

AGREEMENT made on the **XXXXXXXXXXXXXX** between **LOCKHART SHIRE COUNCIL** (hereinafter called the Council) of the One Part and **XXXXXXXXXXXXXX** (hereinafter called "the Contractor") of the Other Part **WHEREAS** the Council is the owner of The Rock Swimming Pool Complex (hereinafter called the "pool complex") situated corner Wilson and Mixner Streets, The Rock on part of Reserve No 32691 **AND WHEREAS** the Contractor has agreed to take over the pool complex for the **2016/2017** summer swimming seasons upon the following terms and conditions:-

1. The Contractor is hereby granted full and exclusive care and control rights to operate and control the pool complex for the periods **7 November 2016 until 12 March 2017** or such other date as may be mutually agreed upon by the Council and the Contractor. Any variation of these dates will be based upon the pool usage and prevailing weather conditions.
2. The Contractor will operate and conduct the pool complex during the agreed term in a proper and orderly manner **AND** will at all times ensure that the conduct and operation of the pool complex complies with the appropriate provisions of the Local Government Act 1993 and the regulations made thereunder or any other New South Wales Statute effecting the control and conduct of public swimming pools.
3. During the term hereof the Contractor will hold the equivalent qualification as a Certificate II in Aquatics (Operations) either through the Institute of Swimming and Recreation Centre Management of Australia or through the Department of Technical and Further Education.
That in the event of the Contractor not holding the Certificate II in Aquatics (Operations) as referred to in 3 above then he/she and/or some other person under his/her control so appointed to be in charge of the The Rock Swimming Pool shall hold a current Pool Lifeguard Certificate and a current First Aid Certificate. Pool Life Guard Certificates must be updated annually and consist of:
 - a. the Royal Life Saving Society of Australia Bronze Medallion; and
 - b. the Senior Resuscitation Certificate or Advanced Resuscitation Certificate issued by
 - i. the Royal Life Saving Society of Australia; or
 - ii. the Surf Life Saving Association of Australia; andand that one of such qualified persons will be in attendance as duty lifeguard at The Rock Swimming Pool during all times such pool is open to the public. The Contractor will in the event of his/her absence from the pool complex record such absence and the name of the person taking his/her place in his/her daily returns book.
4. The Contractor shall provide documentation to Council of qualifications held by The Contractor and all staff.
5. Practice Note No. 15, Water Safety, states that water safety personnel, such as lifeguards and lifesavers on duty, should be readily identifiable at a distance and distinguishable from other pool users.

Council Policy: Provision of Protective Clothing/Equipment requires Council employees exposed to UV rays for a period of more than 30 minutes to wear protective clothing and personal protective equipment at all times.

Council will provide protective clothing and equipment to the Contractor, including:

- Long sleeved, high visibility shirts, with a minimum sun protective factor of no less than 48 UPF+
- Sunglasses – that comply to Australian Standard AS 1067
- Sunscreen – at least 30+
- Masks and Gloves – to be worn when applying chemicals

Quantities of clothing supplied will be at the discretion of the Director of Engineering. Personal protective equipment remains the property of Lockhart Shire Council at all times.

6. The Contractor will operate The Rock Swimming Pool in accordance with Practice Note 15 which relates to the operation of swimming pools (Appendix 'A').
7. The Contractor will maintain in good order and condition and thoroughly cleanse and keep clean the pool complex including machinery, engines, equipment and appliances to ensure their effective operation at all times during the term hereof. In the event of any repairs being necessary, except minor maintenance, to such machinery, engines, equipment and appliances the Contractor will notify the Council thereof and the Council will make the appropriate arrangements for the repairs to be carried out at its own expense. In this event the Contractor will give the Council access to the pool complex at such times as may be necessary to give effect to the provisions of this clause.
8. The Contractor will operate the filtration and chlorination plant in accordance with the attached detailed Specification titled "The Process of Water Treatment in a Recirculating Type Pool" (appendix A) and such Specification is deemed to be part of this Agreement. The Contractor will ensure that when the pool complex is open to the public that the water for the pools complies with recognised industry standards and tests.
9. The Contractor will at all times during the term hereof thoroughly cleanse and keep the pool complex and surrounds in clean and tidy condition and in this regard shall pay particular attention to the toilet, shower and dressing room facilities. All detergents, Chemicals (other than treatment chemicals referred to in Clause 18 disinfectants, cleaning materials and utensils and toilet requisites (including toilet paper and soap) as may be necessary to comply with this requirement will be supplied by the Contractor. In keeping the surrounds of the pool complex clean and tidy the Contractor will attend to all mowing, watering and gardening within the fenced pool complex - **mowing to occur at least every two weeks**. Fuel, lubricants, mowing and gardening equipment and tools for this purpose will be supplied by the Contractor.
10. The Contractor should keep and maintain the buildings and surrounds to the same standard as at the commencement of this Agreement SUBJECT HOWEVER to fair wear and tear and damage by fire flood and tempest being excluded.

This is to include minor maintenance, such as repairs to locks, catches, hinges, taps and tap washers, seats, light bulbs, sewer blockages (infrastructure or pipe failures to remain responsibility of Lockhart Shire Council), etc. The Contractor will accompany the Council's authorised officer for an inspection at the commencement of this agreement in order to determine the standard of maintenance that shall apply for the term of this agreement.

11. Being a pool complex and open to members of the public the Contractor will permit Council's duly authorised officer at any time and from time to time, entry to the pool complex for the purpose of inspecting the pools, buildings, fixtures and fittings, pump and chlorination machinery, engines and the toilet/dressing room facilities. **A formal inspection will take place each month** e.g. the last working day of each month. The Contractor will if so requested accompany the Council's authorised officer on such inspection and in the event of directions being issued for work to be done to satisfy industry standards and/or the terms of this Agreement then the Contractor will attend to the completion of such works as soon as practically possible. See Appendix 'B' for inventory list and monthly inspection form.
12. The Contractor will open the pool complex for the use of the public during such hours and upon such days as he/she considers necessary and appropriate **BUT** agrees to have the pool complex open for use by members of the public as follows:-
 - (i) Monday, Tuesday, Wednesday, Thursday and Friday of normal Public School days between the hours of 6.00am till 8.00am and 1.00pm till 7.00pm;
 - (ii) On Weekends and Public Holidays between the hours of 11.00am and 7.00pm;
 - (iii) Monday, Tuesday, Wednesday Thursday and Friday of Public School holidays between the hours of 6.00am till 8.00am and 11.00am till 7.00pm;
 - (iv) It is agreed the Contractor does not have to open the pool complex on Christmas Day or Boxing Day. **The contractor must open the Pool on all other Public Holidays.**The Contractor will have authority to open prior or close earlier or later depending upon public demand taking into account daylight saving and prevailing weather conditions.
13. In the event of the pool complex being required for group bookings then the group so requiring the pool complex will negotiate with the Contractor for the use thereof at such time and on such days as may be arranged and the terms of such group booking shall be decided upon by the Contractor.
14. The pool complex entry charges on a sessional basis will be determined and set by the Contractor. **The Contractor agrees to keep records showing daily attendances throughout the season and provide monthly attendance details to the Council at monthly inspections. The Contractor shall not prevent entry or remove any patrons without the consent of Council first being obtained.**
15. The Contractor will not underlet or part with possession of the pool complex without the consent of the Council first being obtained.

16. The Contractor will at his/her expense close down the pool complex, filtration plant and all associated equipment together with the kiosk and refrigeration plant at the termination of this agreement and specifically the Contractor will:-
- i) ensure that all equipment and stock supplied is clean and tidy;
 - ii) ensure that the pools surrounds and kiosk are clean and tidy;
 - iii) ensure that completed Daily Returns Book is returned to Council (Appendix C);
 - iv) ensure pool keys are returned to Council;
 - v) ensure telephone account is paid to Council, and
 - vi) ensure the standard of maintenance is satisfactory.
 - vii) Submit a written end of season report detailing any issues or maintenance requirements deemed necessary for attention prior to the future season.
17. The Council, on behalf of the Contractor, will arrange for a Workers Compensation Policy with unlimited Common Law Cover to be taken out for all persons employed by him/her in relation to the operation of the pool complex during the term hereof.
18. The Council will pay for all electricity and water used at the pool complex during the term hereof. Further the Council will pay for all chemicals used specifically for water treatment. The Council will have the right to check and monitor the usage of such electricity, water and chemicals with a view to the prevention of wastage thereof.
19. In the event of the Contractor becoming bankrupt or committing an act of bankruptcy or becoming mentally or physically unfit to perform this agreement or in the event of him/her failing to abide by the terms and conditions of this Agreement then in any such case it shall be lawful for the Council:-
- a) by notice in writing to the Contractor to declare that this Agreement as and from the date thereof be determined forthwith and
 - b) to enter into and upon the pool complex and reclaim same in its capacity as owner thereof.
20. The Contractor shall have exclusive rights to professional swim coaching at the pool complex, subject to the NSW Department of Sport and Recreation conducting their annual Swimsafe Program. The dates for this program are to be advised by the Department with hours typically from 9.00am to 1.00pm or as advised by the Department.
- All other organised training or classes will be by arrangement at the Contractor's discretion.
21. During the term hereof the Contractor will have the sole and exclusive right to conduct a Kiosk at the pool complex and retain trading profits therefrom. Further the Contractor will be responsible for any loss incurred in the operation of the Kiosk. It is agreed the Contractor will be entitled to use the equipment Council has provided in the Kiosk subject to the same being properly maintained and kept in good clean and operational order and condition by him/her. In the event of any repairs being necessary, except those required under this agreement, to Council's kiosk equipment then Council will arrange for the repair thereof at its own cost. The Contractor will obtain all necessary licences as are required by law to conduct the kiosk.

22. The Council will not be responsible for any loss of profits suffered by the Contractor in the operation of the pool complex by virtue of any breakdown of any pool or kiosk plant or equipment.
23. The Council will make available to the Contractor certain plant, equipment and appliances and such will always remain the property of the Council. The Contractor will provide all other tools to check, maintain, cleanse and service the pool complex, plant, engines and equipment and those items as detailed in the Inventory/Condition Report (Appendix 'B') attached.
24. The Contractor will lock all access gates and doors and maintenance sheds, engine room and kiosk at all times when the pool complex is closed to the public and/or when the Contractor's authorised substitute is not in attendance at the pool complex. Further he/she will at all times ensure that the engine/plant room is securely locked so as to prevent any unauthorised person entering such area.
25. The Contractor will collect up all rubbish, garbage and refuse within the pool complex area and dispose of legally.
26. Where a telephone is provided at the pool complex the Contractor will pay for all metered telephone charges provided however he/she will have the right to charge members of the public using the telephone for the cost of such calls. The Council will be responsible for the payment of telephone rental.
27. The Contractor shall supply and maintain a Class A first aid kit for use while the pool complex is open.
28. The Contractor states that he/she is/ is not registered for the Goods & services Tax. The Contractors ABN number is **XX XXX XXX XXX**
29. In consideration of the Contractor fulfilling the obligations of his/her part hereunder the Council will pay him/her a contract fee of \$ 18,000 exclusive of Goods and Services Tax as follows:

On signing the agreement	-	\$5,000
On 1 December, 2016	-	\$5,000
On 1 February, 2017	-	\$4,000

 and the final payment of \$4000 will be made when satisfactory shutdown is completed as referred to in Clause 16 hereof.
30. Council will deduct from each progress payment the amount of any debt owed to Council by the Contractor, which has been outstanding for more than 30 days. The balance of the progress payment (if any) will then be forwarded to the Contractor.
31. Council may extend this agreement for a further term if mutually agreed between Council and the Contractor.
32. The Contractor shall supply a report to Council at the end of each season – information to include numbers of patrons using the facility, water quality and a general report on condition of equipment.
33. The Contractor shall not use social media to offend or make comments that can be interpreted as slurs, demeaning, inflammatory to patrons, members of the community or Lockhart Shire Council.

IN WITNESS WHEREOF the parties hereto have hereunto set their hands the day and year first hereinbefore written.

SIGNED by the said

) **SIGNED** by Council

)

)

in the presence of:

) in the presence of:

SAMPLE

Appendix 'A'

1. THE PROCESS OF WATER TREATMENT IN A RECIRCULATING TYPE SWIMMING POOL

1.1 GENERAL

Treatment of water in a swimming pool is that process whereby the water is cleaned and disinfected so that the water in the pool is safe for bathing at all times.

So to treat the water it is necessary for it to pass through several mechanical and chemical processes.

1.2 SCUM GUTTERS

Take of all floating matter which includes a large amount of pollution. By reason of the fact that large amounts of polluted water flow down the scum gutters it is most important that they are kept clean.

1.3 SCREENS

Are located in the line between the scum gutter and the balance tank to collect all large floating or suspended matter such as grass, cloth, ice cream sticks, etc. Another screen is situated between the balance tank and the main circulating pump to prevent foreign matter getting into the pump.

All screens should be cleaned regularly. Depending on the pool loading it may be necessary to do this every hour, it is important that these screens be cleaned at least daily.

1.4 BALANCE TANK

It is situated adjacent to the pool and plant room and holds the water coming from the pool which is to be recirculated through the filters.

The balance tank is of sufficient size to hold enough water to carry out a filter backwash. When possible a minimum of water should be used for backwashing.

1.5 MAKE UP WATER

The pool make up water is discharged into the balance tank.

1.6 CIRCULATION

Of pool water is controlled by an electrically driven centrifugal pump. This pump picks up the water from the balance tank, passes it through the filters and back into the pool.

1.7 FILTERS Gravity (Rapid Sand Filters)

The filters are composed of several layers of sand of varying grades, ranging from a coarse gravel on the bottom to a fine sand on the top held within an impervious container, these filters have the surface of the water over the sand open to the atmosphere and the movement through the filter is due to gravity only.

The filters remove suspended matter from the water, suspended matter accumulating on top of the sand thus reduces the flow of water.

This accumulation is removed by a process known as "backwashing" whereby the flow of water is reversed, flowing upwards under pressure, through the sand. The top layer of accumulated suspended matter is then floated off to waste.

An "Air Scour" is also connected to the filters. This is a series of pipes arranged under the sand so that air under pressure, from a compressor, is forced up through the sand before the water flow is reversed. By use of this air the filter sand is loosened and results in a better and quicker backwash, thus requiring less water to carry out the operation. Sand filters may over a period become partially clogged with mud balls, which may vary from pea size to as large, or larger than tennis ball size. Formation of the mud balls is usually due to an ineffective flow on the filter bed.

A simple method of getting rid of these mud balls and at the same time cleaning the filter sand is:

- a. Backwash the filter,
- b. Lower the level of the water in the filter to just below the top of the sand,
- c. Add Calcium Hypochlorite to the top of the sand at the rate of 0.6kg per square metre of filter surface,
- d. Raise the water level to about 50mm above the surface of the sand,
- e. Allow to stand 4 to 6 hours,
- f. Completely drain the filter - refill and then backwash again,
- g. Refill filter and recommence circulation.

1.8 CHEMICAL FEEDERS

With a solution feeder as fitted at the pool pre-determined amount of dry chemical is mixed with water in a solution tank.

This solution is then directed to the circulation line via a variable flow impulse type pump which can be regulated to ensure that the correct strength of solution reaches the water.

The thing to be carefully watched with this type of feeder is that the chemical being used is completely dissolved and that the solution in the tank is regularly stirred.

Use of Chemical Feeders at the swimming pools is to dose alum for coagulation and soda ash for alkalinity control to the water being treated.

1.9 COAGULATION

This process depends upon the action of chemicals usually, bitter alum (Aluminium Sulphate Al_2SO_3) is used for the purpose of forming the floc on top of the filters in order to provide satisfactory filtration.

The floc forms when the filter alum, which is acidic, reacts with the alkali in the water forming a cloudy gelatinous precipitate which settles quickly on top of the filter sand.

To form a satisfactory floc the pH condition of the water should be within the limits 7.2 to 7.6.

The amount of alum required to form this floc is 0.5 to 0.8kg alum per square metre of filter surface.

The addition of this amount should be made over a period of 1-2 hours immediately after backwashing the filter.

At this pool it has been found to be advantageous to add the alum by slug dosing it to the balance tank. To do this the following procedure should be followed:-

- a. Mix 2/3 of the required amount of alum with water in a receptacle and pour it immediately after a backwash.
- b. About 1 - 1 ½ hours later add the remaining 1/3 the same way.

The main advantage of this method is that it forms the floc on the filter much faster than by the slow solution feeding method but it will not be effective if the pH is too low.

Coagulation must be correct as a floc which is too heavy will reduce the running time between backwashes and a floc which is too light will result in poor filtration.

1.10 ALKALINITY CONTROL

This section will only deal with the chemicals and equipment used, a break down of pH and Reserve Alkalinity is covered in Section 7.

When acids such as Alum and Chlorine are added to the water together with body acids the water has a tendency to become acidic and as such would produce unsatisfactory bathing conditions.

To neutralise this acidity an alkali, usually in the form of Soda Ash (Sodium Carbonate) is added at the following rates:-

For every 1kg of Alum – ½ kg of Soda Ash

For every 1kg of Chlorine - 1 ½ kg of Soda Ash.

A further addition should be made over and above these figures to counteract the body acids introduced by bathers. The amount of this addition varies and can only be determined by experience, or in other words, by trial and error.

If ever it is necessary to raise the reserve alkalinity quickly it is recommended that Soda Bicarbonate be added to the pool water. The quantities again are determined by experience.

You cannot create any major difficulty by adding too much Soda Bicarbonate as a saturated solution will only give a pH of 8.3 and this can be reduced to the desirable level by the addition of acids.

If the pH is permitted to become too high it may dissolve the floc on the filter and carry it through to the pool giving the water a cloudy effect.

For this reason DO NOT slug dose with Soda Ash.

1.11 CHLORINATION

MA Chlorinator using Chlorine Tablets (Stingy sticks), Trichlor Trichloroisocyanuric Acid with vacuum feed from single a MA48 Chlorinator cylinder.

Stabilisation of the water using cyanuric acid compound so as to maintain a cyanuric acid level of 25 to 30 ppm.

2. SWIMMING POOLS AND HEALTH

2.1 AGENTS OF CONTAMINATION

Faeces, Urine, Mucus, Skin oil and flakes - ear wax.

All these tend to float, therefore being more readily transferable from person to person.

2.2 FACTORS EFFECTING DISEASES

- Washing away of protective mucous membranes exposing unprotected areas of infection. (Virus will attack water logged and irritated mucous membrane.)
- Washing of organisms into ear and nasal passage,
- Excessive or insufficient use of chemicals and filtration,

- Presence of harmful organisms in the water.
- Swallowing of infected water.

2.3 MEASURES TO PREVENT CONTAMINATION

- Prohibition of persons with open sores or any infections.
- Prohibition of animals
- Education of public
- Training of operator in control of plant and first aid.

2.4 HEALTH SWIMMING CONDITIONS

Control the introduction of dirt, bacteria and body discharges into the pool water by:

- Personal cleanliness,
- Excluding surface drainage, sewerage pollution, windblown debris, e.g. sand, dirt leaves, etc.
- Supervision of swimmers and area,
- Removal or destruction of dirt and infected material which has entered a pool in spite of control measures above,
- Continuous disinfection of water,
- Recirculation and filtration at an adequate rate,
- Control of bathing load to allow water purity to be maintained.

3. CHLORINE - ITS STORAGE, HANDLING AND USE

3.1 PHYSICAL PROPERTIES

Weight:	2 ½ times heavier than air,
Colour:	Liquid chlorine is clear amber, Gaseous chlorine is a greenish yellow
Odour:	Chlorine has a penetrating and characteristic odour and attacks the respiratory tract.
Flammability:	Chlorine itself is non-flammable and non explosive
Boiling Point:	1 degree C
Freezing Point:	-101 degrees C

Volume and Weight Relationship:

1 Vol liquid chlorine = 456.8 vols of gaseous chlorine

1kg of liquid chlorine = 0.31m³ of gaseous chlorine

1kg of chlorine gas = 1kg A.C. (Available chlorine)

1.43kg calcium hypochlorite = 1 kg A.C.

2.86 kg bleaching powder (37%) = 1kg A.C.

8 litres 15% NaCl (Sodium Hypochlorite) = 1kg A.C.

1.11kg Trichlor Trichloroisocyanuric Acid (Stingy Sticks) 90% = 1kg A.C.

3.2 CHEMICAL PROPERTIES

The following are typical and interesting chemical reactions of chlorine:

3.2.1. WATER

Chlorine united with water at temperatures above 10 degrees C forms a hypochlorous acid.

3.2.2. ELEMENTS

Chlorine unites directly with most elements to form chlorides. The reaction is rapid if the chlorine is hot and moist, thus to avoid corrosion, chlorine is handled in a cool and dry state. The corrosive attack is due to the action of hypochlorous and hydrochloric acids formed by hydrolysis.

3.2.3 ALKALIES

Chlorine reacts with solutions of the alkali and alkaline earth metal hydroxides to form hypochlorite, well known oxidising agents. Sodium hypochlorite is formed from an aqueous solution of caustic soda and chlorine.

3.2.4 AMMONIA

Chlorine reacts vigorously with ammonia. An excess of ammonia produces ammonium chloride while an excess of chlorine forms a violently explosive compound, nitrogen trichloride.

3.3 STORAGE

Stabilised Chlorine (Stingy Sticks) should be stored upright. Storage space should be well ventilated, readily accessible and opening to the outside air preferably at normal room temperature. Chlorine containers must be stored away from direct sunlight, but in a dry location.

3.4 HANDLING

Protective mask and gloves should be worn when handling "Stingy Sticks"

3.5 RATE OF DELIVERY

At the initial opening of the 20kg containers of "Stingy Sticks" caution must be taken at all times to avoid inhalation of gaseous chlorine substances.

3.6 SAFETY PRECAUTIONS

3.6.1. Labels and Product Information

Always read and follow storage and handling directions printed on labels and production information sheets.

3.6.2. Protective Equipment

Since chlorine gas, even in low concentrations, has a harmful effect on the respiratory system, it is highly desirable that all personnel handling chlorine be provided with suitable safety equipment and be conversant with the use of this equipment. To this end a compressed air breathing mask and apparatus is provided at the pool. Periodic check should be carried out on this equipment by the operator to ensure that it is in safe working condition and that the air bottle contains an adequate supply of air. Past experience has shown that use of this equipment as a diving aid is a satisfactory means of checking the equipment and of ensuring a satisfactory level of operator competence with the apparatus.

3.7 DRY OR SOLUTION TYPE CHLORINE COMPOUNDS

TYPES

Bleaching powder consists of equal parts of slaked lime and calcium hypochlorite and is a very unstable product. It will yield 35-37% available chlorine when fresh.

Calcium Hypochlorite can be in a powder or tablet form and will yield 70% available chlorine.

Sodium Hypochlorite is a highly alkaline solution which is manufactured by passing chlorine gas into Caustic Soda until saturated. This is an unstable solution and will yield 15 ½ % available chlorine.

Chlorinated derivatives of Cyanuric Acid is a compound powder or tablet with 59-90% available chlorine.

This Cyanuric Acid has the great advantage of causing chlorine to be retained in water for long periods. Chlorine is less likely to be dissipated by sunlight thus allowing longer contact periods for disinfection.

4. REQUIREMENTS, SANITATION AND HYGIENE OF A SWIMMING POOL

4.1 CLEANING THE POOL

All solid floating matter in the pool is floated off into the scum gutters and removed by a series of screens and filters.

A lot of pollutants such as body oils adhere to the sides of these scum gutters, therefore the scum gutters should be cleaned daily. The end walls where there are no scum gutters should be cleaned, at least daily, especially at the water line.

Much other foreign matter which gains access to the pool will sink to the bottom. To remove this it is necessary to suction clean the bottom at regular intervals or as necessity demands.

It is important that the pool as a whole is kept clean and free of foreign matter. Large quantities of chlorine are used up on this foreign matter and therefore reducing its effectiveness as a disinfectant.

4.2 CLEANING THE POOL SURROUNDS

The kerb around the pool is raised above the level of the surrounding area to help prevent papers, leaves, etc blowing into the water.

The immediate surround of concourse is concreted with a fall to surface drains, this concourse should be hosed down at least once each day and no water should be permitted to pond.

4.3 DRESSING SHEDS

All floors, seats, closets, shower recesses, etc. should be hosed down daily and shall as a minimum requirement be hosed down and disinfected not less than three times weekly.

All closets at the swimming pool are connected to the sewer reticulation.

All closet pans should be scrubbed daily and kept clean.

4.4 HAND BASINS

Hand basins should be kept in a clean condition.

4.5 SHOWERS

Showers should be hosed out daily and sprayed with a chlorine based disinfectant. Shower roses and taps should be kept in working order at all times.

4.6 GARBAGE - STORAGE AND REMOVAL

The pool is provided with rubbish receptacles, these should be located where people may easily place any rubbish. These receptacles should be emptied as necessary, but at least once every day. The contents should then be stored within the pool grounds in a location accessible to Council's plant for removal by Council for destruction at the garbage depot.

No rubbish whatsoever or waste material that could be likely to afford harbourage for rats or mice or a breeding ground for flies should be permitted to remain on the premises.

5. MICROBIOLOGICAL ASPECTS

5.1 FILTRATION

The purpose of filtration is to clarify water, strain out dust, dirt and other finely suspended particles. In doing so, many micro-organisms are removed but filtration alone cannot be relied upon to remove all organisms and a very good filter plant will only remove up to 98-99%.

The removal of all organisms can only be ensured by an additional process of disinfection.

The suspended matter referred to can be divided into:

Inert Substance:	Dust
	Dirt
	Fibres
Living Micro-Organisms:	Virus
	Bacteria
	Fungi
	Algae

These living micro-organisms are mostly harmless, but some are pathogenic or disease producing and the number of organisms which would be an ineffective dose would vary according to the type of organism and its route of invasion. In other words the virulence of any organism is variable.

5.2 DISINFECTION

Disinfection is the process of killing Pathogenic Micro Organisms. A large number of chemicals have been used for the destruction of these harmful organisms. These include:

- Ozone
- Ultra Violet Rays
- Silver
- Bromine
- Iodine
- Chlorine

In the disinfection of swimming pool water it has been found that chlorine is the most economical and most adaptable and it can be added either as a gas, a powder or in tablet form.

Disinfection should not be confused with Sterilisation which is the killing of all micro-organisms.

5.3 BACTERIAL TESTS

5.3.1 TESTS FOR MICRO-ORGANISMS

Routinely the water of recirculating pools is searched for specific disease producing micro-organisms; such tests are difficult to perform and are carried out only in special circumstances.

The searches normally carried out are for the Total Colony and Coliform counts.

In re-circulation pools with continuous purification the total colony of plate count gives an accurate measure of the general bacterial contamination of the pool water from all sources.

Usually, the total colony rises proportionally in relation to the bathing load; very low counts are characteristic of pool employing free residual chlorination.

The total colony count should not exceed 200 colonies per ml. but occasionally pool waters develop organisms resistant to chlorine which give rise to total colony counts of several thousand per ml. These organisms are easily identified in the water laboratory and do not appear to be of any sanitary significance.

5.3.2 COLIFORM BACTERIA

Coliform organisms are derived from soil, decaying vegetation and the waste of man and other warm blooded animals. One type of coliform organism known as Escherichia coli or E Coli is found exclusively in the excreta of warm-blooded animals. It is a reliable indicator of faecal contamination in water.

5.3.3 RECOMMENDED BACTERIAL LIMITS

Seventy five percent of samples covering any period of time from any pool shall not have a total colony count exceeding 50 colonies per 100ml and the remainder should not exceed 200 colonies per ml.

The arithmetic mean coliform density of all standard samples examined per month shall not exceed 4 per 100ml in two consecutive samples.

If the coliform counts in a single sample exceed the above limit, confirmation samples are required and shall be examined daily until results from at least two consecutive samples show the water to be of satisfactory quality.

6. BIOLOGICAL ASPECTS OF CHLORINATION

6.1 THE REACTION OF CHLORINE WITH WATER

When chlorine is first added to ordinary water no visible trace of chlorine can be found for the brief period due to its destruction by certain chlorine absorbing substances. As the dose is continued, oxidation reactions with inorganic substances and organic compounds take place. In the case of inorganic substances (iron, manganese, ammonia, and hydrogen sulphide) the reaction is fast whereas the reaction with organic material (suspended and dissolved) is slower. The more impure the water, the more chlorine that is used up.

6.2 SUMMARY AND DIAGRAM OF ACTION OF CHLORINE

1. Destruction of chlorine by reducing compounds
2. Reaction with inorganic or organic compounds
3. Chloramines formed
4. Chloramines and other chloro-organic compounds destroyed
5. Free Chlorine (and remaining chloramines)

Chlorine will precipitate Iron and Manganese, it will bleach colour from organic material and is taken out by the filter as well as being lost to the matters previously mentioned.

6.3 BACTERIAL EFFECT OF CHLORINE

The effectiveness of chlorine in destroying micro-organisms is dependant on many variables:-

- The form of chlorine present
- pH
- Duration of contact
- Temperature
- Type of organism
- Chlorine demand of the water

For effective results, the plant operator should strive to maintain the free chlorine residual at not less than 0.4ppm while an effective upper limit appears to be 2.0-3.0ppm. It should be noted, however, that chlorine in a free residual up to 5ppm does not cause any complaints of irritation etc. by bathers.

6.4 BREAK POINT CHLORINATION

Ammonia compounds are introduced to pool water by bathers from urine contamination. When chlorine is added to water, it begins to react with these ammonia compounds and other organic matter and is gradually used up. Only the chlorine in combination with ammonia compounds is thus available for disinfection purposes and is spoken of as combined available chlorine.

The reaction of chlorine with ammonia forms chloramines and some of these chloramines cause bather discomfort, eye irritation, and so called chlorine odour sometimes evident around a pool.

When all chlorine in the water exists as chloramines it is known as margin chlorination and was in the past used as the main method of chlorination ammonium sulphate was added to the circulating water prior to filtration usually with the alum.

The speed of disinfection by these chloramine compounds is very low.

By the addition of sufficient chlorine all the chloramine can be destroyed in the water. However, when a pool is being used by bathers there will always be some chloramines in solution because of the continued introduction of impurities and the time necessary to destroy them.

By the continuous addition of chlorine at the close of the swimming session the chloramine content will be reduced progressively. When all chloramines have been destroyed the residual or free chlorine and the total chlorine will be the same. When this point is reached Breakpoint Chlorination has been achieved.

This is the best method of ensuring that water is free of disease producing organisms.

6.4.1 FREE CHLORINE

Free Chlorine will kill most bacteria in three minutes or less, whereas *combined chlorine* takes up to 90 minutes to kill the same bacteria.

6.4.2 WATER TEMPERATURE

Chlorine is liberated from water at higher temperatures. It has been found that 70 degrees F is the critical temperature over that temperature the chlorine dissipates quickly.

7. ALKALINITY (pH OR RESERVE ALKALINITY)

The essential point to be realised when speaking of alkalinity in pool water is the difference between total acidity and active acidity.

Total Acidity is measured by the usual titration method and furnishes the answer as to how much of the given acid there is in a given volume of the water; (this is Reserve Alkalinity), this however, is no guide to the intensity of the acidity.

For instance, equal quantities of hydrochloric acid and boric acid in solution show exactly the same acidity (or reserve alkalinity) by titration but there is a large difference in the acidic properties (or pH) of these solutions: this difference one may call the Intensity of acidity which for convenience is called the pH of the solution.

In the past, failure to appreciate the distinction between these two and attempts made to control alkalinity by testing for either pH or Reserve Alkalinity only, have resulted in failure to maintain pool water to the desired standards and in a wastage of chemicals.

Full investigations of these matters of acidity have shown that they are completely dependant on the Hydrogen Ions Concentration of the solution.

All liquids, of which water is a constituent, contain free, positive charged hydrogen ions and negatively charged hydroxyl ions.

When the number of these two ions present in the liquid are equal it is said to be neutral.

Additions of an acid to water increase the concentration of the hydrogen ions and decrease the concentration of hydroxyl ions.

The reverse effect is obtained by the addition of an alkali to water.

From the above it may be seen that pH is the measure of Hydrogen ions in water. In determining pH values, advantage is taken of the fact that certain dyes, known as indicators, change their colour in definite and reproducible manner and degree, according to the pH value of the solution with which they are mixed and are read on scale numbered from 1 to 14.

Thus simply, a solution having a pH value of 7 is neutral (neither acid nor alkaline) and as this value decreases below 7 the active acidity increases, above 7 the alkalinity increases.

It must be remembered that the numbers used for this measurement is a logarithmic scale, so that pH 5 represents 10 times more acidity than pH6, and pH4 100 times more than pH6.

Bringing all this information into use at a swimming pool we find that when chlorine and alum are added to the water the alkalinity will drop as both chemicals are acid. Bather pollution will also have the same effect.

To prevent the water becoming acidic by the continued addition of acids a reserve of alkalinity must be maintained at all times. This is usually achieved by regularly adding soda ash (sodium carbonate) to the water to counteract the acid.

For pleasant bathing conditions and effective chlorination pH of the water should be maintained between 7.5 and 7.6.

For the best results from the amount of chlorine used the pH should be kept at the lower end of the scale provided it does not cause any bather discomfort.

With a pH 7, 72.5% of the chlorine is effective, whereas with a pH 8 only 21.5% of the chlorine is effective. Therefore at pH 8 78.5% of the chlorine added for the purpose of disinfection is wasted.

From these points it can be seen that pH control is a very important factor in the efficient administrative and economic control of a swimming pool and that the pH should be held at or about 7.5.

So much for pH (intensity or acidity), now let us consider Reserve Alkalinity (total acidity).

Reserve Alkalinity is expressed chemically as the equivalent amount of calcium carbonate in the water and is calculated in ppm by titration.

Experience has shown that the ideal level is 200-500ppm but 160ppm is adequate in most pools, a reading below this is completely inadequate.

If a reading greater than 100ppm cannot be maintained a sudden increase in the chlorine dosage rate could cause the pH to drop to an undesirable level.

In the event of heavy withdrawals having to be made from the account in an emergency (e.g. Chlorine dose increase for extra load) and a corresponding deposit cannot be made for a while then the second account or the reserve alkalinity, is then called upon to make up the deficiency. This second account is a reserve fund that can be called upon when required to fill the breach until the necessary deposit can be made.

From this illustration it should be seen that both pH and reserve alkalinity are both very essential to the essential operation of pool treatment, that they are supplementary to each other for proper balance of alkalinity.

8. TESTING PROCEDURES

In order that optimum conditions can be maintained and dosage rates altered with changing conditions it is necessary to take regular checks of the water for:

1. Free residual chlorine
2. Total residual chlorine
3. pH
4. Reserve Alkalinity
5. Cyanuric Acid Level

The number of times tests 1, 2 and 3 should be made daily will depend on the attendance at the pool and the experience of the operator, but this should not be less than 4 times daily.

One as soon as the operator starts in the morning, two during the day between 10 am and 4pm and the last one before the operator leaves the pool at night. In conditions of heavy bather loads more frequent tests should be made, every hour if necessary, to maintain safe conditions.

Test 4 should be carried out not less than once every 7 days.

Samples taken for testing purposes should be always taken from that part of the pool where the lowest reading is likely to be found.

All samples for any testing should be taken in a clean glass flask by plunging its neck first into the pool to a depth of about 300-400mm before withdrawing in an upward arc, thus collecting the samples from about 300mm below the surface. The sample should then be protected from any sunlight and the tests carried out immediately.

8.1 EQUIPMENT

At this pool the apparatus used for the measurements of free chlorine, total chlorine and pH is the Lovibond Comparator.

The basis of each test with the Lovibond Comparator is that the colour developed by the addition of an indicator solution to a specially prepared procedure adopted in preparing the sample for colour comparisons varies for each type of test.

Precautions to be observed when carrying out tests:

- a. All reagents or chemicals should be stored so as to prevent deterioration or contamination.
- b. Test should be carried out on distilled or non-chlorinated water each week and any reading obtained subtracted from the result of the pool water tests each day.
- c. Carry out tests in a manner and location so as to preclude any risk of contamination.
- d. Do not expose the water sample to direct sunlight.
- e. Test as soon as possible after taking the sample.

9. ALGAE

9.1 Algae are simple forms of plant life which are harmless to man but sometimes are dangerous to animals.

Algae are normal inhabitants of water although some types can be found in soil or on wet surfaces exposed to air. Most algae are microscopic in size but some, by multiplication and aggregation, produce visible growths.

Colour of algae is usually green but they may be red, black or blue.

TYPES OF ALGAE

There are two major types of algae:

- a. *Attached* algae is the type mostly found in swimming pools where it grows on the walls or the floor.
- b. *Floating* algae is invisible to the naked eye. With a swimming pool that is being continually recirculated the type of algae does not have sufficient time to bond together in sufficient numbers to be seen. This type of algae is often seen on open storage dams in the form of a floating greenish mat.

Algae can be introduced into a swimming pool by numerous ways, some of which are:-

1. Make up water
2. Wind
3. Birds

When algae has been allowed to grow in a pool it makes the sides and bottoms slippery where it is growing, it overloads the treatment plant, it can cause unpleasant odours and also imparts an unpleasant and uninviting appearance to the pool.

9.2 CONTROL OF ALGAE

The aim of algae treatment is to take measures to prevent undue proliferation rather than to eradicate existing growths. If algae are allowed to develop more or less unrestricted drastic action may become necessary. Always remember that an ounce of prevention is worth a pound of cure.

Where algae has been allowed to gain a foothold it may become necessary to drain the pool so that the sides can be scraped down and the algae destroyed by spraying with a 5% solution of copper sulphate or a 10ppm chlorine solution. To keep any algae in check it is suggested that the water in the pool should be given a shock dose of about 10ppm of chlorine once every month.

Copper sulphate can also be used to control algae. Where only isolated areas of algae are noted a bag attached to a rope and containing copper sulphate can be dripped into the pool onto the algae and allowed to stand for several hours.

Copper sulphate has the following disadvantages:

1. Could result in bathers' hair turning a shade of green.
2. Cannot be economically removed from the water.
3. A concentration of 5 ppm will impart a metallic taste to the water.

Generally it has been found that chlorine in concentrations of 10ppm is the best method of controlling algae.

If a pool has become infested with algae the following procedure is recommended:-

- a. When all bathing has finished for the day close down the circulating plant.
- b. Mix sufficient chlorine yielding compound with water in a drum or container to allow the solids to settle to the bottom, decant the clear liquid and add it to the pool water.

The amount of chlorine yielding compound needed would depend upon its available chlorine content. To have the required effect on the algae it will be necessary to dose the water between 5 and 10ppm of free chlorine.

As a guide, a pool with a capacity of 750kl would require 10kg of 70% available chlorine and a pool of capacity 300kl would require 4kg of 70% available chlorine compound to give 5ppm of free chlorine.

- c. Dose the decanted liquid as close as possible to the algae growths. In this regard it is suggested that a hose be used to syphon off the liquid. The outlet end of the hose could be fixed to a rod or pole so that it may be maneuvered under water to where algae is growing.
- d. After allowing about 1 hour of undisturbed contact between the super-chlorinated water and the algae, restart the circulation plant.
- e. Adjust the chlorinator to feed chlorine into the pool at the highest practical rate. This will ensure that a high chlorine content will be maintained for a long period.
- f. Adjust the alkalinity feed rate to counter the extra chlorine dosage.
- g. Allow the plant to run in this manner overnight.
- h. Next morning: Close down the chlorinator until the free chlorine in the pool is reduced to about 2ppm, then restart the chlorinator and run it to maintain a free chlorine reading of not less than 0.4ppm.

The pool should be kept clear of bathers until the free chlorine is in the vicinity of 2ppm.

Brush down the algae growths on the walls with a stiff brush, then suction clean the pool.

NOTE:

Algae will not grow where there is a free chlorine content in the water.

Depending on the severity of the algae growths it may be necessary to carry out this procedure more than once to clear the pool. Also the density of growth will govern the amount of chlorine necessary to kill it, but you cannot over chlorinate water when it comes to algae control.

SAMPLE

END OF SEASON SHUT DOWN OF THE ROCK SWIMMING POOL COMPLEX CHECKLIST:

- All equipment and stock supplied are clean and tidy
- The baths surrounds and kiosk are clean and tidy
- The Pool Record Books are returned to Council
- The bath keys are returned to Council
- The final season telephone account is paid and/or deducted from final Contractor payment
- The standard of maintenance is satisfactory

Signed

Dated

Name

SAMPLE

Appendix 'B'

INVENTORY – THE ROCK SWIMMING POOL – SEASON 2016/2017

ITEM	QTY	DESCRIPTION	Start	Jan	Feb	End
1		Air –viva Resuscitation				
2		Sulo 240 litre garbage receptacles				
3		Metal garbage bins				
4		Bench type seats				
5		Pool vacuum cleaner				
6		Battery operated wall clock				
7		Fire extinguisher 4.5kg dry chemical				
8		Fire resistant security safe of 0.25cu.m capacity				
9		Water testing kit				
10		Extension handle complete with leaf scoop				
11		Public address system, complete with microphone and external speakers				
12		Floor mounted steel cabinet				
13		Pool rake				
14		Wall mounted automatic, single phase hot water unit				
15		Picnic Tables				
16		Basketball Hoop/backboard				
17		Playground equipment				
18		Bike rack				
19		Gas BBQ with gas bottle				
20		Fridge				