Flexible Solutions Ltd.

California Pool Test

September 24, 2001

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Aquatic Consulting Services
4909 Orchard Ave. #104 • San Diego • California • 92107

September 11, 2001

Grant Moonie
Flexible Solutions
4002 Dawnview Circle
Victoria, BC V8N 5M8 Canada

RE: Water Analysis Summary, Hyatt Islandia "California Pool"

Dear Mr. Moonie:

Water treatment procedures, testing methods, daily pool logs, and chemical monitoring and dispensing equipment were examined. In addition, a series of tests were performed on water samples taken from the pool on the first, fourteenth and thirtieth days of the test. Water samples were gathered along the southeast edge of the pool, just east of the 4-foot depth marker. After triple rinsing the color-coded collection bottles, water was sampled from eighteen inches below the water surface at a position several feet away from the nearest pool return inlet. Water samples were also collected at the same time by Expert Chemical Analysis for testing of IPA levels. On each day of the test, water was sampled prior to the 6 ounces of Heat$avr being added to the pool, then at intervals five, ten, twenty and thirty minutes after the chemical was added.

Water samples were analyzed for free available chlorine, total available, pH, calcium hardness, total alkalinity, copper and iron, using LaMotte Water Link Express reagents and colorimeter with digital readout. Nitrates and phosphates were measured using LaMotte's "Algae Alert" color comparator test kits and reagents, Nitrate Test Kit, #3465, and LR Phosphate Test Kit #3465. Total dissolved solids

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oxidation reduction potential were measured with an Oakton handheld ORPTestr and a TDS Testr1. Combined available chlorine and the Langellar Saturation Index were calculated from the test results.

Heat$avr was added at a ratio of 1 ounce per 400 square feet of water surface area. The Hyatt Islandia pool is located outdoors. The pool is in the shape of the State of California, and is approximately 95'6" long, and is 34'6" wide at its widest point. Depth ranges from 2'10" to 8' deep. the perimeter is 240 linear feet, area is 2,375 square feet, and volume equals 97,708 gallons. The gunite pool is surface with fiberglass.

Chemical feeder, controllers and chemicals are supplied by Ecolab. Daily testing, record keeping and pool maintenance are performed by the Hyatt engineering staff. The water is sanitized and oxidizer with 68% available chlorine, calcium hypochlorite "Aquabalance Chlorinating Tablets". The pH is adjusted downward with muriatic acid. The ORP and pH are monitored with an Acu-Trol controller. The water is heated using natural gas with a Teledne Laars 818,100 BTU/hour output "MightyTherm" heater. Water is filtered through two 7,065 square foot, manual backwash, Triton II TR-140 high rate sand filter tanks, with #20 silica sand media. Flow rate is typically maintained around 150 gallons per minute for a very slow turnover time of 10.8 hours. (California code requires a minimum turnover of 6 hours).

The pool was last drained completely and refilled in May 2000. On average 1,517 gallons of water are replaced per day.

Overall, water quality was good. A few potentially serious, but correctable water quality problems exist, primarily as a result of the slower than required turnover rate, undersized filtration system, and the lack of thorough water testing and record keeping by Hyatt employees.

Results of the analysis performed on the source water and water samples collected from the pool are attached. The following is a brief explanation of each of the items tested.

Free chlorine, in the form of hypochlorous acid, provides the residual sanitizer - oxidizer which is immediately and readily available to destroy the harmful to human health, pathogenic organisms entering the water. Maintaining acceptable residuals helps prevent the rapid growth of bacteria, viruses, protozoa, and algae that may transmit through water and lead to the spread of disease through ingestion of contaminated water, inhalation of water vapor, or body contact with pathogens absorbed during immersion.

Chloramines (CAC) are the incomplete oxidation of organic contaminants that form when chlorine (OCI) combines with ammonia and other bather waste and organic products in the water. They're undesirable because they are approximately sixty to one hundred times slower than free chlorine at attacking bacteria, are responsible for the unpleasant odor often associated with poorly ventilated pools, and for much of the eye, skin and mucous membrane irritation experienced by swimmers. CAC readings should be monitored daily, and chloramines and other organic contaminants should be completely oxidized through breakpoint chlorination or shocking of the pool whenever measurable levels exceed 0.2 ppm.

Oxidation reduction potential (ORP) is a standard method of a measuring the sanitizer's ability to oxidize and sanitize the water. ORP sensors measure HOCI (hypochlorous acid) conductivity of water, the potential generated for oxidation, and permit constant monitoring of sanitation levels. ORP takes into consideration all water constituents, including pH, TDS, cyanurates, and organic contaminants. It is a true, qualitative measure of water cleanliness. ORP falls whenever pH is high, and when TDS, chloramine or cyanurate levels are high. Organic and chemical loading drastically reduce the ability of the bactericide to overcome pathogenic organisms. ORP should be maintained at a minimum level of 750 millivolts in commercial pools and spas.

Cyanuric acid, a water conditioner or chlorine stabilizer, is added to the water to prevent chlorine dissipation and loss into the air from exposure to the sun's ultraviolet light. Moderate levels (10 to 20 ppm) of cyanuric acid can help lower chlorine costs in outdoor pools. However, cyanuric acid ties up chlorine and reduces its effectiveness (as measured by the oxidation reduction potential or ORP) so maintenance of much higher free available chlorine levels are required to achieve the same level of sanitation and oxidation as would be available in an un-stabilized pool.

pH is the log of the reciprocal of the hydrogen ion concentration of a solution, a measure of the acidity or alkalinity of the water, and is determined by the concentration of hydrogen ions in a specific volume of water. pH levels in chlorinated pools should be maintained slightly alkaline in the range of 7.2 to 7.8, depending on the need to maintain adequate ORP levels and balanced water conditions. The pH is being constantly monitored by the controller, and is being adjusted downward by injection of muriatic acid.

Total alkalinity is the sum of all the alkaline minerals in the water, primarily in bicarbonate form in swimming pools but also as sodium, calcium, magnesium and potassium carbonates and hydroxides. Total alkalinity is a measure of the water's resistance ability to changes in pH. Total alkalinity was recorded at an extremely low level in incoming source water. To continually bring the total alkalinity up to acceptable levels, sodium bicarbonate (baking soda) must be added to the pool water. Maintaining low total alkalinity in the pool can cause "pH bounce", corrosion, and staining of pool walls. Maintaining high total alkalinity levels causes over stabilization of the water which leads to extremely high acid demands, formation of bicarbonate scale, and may result in the formation of a white carbonate precipitate which clouds the water. To raise total alkalinity, sodium bicarbonate is added using the formula:

(Volume) 71,425) x ____ ppm desired change =_____ pounds.

Volume of pool water in gallons is divided by the constant 71,425; then multiplied by the part per million change desired. This will result in the number of pounds of sodium bicarbonate that must be added to raise the total alkalinity to desired levels. Total alkalinity levels should be maintained in the recommended range of 80 to 120 ppm.

Calcium hardness is a measure of the temporary carbonate hardness of the water. Water that is too soft causes corrosion, plaster etching, brittleness, staining, tile popping due to the eating away of grout, and deterioration of metal circulation system components. Hard water will lead to scale formation, calcification of pipes and heater elements, and cloudiness of the water. Water hardness levels should be maintained between 200 and 400 ppm.

Maintenance of dissolved mineral levels over 0.2 ppm for iron, or 0.3 ppm for copper will result in water discoloration and pool wall surface staining. Metals may cause the hair of bathers – particularly those with blond, gray or white hair, to turn green. Use of sequestering or chelating agents may be helpful in removing the copper, iron and other dissolved metals from the water and in preventing staining.

Total dissolved solids (TDS) are composed of everything that is dissolved in the water. TDS levels build as water evaporates and solids become more concentrated. The water clouds, pH goes up, scaling increases, water foams, and chemicals, particularly sanitizers, become less effective. Regular dilution (at least 8 gallons per user per day) and pool emptying and refilling should be continued to reduce the TDS level. A good way to estimate how often a pool will need to be emptied to control for TDS build-up, assuming adequate oxidation is occurring, is to divide the volume in gallons of water by three, and then divide by the average number of people using the pool per day.

The pool water was crystal clear. Alternating red and black panels on a 2 inch diameter test disk placed at the bottom of the pool could be clearly differentiated. The main drains could clearly be seen, and water quality continued to meet standards of clarity throughout the test period.

Nitrates stimulate plant growth, and when high levels of nitrates (greater than 25 ppm) are present in pool water, uncontrolled algae growth often occurs even though unaccountably large amounts of chlorine are being used. Nitrates are introduced into pools from: fill water in areas where fertilizer has worked its way down into the ground water, contaminated reservoirs or wells, rain, fertilizers or grass blown into the pool from the adjoining landscaping, human or animal urine or fecal matter, and bird droppings. Pools located in agriculture areas, screened pools, and pools that border large bodies of water often experience nitrate problems. To lower nitrate levels, try shocking the water with chlorine to over 30 ppm, or partially drain and refill the pool with water, which is not contaminated with nitrates. Nitrites were present in the source water, but at a level lower than that found in the pool.

Phosphates are introduced to pool water through bather urine and sweat, laundry detergents, leaves, dirt, and other organic wastes. If phosphate levels are too high, uncontrollable algae growth will result. Phosphates in pool water should be kept below 0.2 - 0.5 ppm, or < 125 ppb. To prevent algae growth, remove phosphates by adding lanthanum carbonate (AKA ”Starver”, ”Phos Free”, ”Zero Phos”). Insoluble lanthanum phosphate will form and precipitate the phosphate compounds out of the water solution. The precipitate can then be Vacuumed or filtered out of the pool.

Mineral saturation control, or water balance, was calculated using the Langelier Saturation Index. Water temperature, pH, total alkalinity, calcium hardness, and total dissolved solids act together to cause corrosiveness or calcification qualities of water. Water is the universal solvent. As a result of the law of chemical equilibrium, water will dissolve things until it becomes saturated. When water becomes over-saturated, excess material will be lost by precipitation.

In conclusion, pool water quality components commonly monitored by pool operators, including: free, total and combined chlorine; water temperature, total dissolved solids, cyanuric acid, pH, total alkalinity, calcium hardness, saturation index, iron, copper, nitrates, phosphates and clarity were not affected by the addition of Heat$avr. Minor fluctuations in water chemistry that occurred during the 30-minute test periods were more likely a consequence of normal chemical consumption resulting from introduction of bather and environmental wastes, and automated chemical injection.

The isopropyl alcohol added to the pool during the application of the Heat$avr product dispersed on the water surface within minutes after being applied, and the concentration present in the water decreases rapidly. Even at peak levels of concentration found in the pool, toxic risks of exposure by bathers to isopropyl alcohol are negligible. Levels 30 times as high are permitted by the Food & Drug Administration in beverages consumed by bathers sitting around the pool.

According to the U.S. Department of Energy, approximately 70% of the energy lost from a swimming pool occurs through evaporation. Therefore, any product such as Heat$avr which slows down evaporation will result in substantial energy savings. If, as it appears from research conducted during this and other tests, this can be done at minimal cost to the consumer, and without affecting the water or harming bathers, its use should be encouraged**.**

Sincerely,

Alison Osinski, Ph.D.
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Water Analysis

Pool Hyatt Islandia Pool

Date Monday June 18, 2001 (Day 1)

Pre chemical Application	5 minutes post	10 minutes post	20 mins post	30 mins post	Test	Acceptable	Within Range
79EF	79EF	79EF	79EF	79EF	water temperature	Appropriate for primary activity, and <104°F	Yes
2,330 ppm	2,330 ppm	2,330 ppm	2,330 ppm	2,330 ppm	Total dissolved solids	<1,500 ppm	No
655 mV	680 mV	695 mV	705 mV	710 mV	ORP	750-900 mV	No
1.23 ppm	1.33 ppm	1.00 ppm	1.00 ppm	1.00 ppm	FAC	1.0 – 5.0 ppm or as needed to maintain a 750 mV ORP	No
1.29 ppm	1.66 ppm	1.55 ppm	1.78 ppm	1.44	TAC	As needed to maintain a 750 mV ORP but no more than 0.2 ppm higher than FAC	No
0.06 ppm	0.33 ppm	0.55 ppm	0.78 ppm	0.44 ppm	CAC	<0.3 ppm	No
5 ppm	10 ppm	5 ppm	5 ppm	10 ppm	Cyanuric acid	0-30 ppm (0 indoors)	Yes
7.27	7.01	6.96	7.11	7.33	pH	7.2 – 78	No
20 ppm	10 ppm	10 ppm	20 ppm	10 ppm	Total alkalinity	80 – 20ppm	No
350 ppm	390 ppm	390	400	370	Calcium hardness	200-400 ppm	Yes

Pre chemical Application	**5 minutes post**	**10 minutes post**	**20 mins post**	**30 mins post**	**Test**	**Acceptable**	**Within Range**
-0.53	-0.79	-0.94	-0.79	-0.67	Saturation Index	-0.3 to +0.3	No
0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	Iron	0 – 0.2	Yes
2.46 ppm	1.89 ppm	2.43 ppm	2.45 ppm	2.27 ppm	Copper	0 – 0.3	No
40 mg/l	40 mg/l	40 mg/l	40 mg/l	40 mg/l	Nitrates	<10 mg/l	No
> 1,000 ppb	> 1,000 ppb	> 1,000 ppb	> 1,000 ppb	> 1,000 ppb	Phosphates	<125 ppb	No
<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	Clarity	<0.25 NTUs	Yes

Water Samples were collected from the 4 foot depth area on the SE side of the pool, from 18 inches below the water surface and away from the return inlet.

SI = 7.27 (pH) + 1.4 (af) + 2.2 (cf) + 0.7 (tf) – 12.2 (TDSf) = -0.53 (Aggressive)
SI = 7.01 (pH) + 1.4 (af) + 2.2 (cf) + 0.7 (tf) – 12.2 (TDSf) = -0.79 (Aggressive)
SI = 6.96 (pH) + 1.4 (af) + 2.2 (cf) + 0.7 (tf) – 12.2 (TDSf) = -0.94 (Aggressive)
SI = 7.11 (pH) + 1.4 (af) + 2.2 (cf) + 0.7 (tf) – 12.2 (TDSf) = -0.79 (Aggressive)
SI = 7.23 (pH) + 1.4 (af) + 2.2 (cf) + 0.7 (tf) – 12.2 (TDSf) = -0.67 (Aggressive)

Water Analysis

Pool Hyatt Islandia Pool

Date Monday July 2, 2001 (Day 14)

Pre chemical Application	**5 minutes post**	**10 minutes post**	**20 mins post**	**30 mins post**	**Test**	**Acceptable**	**Within Range**
80°F	80° F	80° F	80° F	80° F	Water temperature	Appropriate for primary activity, and <104°F	Yes
3,280 ppm	3,280 ppm	3,280 ppm	3,280 ppm	3,280 ppm	Total dissolved solids	<1,500 ppm	No
760 mV	780 mV	790 mV	785 mV	805 mV	ORP	750-900 mV	Yes
2.94 ppm	3.58 ppm	3.24 ppm	3.15 ppm	3.48 ppm	FAC	1.0 – 5.0 ppm or as needed to maintain a 750 mV ORP	Yes
4.18 ppm	4.00 ppm	4.01 ppm	4.17 ppm	4.11	TAC	As needed to maintain a 750 mV ORP but no more than 0.2 ppm higher than FAC	No
1.24 ppm	0.42 ppm	0.77 ppm	1.02 ppm	0.63 ppm	CAC	<0.3 ppm	No
5 ppm‘	10 ppm	5 ppm	5 ppm	5 ppm	Cyanuric acid	0-30 ppm (0 indoors)	Yes
7.23	7.18	7.23	7.28	7.22	pH	7.2 – 78	No
30 ppm	40 ppm	40 ppm	40 ppm	40 ppm	Total alkalinity	80 – 20ppm	No
440 ppm	460 ppm	430	430	430	Calcium hardness	200-400 ppm	No

Pre chemical Application	**5 minutes post**	**10 minutes post**	**20 mins post**	**30 mins post**	**Test**	**Acceptable**	**Within Range**
+0.33	+0.28	+0.33	+0.38	+0.32	Saturation Index	-0.3 to +0.3	No
0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	Iron	0 – 0.2	Yes
0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	Copper	0 – 0.3	Yes
30 mg/l	30 mg/l	30 mg/l	30 mg/l	30 mg/l	Nitrates	<10 mg/l	No
>1,000 ppb	>1,000 ppb	>1,000 ppb	>1,000 ppb	>1,000 ppb	Phosphates	<125 ppb	No
<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	Clarity	<0.25 NTUs	Yes

Water Samples were collected from the 4 foot depth area on the SE side of the pool, from 18 inches below the water surface and away from the return inlet.

SI = 7.23 (pH) + 1.7 (af) + 2.9 (cf) + 0.7 (tf) – 12.2 (TDSf) = +0.33 (Balanced)
SI = 7.18 (pH) + 1.7 (af) + 2.9 (cf) + 0.7 (tf) – 12.2 (TDSf) = +0.29 (Balanced)
SI = 7.23 (pH) + 1.7 (af) + 2.9 (cf) + 0.7 (tf) – 12.2 (TDSf) = +0.33 (Balanced)
SI = 7.28 (pH) + 1.7 (af) + 2.9 (cf) + 0.7 (tf) – 12.2 (TDSf) = +0.38 (Over saturated)
SI = 7.22 (pH) + 1.7 (af) + 2.9 (cf) + 0.7 (tf) – 12.2 (TDSf) = +0.32 (Balanced)

Water Analysis

Pool Hyatt Islandia Pool

Date Wednesday July 18, 2001 (Day 30)

Pre chemical Application	**5 minutes post**	**10 minutes post**	**20 mins post**	**30 mins post**	**Test**	**Acceptable**	**Within Range**
70° F	71° F	71° F	70° F	69° F	Water temperature	Appropriate for primary activity, and <104°F	No
1.960 ppm	1.960 ppm	1.960 ppm	1.960 ppm	1.960 ppm	Total dissolved solids	<1,500 ppm	No
780 mV	785 mV	785 mV	785 mV	780 mV	ORP	750-900 mV	Yes
2.78 ppm	2.3 ppm	2.04 ppm	2.01 ppm	1.97 ppm	FAC	1.0 – 5.0 ppm or as needed to maintain a 750 mV ORP	No
2.97 ppm	2.83 ppm	2.65 ppm	2.31	2.4	TAC	As needed to maintain a 750 mV ORP but no more than 0.2 ppm higher than FAC	No
0.19 ppm	0.53 ppm	0.61 ppm	0.3 ppm	0.43 ppm	CAC	<0.3 ppm	No
10 ppm	10 ppm	10 ppm	10 ppm	10 ppm	Cyanuric acid	0-30 ppm (0 indoors)	Yes
7.67	7.66	7.64	7.60	7.64	pH	7.2 – 78	No
50 ppm	60 ppm	50 ppm	60 ppm	50 ppm	Total alkalinity	80 – 20ppm	No
480 ppm	480 ppm	480 ppm	490 ppm	480 ppm	Calcium hardness	200-400 ppm	No

Pre chemical Application	5 minutes post	10 minutes post	20 mins post	30 mins post	Test	Acceptable	Within Range
					Saturation Index	-0.3 to +0.3	No
0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm	Iron	0 – 0.2	Yes
0.17	0.33	0.21 ppm	0.20 ppm	0.19 ppm	Copper	0 – 0.3	Yes
30 mg/l	30 mg/l	30 mg/l	30 mg/l	30 mg/l	Nitrates	<10 mg/l	No
>1,000 ppb	>1,000 ppb	>1,000 ppb	>1,000 ppb	>1,000 ppb	Phosphates	<125 ppb	No
<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	<0.25 NTUs	Clarity	<0.25 NTUs	Yes

Water Samples were collected from the 4 foot depth area on the SE side of the pool, from 18 inches below the water surface and away from the return inlet.

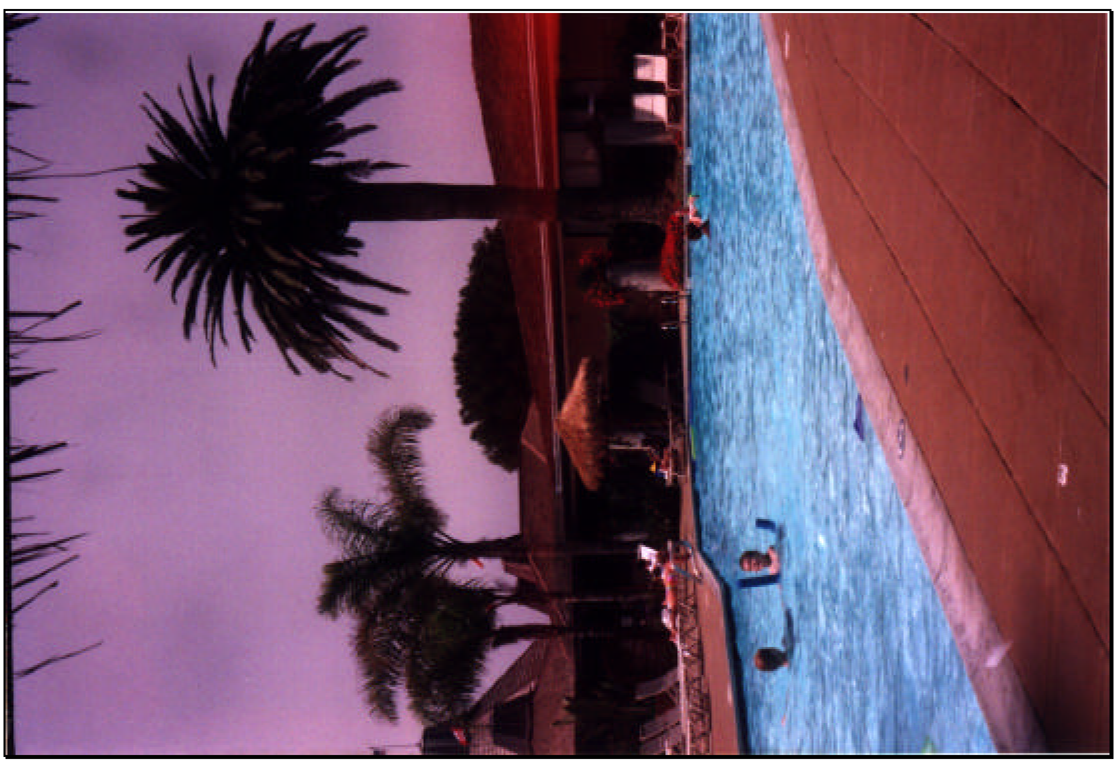
SI = 7.67 (pH) + 1.7 (af) + 2.5 (cf) + 0.6 (tf) – 12.2 (TDSf) = +0.27 (Balanced)
SI = 7.66(pH) + 1.9 (af) + 2.5 (cf) + 0.6 (tf) – 12.2 (TDSf) = +0.46 (Over saturated)
SI = 7.64 (pH) + 1.7 (af) + 2.5 (cf) + 0.6 (tf) – 12.2 (TDSf) = +0.24 (Balanced)
SI = 7.60 (pH) + 1.9 (af) + 2.5 (cf) + 0.6 (tf) – 12.2 (TDSf) = +0.4 (Over saturated)
SI = 7.64 (pH) + 1.4 (af) + 2.5 (cf) + 0.6 (tf) – 12.2 (TDSf) = - 0.06 (Balanced)

1. Hyatt Islandia "California Pool" : View from the shallow (NE) end toward the deep (SW) end

2. Hyatt Islandia "California Pool" : View from the deep (SW) end toward the shallow (NE) end.

Photos taken by Alison Osinski, Ph.D. • Aquatic Consulting Services • June 18, 2001

3. Hyatt Islandia “California Pool” : View from the South corner



4. Hyatt Islandia “California Pool”: view from the North corner.

Photos taken by Alison Osinski, Ph.D. • Aquatic Consulting Services • June 18, 2001

↑

5. View of the pool with the hotel in the background. Water samples were gathered near the spot where the little boy is standing in the pool.

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Analytical Testing Report

Grant Moonie
Flexible Solutions
4002 Dawnview Cr,
Victoria, B.C. VSN 5M8
Canada

08-09-01

ECA #01239

The analysis of the sample(s) has been completed and the sample information and results are in the table on the following page(s)

Sampling and Analysis Protocol:

The test samples were collected on 6-18-01, 7-02-01, and 7-18-01. All of the samples were collected at the Hyatt Islandia "California Pool" approximately 20 feet from the site of addition of the HEAT$AVR. The collection was done by skimming a glass sampling container on the pool surface until it was completely full with no headspace. These samples were taken at the 0, 5, 10, 20, and 30 minute points from adding the HEAT$AVR to the pool. PTFE caps were placed on the containers, they were labeled and placed into an iced container to be transported to the laboratory. The samples were refrigerated until analysis. The analysis was done using gas chromatography-mass spectrometry with heated headspace gas sample introduction. The analysis for 2-propano1 was done in the very sensitive selected ion monitoring (SIM) mode and the other compounds were analyzed using the standard full scan technique.

Conclusions:

The 2-propano1 appeared to travel quickly upon the surface and then reduce in quantity quickly over time, In the 30 minutes after the HEAT$AVR was added to the pool, you see an increase in the concentration (ppm) of 2-propano1 until around the 10 to 15 minute mark. Then the concentration begins to decrease at a rapid rate. The increase in concentration in the first 10 to 15 minutes is probably because the samples were taken 20 feet from the addition site and it took 10 to 15 minutes for the maximum concentration of 2-propano1 to reach the 20 foot mark on the pools surface. There were no noticeable effects on the chloroform concentration (from chlorine added) from the beginning to the end of the test. The acetone appears to be related to the presence of children in the pool at the time of testing.

If you have any questions concerning these results, please call us at (858) 535-9979.

Sincerely,

Jim Polansky
Scientist

Q.C. Officer

ECA
EXPERT · CHEMICAL · ANALYSIS
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Analytical Testing Report

Results of Analysis

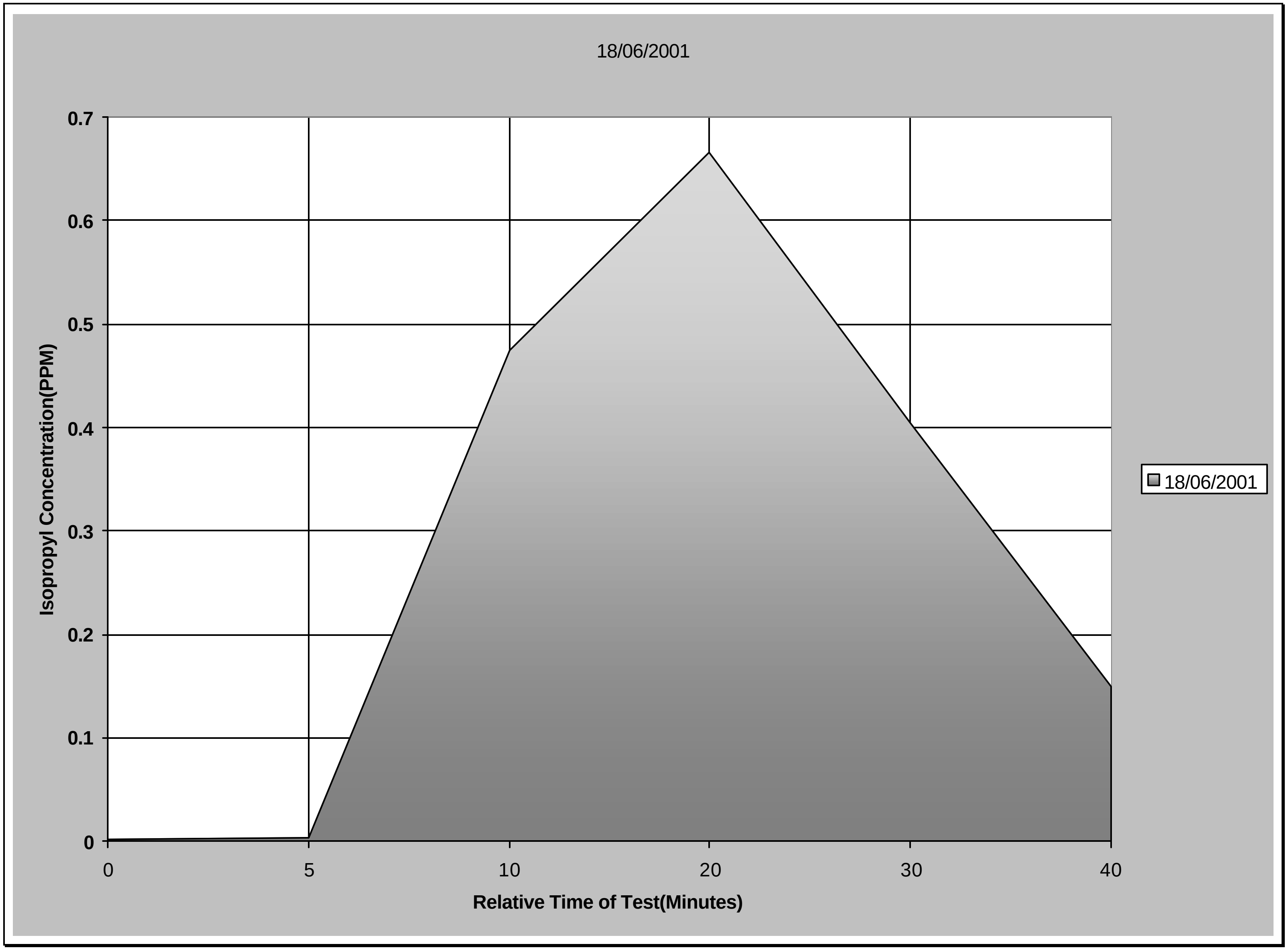
Isopropyl Alcohol (2-propanol) Tests

Date of Test	Relative Time of Test	2-propanol concentration (ppm)
6-18-01	before addition of solution	<.002 ppm
	5 min. after addition of solution	0.003 ppm
	10 min. after addition of solution	0.475 ppm
	20 min. after addition of solution	0.666 ppm
	30 min. after addition of solution	0.404 ppm
7-02-01	before addition of solution	< 0.002 ppm
	5 min. after addition of solution	0.010 ppm
	10 min. after addition of solution	0.365 ppm
	20 min. after addition of solution	0.235 ppm
	30 min. after addition of solution	0.312 ppm
7-18-01	before addition of solution	0.019 ppm
	5 min. after addition of solution	0.024 ppm
	10 min. after addition of solution	0.754 ppm
	20 min. after addition of solution	0.455 ppm
	30 min. after addition of solution	0.440 ppm

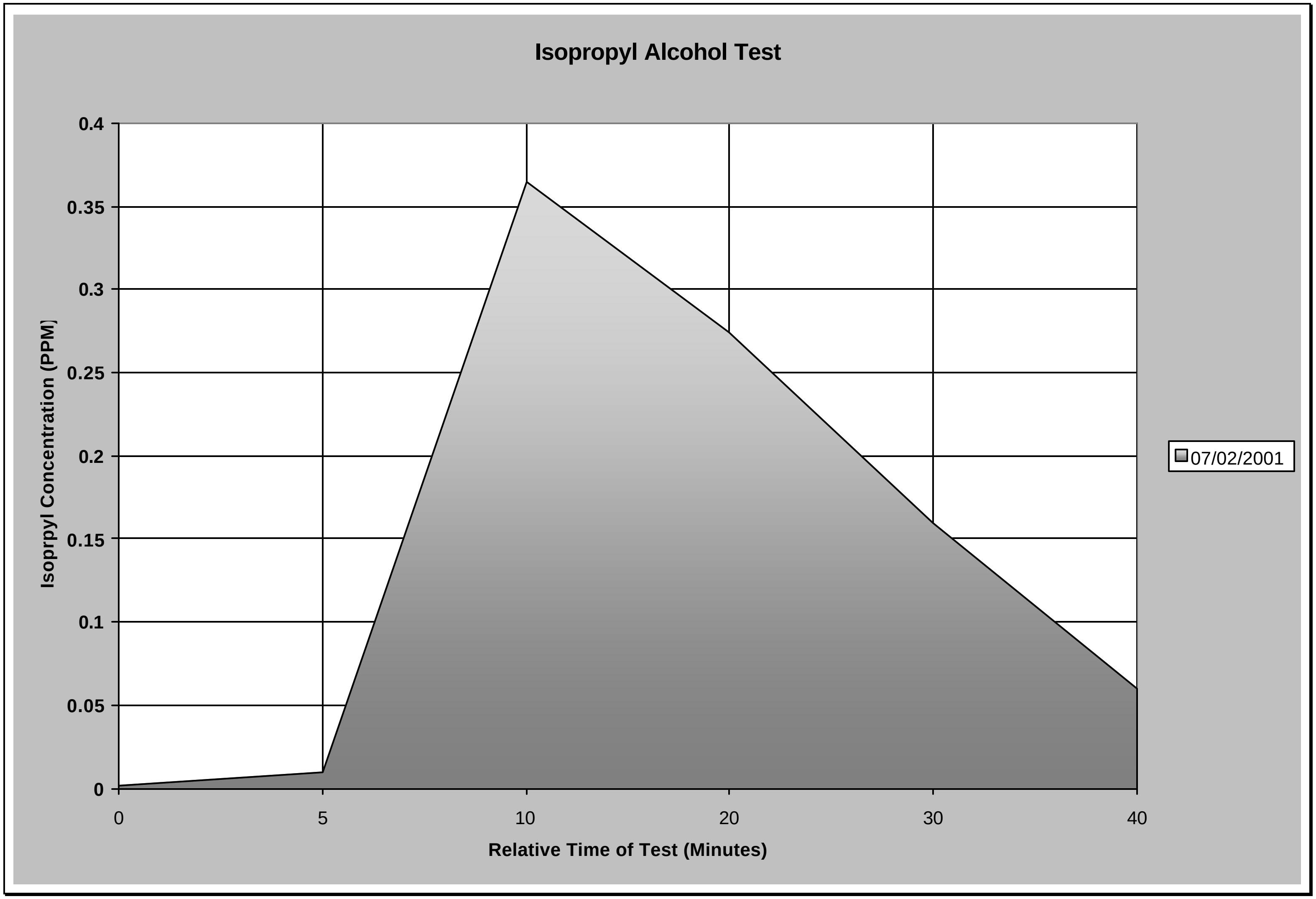
Testing for Other Chemicals

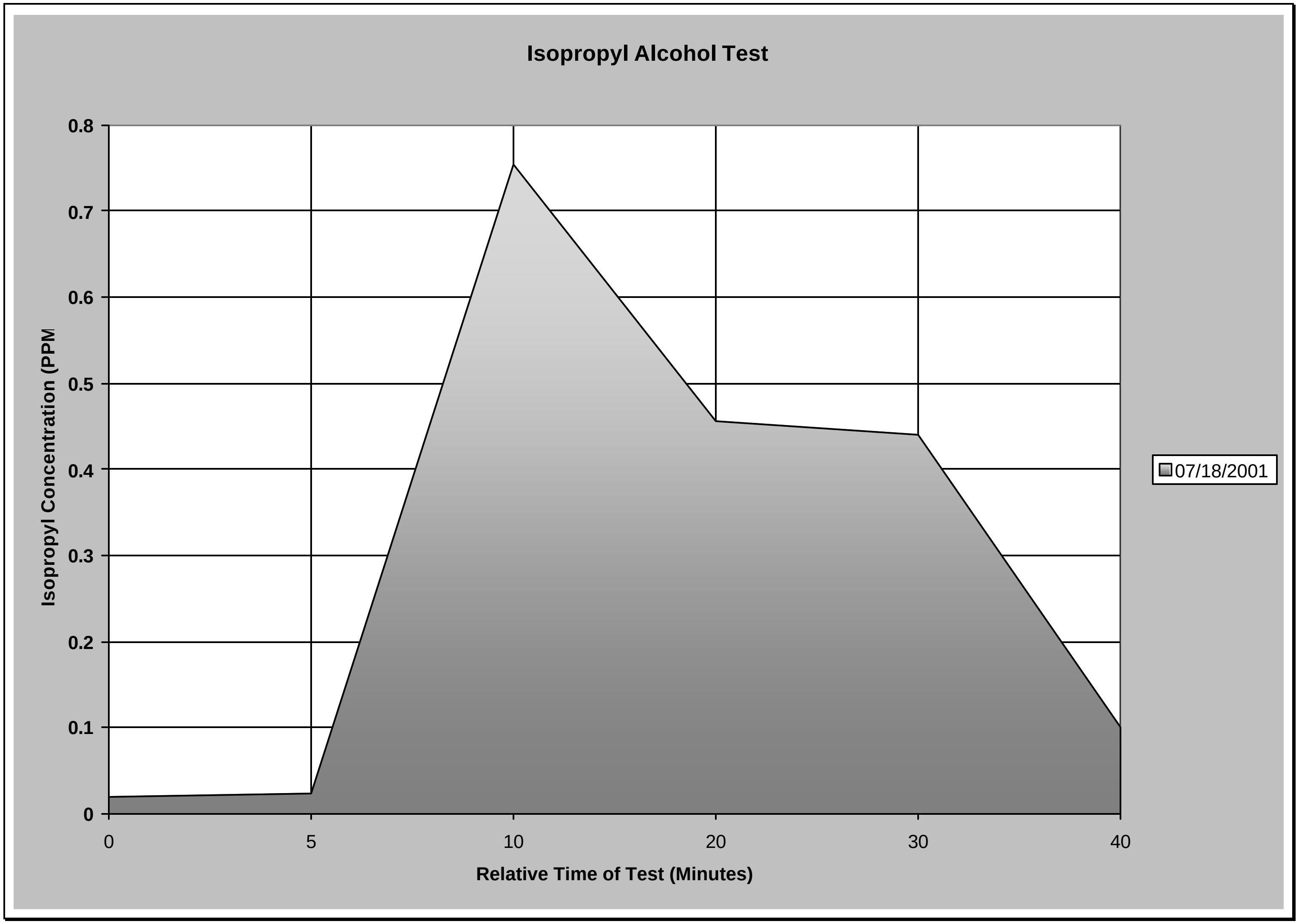
Date of Test	Relative Time of Test	Results
6-18-01	before addition of solution	Chloroform: 0.404 ppm*
	30 min. after addition of solution	Chloroform: 0.446 ppm* Acetone: 0.088 ppm
7-02-01	30 min. after addition of solution	Chloroform: 0.641 ppm* Acetone: 1.15 ppm
7-18-01	30 min. after addition of solution	Chloroform: 0.535 ppm* Acetone: 2.089 ppm

note*: there were no children in the pool before the addition of the solution on 6-18-01. At all other testing times there was someone in the pool.



18/06/2001
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Isopropyl Concentration(PPM)
0
5
10
20
30
40
Relative Time of Test(Minutes)
18/06/2001


Isopropyl Alcohol Test
Isoprpyl Concentration (PPM)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
5
10
20
30
40
Relative Time of Test (Minutes)
07/02/2001



Isopropyl Alcohol Test
Isopropyl Concentration (PPM
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
20
30
40
Relative Time of Test (Minutes)
07/18/2001

Lapin & Associates

Charles A. Lapin, Ph.D., D.A.B.T

September 4, 2001

Grant Moonie
Flexible Solutions
4002 Dawnview Cr.
Victoria, B.C.
V8N 5M8 Canada

Dear Mr. Moonie:

You contacted me for a professional opinion on the potential toxic risks from isopropanol and a proprietary ingredient when used in swimming pools as part of your product called Heat$avr. You provided me with study results that demonstrated that the concentration of isopropanol peaked within 10-25 minutes after addition to the pool and dropped quickly thereafter. The highest peak level measured was 0.8 ppm. You also provided me toxicity testing results that found no eye or skin irritation from 50 ppm when tested as the Heat$avr product.

I did a literature review and found three references that addressed allowable or no-effect exposure levels for isopropanol. This information and that supplied by you are summarized in the attached table. From the table, it is clear that even the highest concentration found in the pool study is well below concentrations that are either not expected to cause toxicity or are allowed by regulatory authorities. For these reasons, it is my opinion that under conditions of intended use the isopropanol component of Heat$avr presents no health risk to the general public.

Also based on a literature review, I found that at high concentrations **(100%)** the proprietary ingredient has a very low order of acute toxicity and is only minimally to mildly irritating to eyes and skin. In concentrations used in Heat$avr, it is my opinion that the proprietary ingredient would present no health risk to the general public.

Sincerely,

Charles A. Lapin

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Concentration of Isopropanol in water	Comment	Reference
224 ppm	Water consumed daily for 6 weeks produced no apparent ill effects in human volunteers	1
70 ppm	No chronic toxicity expected in general population	2
50 ppm	Not irritating to eyes or skin in toxicity tests	3
25 ppm	FDA allows in non-alcoholic beverages	4
0.8 ppm	Highest level measured in pool study	5

References

1. Dhillon S A. Von Burg R: Toxicology Update: Isopropyl Alcohol. J Appl Toxicol 1995; 15: 501-506.

2. Derived for chronic toxicity inhalation reference level (7 mg/m^3 x 20 m^3/da)/(2 L/da). Source of reference level: Office of Environmental Health Hazard Assessment, California Environmental Protection Agency.

3. Toxicity tests conducted for Flexible Solutions, report posted on website www. flexiblesolutions.com

4. Hazardous Substances Data Bank, National Library of Medicine, updated May 15, 2001.

5. Testing conducted for Flexible Solutions on 7/18/01.