	11	1,355
1994	0	0	130	126	155	221	205	184	161	161	30	9	1,382
1995	0	66	0	90	137	133	175	164	174	154	86	4	1,183
1996	0	0	43	136	109	196	222	177	174	126	43	0	1,226
1997	0	104	136	179	179	188	205	156	161	132	0	0	1,441
1998	0	0	7	61	112	183	188	191	187	137	29	25	1,120
1999	0	0	0	90	167	184	190	170	161	137	46	63	1,207
2000	0	0	33	114	109	172	182	164	145	17	91	76	1,104
2001	0	0	41	98	174	204	175	156	178	136	0	0	1,163
2002	33	35	78	120	138	203	182	157	155	148	33	0	1,282
2003	24	25	76	62	110	172	182	157	167	127	61	0	1,164
2004	35	0	103	148	152	195	184	170	178	36	59	0	1,260
2005	17	19	43	116	146	189	192	167	163	119	51	19	1,240
Average	17	19	43	116	146	189	193	167	163	120	51	19	1,241

Table Notes: The *No Rain* diversions are based on no precipitation and average monthly crop water requirements. Crop water requirements are based on weather data obtained on El Sur Ranch irrigated pastures from August 2004 through August 2006. This site specific weather data was correlated with weather data from Monterey, California to calculate the irrigation diversion requirement for optimal pasture production for 1975 through 2005.

***Historical Irrigation Diversions***

Table 6 lists the El Sur Ranch estimated historical irrigation diversions based on analysis of energy usage by the irrigation pumps and pump efficiency tests. The pump efficiencies were tested in 1967, 1992 and 2004. A comparison of Table 5 and Table 6 shows that historical

Irrigation diversions frequently provided less water than was required for full irrigation of the crop for the reasons described in this memorandum. A comparison of tables 5 and 6 also reflects that when optimal production was operationally required, as in 1976, 1977, 1979, 1981, 1982, 1984, and 2004 irrigation amounts were closely correlated to calculated crop irrigation diversion requirements.

**Table 6 - Historical Diversions  
(Based on Analysis of Electrical Energy Usage by the Pump Motors)**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1975	0	0	0	0	36	193	206	206	133	63	1	3	840
1976	3	34	48	58	212	186	190	201	189	40	51	0	1,212
1977	0	0	138	203	198	228	180	190	183	108	119	64	1,611
1978	0	0	0	0	164	153	125	125	221	153	0	0	940
1979	0	0	0	0	59	229	206	208	168	162	0	0	1,032
1980	0	0	0	0	23	226	196	188	186	75	107	37	1,037
1981	0	0	0	0	143	204	215	230	160	93	0	0	1,045
1982	0	0	0	0	120	200	202	184	203	136	1	0	1,046
1983	0	0	0	0	14	15	208	133	61	46	0	0	476
1984	30	0	0	241	262	262	253	301	177	213	0	0	1,737
1985	0	0	0	0	240	272	231	210	32	0	0	0	984
1986	0	0	0	0	105	339	189	199	127	0	52	0	1,012
1987	0	0	0	0	0	275	264	205	196	10	0	0	950
1988	0	0	0	239	21	265	68	71	99	215	76	0	1,054
1989	0	0	0	0	35	71	92	79	161	134	0	0	572
1990	0	0	0	50	143	62	60	173	269	199	64	0	1,021
1991	17	0	0	0	52	196	191	136	116	170	0	57	934
1992	0	0	0	0	267	257	116	99	241	119	0	0	1,099
1993	0	0	0	0	159	178	202	218	147	87	0	0	992
1994	0	0	0	0	111	139	102	102	182	33	0	0	669
1995	0	0	0	0	87	83	225	155	201	111	0	0	862
1996	0	0	0	0	129	164	170	184	190	128	8	0	973
1997	0	0	0	118	150	122	94	97	121	98	0	0	800
1998	0	0	0	0	0	20	140	123	109	71	5	0	468
1999	0	0	1	0	85	89	106	177	127	90	0	0	675
2000	0	0	0	0	37	206	129	116	191	35	0	0	714
2001	0	0	0	0	39	188	174	116	158	21	0	0	697
2002	0	0	0	0	161	174	135	104	105	88	0	0	767
2003	0	0	0	0	6	144	205	125	142	102	37	0	760
2004	0	0	0	94	253	199	156	161	177	96	0	0	1,136
<b>Avg.</b>	<b>2</b>	<b>1</b>	<b>6</b>	<b>33</b>	<b>110</b>	<b>178</b>	<b>168</b>	<b>161</b>	<b>159</b>	<b>96</b>	<b>17</b>	<b>5</b>	<b>937</b>

## References

- Fangmeier, D. D., and Biggs, E. N. (1986). Rep. 8555. *Alternative Irrigation Systems*. Cooperative Extension Service, University of Arizona, Tucson, Arizona.
- Martin, D. L., Stegman, E. C., and Fereres, E. (1990). *Irrigation Scheduling Principles*. Chapter 7 in *Management of Farm Irrigation Systems* (Monograph), Hoffman, G. J., Howell, T. A., and Solomon, K. H. (eds.). American Society of Agricultural Engineers, St. Joseph, Michigan, 1040p.
- Natural Resources Consulting Engineers, Inc. (NRCE). (May 2005). Reasonable Beneficial Use – Land Use Study for El Sur Ranch Irrigated Pastures – Water Right Application #30166. Part of the Technical Report in Support of Water Right Application #30166 El Sur Ranch, Monterey County, California. May 2005.
- Rhoades, J. D. (1974). *Drainage for Salinity Control*. Edited by J. Van Schilfgaarde. *Journal of Drainage for Agriculture*, American Society of Agronomy, No. 17, 433-462.
- United States Bureau of Reclamation (USBR) and Bureau of Indian Affairs (BIA). (1978). *Water Conservation Opportunities Study*. Washington, D.C. (referenced on pg 37 of *Principles of Farm Irrigation System Design* by James, L.G., 1988).
- United States Department of Agriculture, Soil Conservation Service (USDA-SCS). (1970). *Irrigation Water Requirements*. Technical release no. 21 (TR#21).
- University of California (1989). *Irrigation Scheduling – A Guide for Efficient On-Farm Water Management*, University of California, Division of Agriculture and Natural Resources, Publication 21545.

3752582.3