

**SARATOGA UNDERGROUND WATER CONSERVATION
DISTRICT**

LAMPASAS COUNTY, TEXAS



1998 Management Plan

Saratoga Underground Water Conservation District

District Mission

The Saratoga Underground Water Conservation District strives to protect and enhance the quantity of useable quality water by conserving, preserving, preventing waste, and recharging the underground waters of the Trinity and Other Aquifers to points as far as practicable to minimize the draw-down of water tables and the reduction of artesian pressure within the District boundaries.

Time Period of Plan

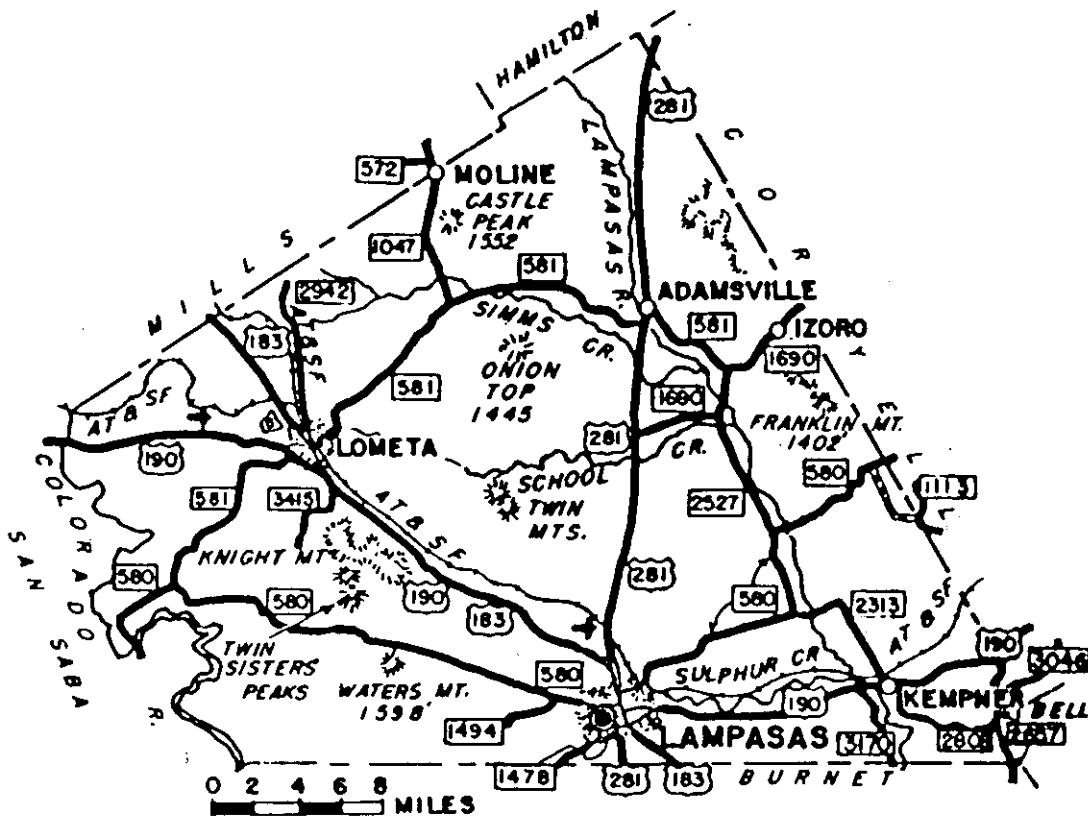
This plan becomes effective upon certification by the Texas Water Development Board and will remain in effect until September 1, 2008, or a period of ten years whichever is later. The plan may be revised at any time, or after five years when the plan will be reviewed to insure that it is consistent with the applicable Regional Water Plans and the State Water Plan.

History

The need for a local underground water conservation district to properly manage water from the Trinity and Other Aquifers in Central Texas was first identified in the late 1980's. At the request of many concerned area citizens, our local State Representative and State Senator were contacted by our County Judge, with the approval of the Lampasas County Commissioners' Court, with an approach to create and enact an Act to form a water district. During Regular Session of the 71st Legislature, H.B. No. 3122 passed unanimously both in the House and the Senate in May, 1989. Be it enacted by the Legislature of the State of Texas on June 14, 1989 with a confirmation election to be held and approved by the registered voters of Lampasas County, Texas. Such election was held in November, 1989 and approved by a majority of the voters thereby officially establishing the Saratoga Underground Water Conservation District effective January 1, 1990.

Location and Extent

The Saratoga Underground Water Conservation District is located in Central Texas. The District comprises an area of 714 square miles or 456,960 acres, all located within the boundary of Lampasas County, Texas. Principal municipalities and communities in our District include Lampasas, Lometa, Kempner, Adamsville, Izoro, and Moline, with the city of Lampasas being the County Seat. County population is estimated at being approximately 16,500.



Statement of Guiding Principles

The Saratoga Underground Water Conservation District is created and organized under the terms and provisions of Article XVI, Section 59, of the Constitution of Texas and Chapter 36 (formerly Chapters 50 & 52) of the Texas Water Code, Vernon's Texas Civil Statutes, and the District's actions are authorized by, and consistent with this constitutional and statutory provision, including all amendments and additions. The Act under which the Saratoga Underground Water Conservation District is created prevails over any provision of general law that is in conflict or inconsistent with this Act. The District was created for the purpose to protect and enhance the quantity of useable quality water by conserving, preserving, preventing waste, recharging, controlling subsidence, protecting and preventing waste and as far as practicable to minimize the draw-down of the water table and the reduction of artesian pressure of the Trinity and Other Aquifers within the District boundaries. In order to carry out it's constitutional and statutory purposes, the District has all the powers authorized by Article XVI, Section 59, of the Texas Constitution, and Chapter 36 of the Texas Water Code, Vernon's Texas Civil Statutes, together with all amendments and additions.

The District's purposes and powers are implemented through promulgation and enforcement of the District's regulations. These regulations are adopted and revised under the authority of Subchapter E, Chapter 36, Texas Water Code, and are incorporated herein as a part of the District's management plan.

The District is governed by a board of five directors composed of the county judge and the county commissioners of Lampasas County, Texas, with the county judge as chairman of the board of directors. The county judge and each county commissioner serves as a director as an additional duty of service on the commissioners' court. The District is also served with six ex-officio directors; one from each commissioner precinct in the County; one at-large member; and one advisory member.

Topography

The District is within the Brazos River Basin and the Colorado River Basin. The County/District line between San Saba and Lampasas Counties is the Colorado River. The District is dissected by the Lampasas River, as well as numerous creeks. Sulphur Creek is the major creek in the District and its main source of water is from springs. Drainage is typically from west to east.

Ground Water Resources

The Saratoga Underground Water Conservation District lies in several aquifers, but the Trinity aquifer being the primary source of ground water of interest in our area. Water from this aquifer is used for irrigation, public water supply, industrial, stock, and domestic needs of the people and entities served.

Other aquifers include, but are not limited to, Marble Falls, Alluvium and Travis Peak Formation, Quaternary Alluvium, Alluvium and Terrace Deposits, Cretaceous System, Glen Rose Limestone, Glen Rose (lower), Pearsall (Hensell, Cow Creek Members) , Sligo and Hosston within the District boundaries that meet the limited needs of individuals, however, the Saratoga U.W.C.D. does not have the authority to regulate or manage these additional resources.

These aquifers occur in parts of many counties all the way up to a northern region of the state, but mostly in Central Texas. The primary source of ground water in the Travis Peak Formation is rainfall on the outcrop area. The District's altitude ranges from 800 to 1700 feet. Surface water seepage from lakes, creeks, and rivers, such as the Lampasas River located on the outcrop, is

also a source of ground water to the formation. Another source of ground water is seepage from unlined earthen tanks and ponds, and the effluent water used in the irrigation of crops on the outcrop. Ground water in the Hensell and Hosston Members of the Travis Peak Formation occurs under both water table and artesian conditions.

The lower sands and shales of the Travis Peak are geologically and hydraulically continuous with the basal sands of the Antlers and both formations have a common piezometric surface and same quality of water.

In the outcrop area, the sands and gravels of the Travis Peak Formation are not completely water saturated, and water table conditions prevail. Ground water found in one area of the outcrop may not be found in another due to localized sand and shale facies as well as channel-like sand bodies characteristic of this formation. In addition, perched water tables and artesian conditions occur locally in the outcrop area due to sand lenses interbedded with shales within the Travis Peak Formation.

Artesian conditions exist downdip as a result of the Hensell and Hosston aquifers being overlain by the Glen Rose Formation and the Pearsall Member of the Travis Peak Formation.

Recharge

Most of the recharge to the Antlers and Travis Peak Formations occurs in the outcrop area which covers 1,732 square miles. The exact amount is unknown, but can be approximated by planimetering the areal extent of the outcrop areas which provide recharge, compiling rainfall records of the area, and estimating infiltration rates. This will represent the outcrop area potentially contributing recharge to the aquifers within the District. The average annual rainfall for the District is 29.80 inches.

The outcrop soils generally consist of permeable sand and sandy clay loams. The terrain is characterized by gentle sloping plains with moderate relief. These conditions are excellent for recharge from rainfall, seepage from lakes, creeks, and rivers, and infiltration resulting from the irrigation of crops. The actual amount is undetermined, but indications are that recharge does occur in the outcrop. An estimate of three (3) percent of the average annual precipitation, as applied to the outcrop area, is assumed available as recharge. This is approximately 0.1 foot per year and amounts to 110,840 acre feet per year that is available as recharge to the entire Travis Peak Formation. However, due to

small streams dissecting the formations and preventing downdip movement of the ground water, this amount is reduced to about 88,400 acre feet per year. After subtracting the municipal, industrial, and irrigation pumpage that occurs shortly downdip from the dissecting streams, a net amount of approximately 82,400 acre feet is available to move downdip in the Travis Peak Formation. Much of this available recharge is discharged naturally from the formations in the outcrop area by springs, seeps, and evapotranspiration.

In the Saratoga U.W.C.D. and Lampasas County, the subsurface units of the Travis Peak Formation are well cemented and the outcrop soils are tight, reddish-brown clay loams and sandy clays. The terrain consists of tabular divides, small limestone capped mesas, and valleys of moderate relief. These conditions suggest that there is comparatively little recharge in this area which also includes Burnet, Mills, and Brown Counties. Ground water moves slowly downdip. Water level measurements indicate the present gradient of the piezometric surface is 10 to 25 feet per mile east-southeast in most of the region.

In data obtained from the Texas Water Development Board, the estimated annual amount of recharge to our District is 6,570 acre-feet.

Additional recharge through feasible methods could be obtained if a brush control management program was implemented in Lampasas County. Other

benefits realized are reduction in precipitation interception and infiltration. The following table illustrates the water balance differences exhibited in the Texas Agricultural Station in Sonora, Texas.

	100% Grass	70% Grass 12% Oak 18%Juniper	40% Grass 24% Oak 36% Juniper
Rainfall	22.6	22.6	22.6
Interception Loss	3.0	6.3	9.6
Water Reaching the Soil	19.6	16.3	13.0
Runoff	0.2	0.2	0.2
Water Going in the Soil	19.4	16.1	12.8
Evapotranspiration	15.7	15.8	12.8
Deep Drainage	3.7	0.3	0.0

3.7 inches of deep drainage/year = 100,500 gallons/acre/year

Using the results from the brush management experiment in Sonora (Thurrow and Hester, 1997)¹, and assuming Lampasas County contains a composition of 40% grass, 24% oak, and 36% juniper, the following additional recharge may be possible if the District implements a brush management plan to change the composition to 70% grass, 12% oak, and 18% juniper.

Rainfall:

Lampasas County = 29.8 inches per year
 Sonora = 22.6 inches per year

Percent increase in rainfall from Sonora to Lampasas County:

$29.8 \text{ (inches/year)} - 22.6 \text{ (inches/year)} = 7.2 \text{ (inches/year)}$
 $(\text{inches/year})/22.6 \text{ (inches/year)} = (0.318) (00\%) = 32\% \text{ increase in rainfall per year}$

¹ "How an Increase or Reduction in Juniper Cover Alters Rangeland Ecology", by Thomas L. Thurrow and Justin W. Hester, 1997 Juniper Symposium, Technical Report 97-1, Texas A&M Research and Extension Service.

Deep Drainage:

Sonora = 0.3 inches/year

0.3 inches of deep drainage/year = 8,148.7 gallons/acre/year

32% increase in Lampasas County from 0.32 = 0.096

0.096 (increase in Lampasas County per year in inches/acre/year) + 0.30 (deep drainage in inches/acre/year) = 0.40 in/acre/year deep drainage

If: 0.3 inches/acre/year = 8,148.7 gallons

Then: 0.4 inches/acre/year = (8,148.7) (0.4)/0.3
= 10,864.9 gallons

If: 1 acre-foot = 325,851 gallons

And if: 10,864.9 gallons/acre/year in Lampasas County

Then: 10,864.9 (gallons/acre/year)/325,851 (gallons/acre/foot) = 0.033 (acre-feet)/(acre/year)

This is the amount of additional recharge per acre of land cleared gained from clearing land with 40% grass, 24% oak, and 36% juniper, to 70% grass, 12% oak, and 18% juniper. Thus, each year, 0.033 acre-feet of additional recharge would be accrued for every acre cleared.

If a brush control management program was implemented on 250,000 acres, for example, then the following additional recharge might be gained:

250,000 acres (number of acres cleared) 0.033 acre-feet (additional recharge) = 8335.8 acre-feet additional recharge gained.

Water Levels & Storage

The sands within the calcareous facies of the Travis Peak Formation in west-central Texas exhibit extremely low permeabilities due to cementation. Pumping tests conducted in the calcareous facies area indicate that coefficients of permeability range from 1 to 20 gpd/ft². The low coefficients of permeability and the relatively thin sand thickness' combine to produce very low coefficients of transmissibility that range from 0 to 1,000 gpd/ft.

In the remainder of the region, excluding the northwest outcrop and calcareous facies areas, ground water within the Hensell and Hosston Members of the Travis Peak Formation is under artesian conditions. Test data indicate that coefficients of permeability of the Hosston range from approximately 17 to 171 gpd/ft². In general, permeabilities in the vicinity of Balcones Fault Zone appear to be low. This could be due to the faults causing decreases in permeabilities. Thus, the average coefficient of permeability for the Hosston is about 77 gpd/ft². The artesian storage coefficients for the Hosston range from 0.000028 to 0.000077.

Test data for the Hensell Member in the downdip region, show coefficients of permeability ranging from 26 to 126 gpd/ft². The Hensell thins and becomes shaly downdip, therefore a range in coefficients of transmissibility from approximately 0 to 15,000 gpd/ft could be expected in the region. Lack of test data prohibits assigning a coefficient of storage range for the Hensell Member, however, storage values should be somewhat less than those of the Hosston Member.

The coefficients of transmissibility and storage may be used to predict future drawdowns of water levels caused by pumping from the Hensell and Hosston Members of the Travis Peak Formation. Wells show water level fluctuations which are seasonal in nature. The water level declines correlate with the large irrigation pumpage in the summer months, and in the fall and winter water levels are recovering due to small withdrawals and recharge of the permeable sands by rainfall.

Projected Aquifers Water Supplies and Ground Water Usage & Demands

The projected average annual total usable amount of ground water available from the Trinity and other aquifers in the District is 18,150 acre-feet.

The estimated projected water supply for the year 2010 is 2,096 acre-feet; and, for the year 2050 is 1,421 acre-feet.

Estimate of projected water demand for the year 2010 is 4,751 acre-feet; and, for the year 2050 is 4,980 acre-feet.

Estimate of amount of ground water used on an annual basis:

1990	1991	1992	1993	1994	1995
1,154 ac/ft	1,107 ac/ft	1,246 ac/ft	1,153 ac/ft	1,156 ac/ft	1,154 ac/ft

Supply data and information was furnished by Texas Water Development Board, Water Supplies Section and Water Resources Planning Division.

Tracking Methodology

The Chairman of the Board of Directors will give an activity report to the District Board of Directors at the annual meeting, or as needed, to insure management objectives and goals are being followed and achieved by the District. The Board will maintain the report on file for public inspection at the District office upon adoption.

Management Goals, Objectives, and Performance Standards

Goal 1.0 Implement management strategies that will protect and enhance the quality of useable quality water by encouraging the most efficient use of ground water.

Management Objectives

1.1 Each year, the district will provide educational materials identifying conservation measures for the efficient use of water. Annually, two District newsletter issues will be published that contain water conservation information. Handout packets with conservation literature will be provided at the annual Lampasas County Agriculture Day, or one other water related function.

Performance Standards

1.1(a) Number of newsletters published annually containing water conservation information.

1.1(b) Number of annual events where conservation material was provided, and upon request, at the District office.

Management Objective

1.2 Each year the District will provide informative speakers to local school districts and/or civic organizations to raise public awareness to ensure wise use of ground water.

Performance Standard

1.2 Number of informative speaking appearances to promote wise water usage provided annually.

Goal 2.0 Implement a program to improve and protect the quality of the aquifer and to control and prevent waste.

Management Objective

2.1 Each year, continue to maintain a collection site for recycling of waste oil and used oil filters and provide all necessary reports to District board reflecting results of program.

Performance Standard

2.1 Number of reports provided annually to District board reflecting results of program.

Goal 3.0 Lend support to a water quality monitoring group for the purpose of establishing baseline water quality throughout the District.

Management Objective

3.1 District will lend support to a local water monitoring team that monitors Sulphur Creek, the major creek located in the District, for water quality. Our local monitoring team takes samples of water, performs various chemical testing with the water, and then individual test results and a sample of water (tested for fecal count) from each monitoring site, are delivered for final testing. The water and monitors' testing results are analyzed by a state certified laboratory for the Brazos River Authority and Texas River Watch, where permanent records are kept on the quality of water. Monitoring is performed monthly and has to take place within the same three day period every month and all monitors have to perform the testing within a three hour time frame so that test results will be more accurate.

Performance Standard

3.1 Number of water monitors to which the District will help furnish monitoring supplies annually, or as needed.

Goal 4.0 Address conjunctive surface water management issues.

Management Objective

4.1 Annually meet with leaders of the incorporated cities in our District to discuss *and review potential better use of surface water resources* in the area. District will consult with other water districts and other informed water conservationists on water issues throughout the year to learn more efficient ways to manage surface water.

Performance Standards

4.1(a) Number of meetings with cities' representatives annually.

4.1(b) Number of consultations with other districts and water conservationists annually.

Goal 5.0 Controlling and Preventing Subsidence

The rigid geologic framework of the District precludes significant subsidence from occurring. **This goal is not applicable to the operations of the District.**

Goal 6.0 Addressing natural resource issues which impact the use and availability of ground water, and which are impacted by the use of ground water.

This goal is not applicable to the operations of the District.

MANAGEMENT

The District will manage the supply of ground water within the District in order to conserve the resource while maintaining the viability of all resource user groups, public and private. The District will identify and engage in activities and practices that, if implemented, would result in reduction of ground water use. The District will make a regular assessment of water supply and ground water storage conditions and will report these conditions to the Board and to the public.

The District may require reduction of ground water withdrawals to amounts that will not cause harm to the aquifers. The District may, at the Board's discretion, amend or revoke any permits after notice and hearing to achieve this purpose. The District will consider the public benefit against individual hardship in determining permit denial or limiting ground water withdrawals after considering all appropriate testimony. The District shall treat all citizens with equality. A public or private user may appeal to the Board for discretion in enforcement of the provisions of the District's rules and regulations on grounds of adverse economic hardship or unique local conditions. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board.

ACTIONS, PROCEDURES, PERFORMANCES, AND AVOIDANCE FOR PLAN IMPLEMENTATION

The District will implement and use the provisions of this plan as a guidepost for determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District, and any additional planning efforts that the District may participate in will be consistent with the provisions of this plan. The District will seek cooperation in the implementation of this plan and the management of ground water supplies within the District. All activities of the Saratoga Underground Water Conservation District will be undertaken in cooperation and coordination with the appropriate state, regional, or local water entity.

The District will adopt rules relating to the permitting of wells and production of ground water. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical advice available.

LAMPASAS COUNTY, TEXAS
SARATOGA UNDERGROUND WATER DISTRICT

P.O. Box 231
Lampasas, TX 76550



Telephone
512/556-8271

September 30, 1998

Mr. Mike Bukala
Information and Support Director
Brazos River Authority
P. O. Box 7555
Waco, TX 76714-7555

Dear Mr. Bukala:

Enclosed is a copy of the proposed Saratoga Underground Water Conservation District Management Plan as required by Senate Bill No. 1.

Included in the requirements of SB1, we are required to develop this plan in coordination with surface water management entities. I ask that you please review the plan and provide copies to your board.

We have scheduled a public hearing on the Management Plan at 11:00 a.m. on October 26, 1998, 3rd Floor Meeting Room, Lampasas County Courthouse, Lampasas, Texas. We certainly welcome you to attend the hearing and make comments at that time.

Please contact me if you have any questions regarding this plan.

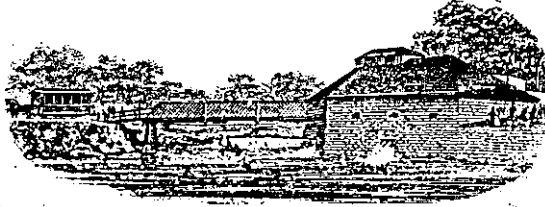
Sincerely,

Norris Monroe
Chairman of Board
Saratoga U.W.C.D.

NM/js
Enclosure - Management Plan

LAMPASAS COUNTY, TEXAS
SARATOGA UNDERGROUND WATER DISTRICT

P.O. Box 231
Lampasas, TX 76550



Telephone
512/556-8271

September 30, 1998

Dr. Quentin Martin
Manager, Water Supply Planning
Lower Colorado River Authority
P. O. Box 220
Austin, TX 78767-0220

Dear Dr. Martin:


Enclosed is a copy of the proposed Saratoga Underground Water Conservation District Management Plan as required by Senate Bill No. 1.

Included in the requirements of SB1, we are required to develop this plan in coordination with surface water management entities. I ask that you please review the plan and provide copies to your board.

We have scheduled a public hearing on the Management Plan at 11:00 a.m. on October 26, 1998, 3rd Floor Meeting Room, Lampasas County Courthouse, Lampasas, Texas. We certainly welcome you to attend the hearing and make comments at that time.

Please contact me if you have any questions regarding this plan.

Sincerely,


Norris Monroe
Chairman of Board
Saratoga U.W.C.D.

NM/js
Enclosure - Management Plan

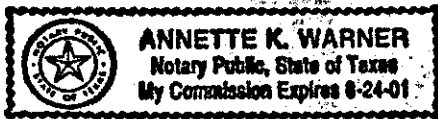
PUBLISHER'S AFFIDAVIT

I solemnly swear that the attached notice was published in the Lampasas Dispatch Record, a newspaper of general circulation which has been continuously and regularly published for a period of not less than one year preceding the dates of publication of the attached notice, that the said notice was published in the issues of such newspaper on the days of October 15, 1998.

Fred E. Lowe
Publisher, Fred E. Lowe
or James F. Lowe

SWORN TO AND SUBSCRIBED BEFORE ME BY Fred E. Lowe

this the 19th day of October, 1998, to certify which witness my hand and seal of office.



Annette K. Warner
Notary Public, State of Texas

Lampasas Dispatch Record

Thursday, October 15, 1998

Public Notices 122

PUBLIC NOTICE

A public hearing will be held on the Saratoga Underground Water Conservation District Management Plan at 11:00 a.m. on October 26, 1998. Meeting will be conducted in the Lampasas County Courthouse, 3rd Floor Meeting Room, Lampasas, Texas. Interested citizens are invited to attend.

ANNETTE K. WARNER
Notary Public, State of Texas
My Commission Expires 8-24-01



STATE OF TEXAS

COUNTY OF LAMPASAS

RESOLUTION

WHEREAS, the **Saratoga Underground Water Conservation District** has posted notice and held the appropriate public hearing; and

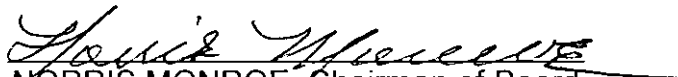
WHEREAS, the **Saratoga U.W.C.D.** has followed the rules set forth by Senate Bill No. 1 and the Texas Water Development Board; and

WHEREAS, no public comment opposing the plan was presented.


NOW THEREFORE, BE IT RESOLVED that the **Saratoga Underground Water Conservation District** Management Plan, as prepared and presented to the Board of Directors is adopted.

PASSED AND APPROVED by the Board of Directors of the **Saratoga Underground Water Conservation District**, Lampasas County, Texas, at a scheduled meeting held at 11:30 a.m. on October 26, 1998.




MORRIS MONROE, Chairman of Board

Saratoga Underground Water Conservation District


Jeanette Snell, Clerk