TITLE PAGE

INTEGRATED SOLAR AND HYDRAULIC JUMP ENHANCED WASTE STABILIZATION POND

BY

OGAREKPE, NKPA MBA
PG/Ph.D./11/59444

A PROJECT REPORT SUMMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY (Ph.D) IN CIVIL ENGINEERING, UNIVERSITY OF NIGERIA, NSUKKA

SUPERVISOR: ENGR. PROF. J.C. AGUNWAMBA

MAY, 2015

CERTIFICATION

Ogarekpe, NkpaMba, a postgraduate student in the Department of Civil Engineering with Reg. No. PG/Ph.D./11/59444 has satisfactorily completed the requirements for the research work for the degree of Ph.D. in Civil Engineering. The work embodied in this thesis is original and has not been submitted in full for any other diploma or degree of this or any other university.

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APPROVAL PAGE

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MAY, 2015

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DEDICATION

This work is dedicated to the Almighty God and my parents for their love and encouragement.

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To the immortal, the only God, I humble myself in endless gratitude, for the wisdom and enablement to see this work through to the end.I am greatly indebted to my supervisor and mentor,Engr. Prof. J.C. Agunwamba whose invaluable fatherly guidance, comments, patience, efficient supervision, direction and encouragement saw to the completion of the project.

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My appreciation goes to all the members of the Ogarekpeôs family for their love, encouragement and support. To my dearest and ever loving father and mum, you have always been my greatest source of strength and love. You have always taught me that ñthere is a room at the top for every earnest endeavours cryò. May God richly bless you and keep you to reap the reward of your sacrifice.

I am grateful to Mr. JohnmarkOcheje of the Department of Geography who helped me in the digitization of the maps of Nsukka urban and Enugu State.

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Finally, I return all the thanks to God Almighty. I am NOTHING without Him.

ABSTRACT

This study on the integrated solar and hydraulic jump enhanced waste stabilization pond (ISHJEWSP) is aimed at determining the effect of variations in solar radiation, hydraulic jump, hydro-kinematic factors and pond geometry, on the treatment efficiency of wastewater in the ISHJEWSP. An equation to account for these effects was derived, calibrated and verified. An empirical regression model for the prediction of the Biochemical Oxygen Demand (BOD_5) in the ISHJEWSP for sewage treatment was also developed. Three sets of experimental ponds with varying locations of slopes were constructed using metallic tanks with each set consisting of eight numbers of ponds with varying width. Also, solar reflectors were constructed to increase the incident sunlight intensity. Wastewater samples collected from the inlet and outlet for varying inlet velocities of the ISHJEWSPs were examined for physicochemical and biological characteristics for a period of nine months. The parameters examined were temperature, pH, detention time, dissolved oxygen, total coliform count, total suspended solids, E-coli, algae concentration, BOD_5 and tracers studies. The efficiencies of the ISHJEWSPs with respect to these parameters fluctuated with variations in solar radiation, width, inlet velocity and location of point of initiation of hydraulic jump with the smallest ISHJEWSP in width giving the highest treatment efficiency at higher intensities of solar radiation. It was generally observed that the treatment efficiencies of the ISHJEWSPs increased as the location of the point of initiation of the hydraulic jump decreased relative to the inlet and with increase in inlet velocity for all sets studied though with precedence to solar radiation and temperature. A comparison of the conventional WSP and the ISHJEWSP showed that the bacteria removal was significantly higher in the ISHJEWSP than the conventional pond at a significance level of 5%. The verification of the conventional model gave a good average coefficient of correlation of R = 0.800 (0.713 to 0.891) between the measured and calculated N_e/N_o with an average standard error of 0.173 (0.157 to 0.224) and average R = 0.924(0.858 to 0.965) and average standard error of 0.034 (0.010 to 0.060) for the ISHJEWSP, respectively. An empirical model was developed to predict the BOD_5 in the ISHJEWSP based on the independent variables of pH, temperature, algae concentration, dissolved oxygen, inlet velocity, location of point of initiation of hydraulic jump, angle of inclination causing hydraulic jump and intensity of solar radiation. The empirical regression model developed gave a good multiple regression coefficient of correlation of 0.938 with a standard error of 5.224 at a significance level of 10%.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

An integrated solar and hydraulic jump enhanced waste stabilization pond (ISHJEWSP) is introduced as a new technology that incorporates solar reflector and the introduction of hydraulic jump through change in pond bed slope of the conventional waste stabilization pond. The essence is for the purpose of increasing the treatment efficiency of waste stabilization ponds and thereby reducing the large land area requirement of waste stabilization ponds.

One of the basic objectives of science and engineering has been to utilize all the available natural resources, in order to improve man's standard of living. However, anthropogenic activities have continually resulted in the contaminations of these resources and the environment. Contaminated water causes an estimated 6 to 60 billion cases of gastrointestinal illness annually. The majority of these cases occur in rural areas of developing nations where the water supply remains polluted and adequate sanitation is unavailable (Caslake et al., 2004). Therefore, treated wastewater of domestic origin is now being considered and used in many countries throughout the world as an additional renewable and reliable source of water which can be used for various purposes (Anglelakis et al., 2003; Oron, 2003). Treated wastewater reuse makes a contribution to water conservation and expansion of irrigated agriculture, taking on an economic dimension. It also solves disposal problems aimed at protecting the environment and public health and prevent surface water pollution (Papadopoulos and Savvides, 2003). The benefits and the potential health and environmental risks resulting from wastewater reuse and the management measures aimed at using wastewater within acceptable levels of risk to public health and the environment are well documented (Asano and Levine, 1996; Marcos do Monte et al., 1996). Therefore, wastewater reuse requires effective treatment and measure to protect public health and the environment at a feasible cost (Sipala et al., 2003; Anderson et al., 2001).

Waste stabilization ponds (WSP) are very effective in the removal of faecal coliform bacteria (Kayombo et al., 2005). It consists of a large, shallow earthen basin in which wastewater is retained long enough for natural purification processes to provide the necessary degree of treatment. Its efficiency depends on the availability of sunlight and high ambient temperature which are the prevailing climate conditions in most African communities (Agunwamba, 2001a).

Solar radiation is becoming increasingly appreciated because of its influence on living matter and the feasibility of its application for useful purposes. It is a perpetual source of energy, along with other forms of renewable energy, has great potential for wide variety of application because it is abundant and accessible (Acra et al., 1990; Medugu et al., 2010). The bacteria inactivity rate in a contaminated water sample is proportional to the intensity of sunlight and atmospheric temperature and inversely proportional to the water depth (Acher et al., 1997).

A Hydraulic jump occurs when liquid at high velocity discharges into a zone of lower velocity, a rather abrupt rise (a step or standing wave) occurs in the liquid surface. The occurrence of hydraulic jump results in the increase in dissolved oxygen thus increased rate of microbial activities in the pond thereby increasing the pond performance.

1.2 RESEARCH PROBLEM

The conventional waste stabilization pond does not give a satisfactory efficiency of treatment. Large land area is usually required in order to obtain a high degree of treatment efficiency. Also, the problem of land availability is not left out. It is therefore necessary to conduct a research to determine a means of increasing the efficiency of treatment without increasing the land area requirement.

1.3 SIGNIFICANCE OF RESEARCH

There is presently widespread interest with regards to the handling and treatment of wastewater because of the effects of environmental pollution and health hazard on receiving streams and other needs in certain areas. The study of the ISHJEWSP is expected to mitigate if not eradicate some environmental hazards related to wastewater like odour and pollution. If this is achieved, it will widen the applicability and popularity of the waste stabilization pond.

1.4 OBJECTIVES OF THE STUDY

The main objective of this study is to use the ISHJEWSP to increase the efficiency of treatment of the waste stabilization pond without increasing the surface area requirement.

Hence, the specific objectives of this study are summarized thus:

i To determine the effect of increase in solar radiation on treatment efficiency of wastewater in the integrated solar and hydraulic jump enhanced waste stabilization pond (ISHJEWSP).

ii To investigate the effect of change in width on the ISHJEWSP.

iii To investigate the effect of change in the inlet velocity (inlet discharge) on the efficiency of the ISHJEWSP.

iv To investigate the effect of change in location of the point of initiation of hydraulic jump on the efficiency of the ISHJEWSP.

v To derive, calibrate and verify a new model for the prediction of the performance of the ISHJEWSP and compare with existing conventional model and

vi To develop a regression model for the prediction of biochemical oxygen demand in the ISHJEWSPs for sewage treatment.

1.5 RESEARCH SCOPE

The research is centered on the improvement of the efficiency of the integrated solar and hydraulic jump enhanced waste stabilization pond with reference to the University of Nigeria, Nsukka treatment plant.

1.6 RESEARCH LIMITATIONS

The integrated solar and hydraulic jump enhanced waste stabilization pond is fairly a new area in wastewater treatment and therefore, affected the number of citations of empirical literatures. Also, the research is highly capital intensive.

CHAPTER TWO

LITERATURE REVIEW

2.1 OVERVIEW OF WASTE STABILIZATION POND

Waste stabilization ponds (WSPs) are popular wastewater treatment system used for the removal of organics and pathogenic organisms. High efficiencies of WSP have been reported with respect to removal of intestinal nematode (Lakshminarayama and Abdulappa, 1972; Feachem et al., 1983; Saqqar and Pescode, 1992); organic compounds and faecal bacteria (Mara, 1976). In addition, it is also economical (Arthur, 1983). It is simple to construct, operate and maintain and it does not require any input of external energy.

The screened raw sewage is treated in the waste stabilization pond by natural processes based on the activities of both algae and bacteria. Although some oxygen is provided by diffusion from the air, the bulk of the oxygen in the ponds is provided by photosynthesis (Howard et al., 1989). In addition to being useful in the treatment of sewage, waste stabilization pond is being applied in the treatment of industrial and agricultural wastes. Its long detention time; its relatively slow-rates of sludge accumulation; and its physicochemical conditions such as neutrality to alkaline pH, make it attractive in treating industrial wastewaters. Besides, in maturation ponds, aerobic conditions promote precipitation of heavy metals. Ponds have been successfully used to treat industrial wastes high in copper and group II metals, waste from palm oil and natural rubber industries and polishing waste water from activated sludge plants and trickling filter (Agunwamba, 2001a).

The usefulness of the waste stabilization pond in wastewater treatment is not in doubt. However, WSPs are limited in application by their large area requirement (Mara et al., 1983). The challenge is not only land cost but land availability. Researches have been carried out on the use of hydraulic jump for wastewater treatment (Agunwamba and Ogarekpe, 2010; Agunwamba et al., 2013a). The use of solar radiation for the treatment of chemically and biologically contaminated water is not a new phenomenon (Bunce, 1991; Conry et al., 1996; Davies-Colley et al., 1994; Malik et al., 1982; Safapour et al., 1999; Sinton et al., 2002). Solar radiation removes a wide range of organic chemicals and pathogenic organisms by direct exposure, is relatively inexpensive, and avoids generation of harmful by-products of chemically driven technologies (Bunce, 1991).

Waste stabilization ponds are classified according to the nature of the biological activities taking place. Other criteria for classification include the types of influent (untreated, screened, or activated sludge influent), pond overflow condition, and method of oxygenation. In terms of biological activities; ponds are classified as anaerobic, facultative and maturation ponds.

2.2 WASTE STABILIZATION POND PROCESSES

The processes that take place in WSPs depend on the efficient utilization of sunlight energy through large scale culture and algae in the satisfaction of the oxygen demand of organic waste. Sunlight energy is absorbed by pond algae which through photosynthesis release molecular oxygen into the pond. This oxygen is used by aerobic sewage bacteria in decomposing the organic matter from waste newly introduced into the pond and from aerobic sludge accumulated in the pond as a result of previous bacterial activities. During bacterial oxidation of the organic matter, its basic molecular components such as carbon dioxide, ammonia and phosphates are released into the liquid and become available for algal growth. The cycle continues so long as sunlight and nutrient are supplied. Thus, large energy is used to produce oxygen and to effect waste treatment, excess oxygen is liberated into the atmosphere and excess algae are produced in the process. It is then obvious that more oxygen will be produced in shallow lagoon than in a deeper lagoon of the same volume. As the waste enters the lagoon, the heavier solids settle and form a sludge layer where they undergo anaerobic digestion. The soluble waste is firstly oxidized aerobically by lagoon bacteria according to the following:

$$\textbf{Waste} + \textbf{O}^{-2} + \textbf{Bacteria} = \textbf{Waste} + \textbf{New bacteria}$$

Sewage treatment in stabilization pond depends on aerobic decomposition of organic matter than the bacterial decomposition of this organic matter which release oxygen during the day light. Oxygen also dissolves from the atmosphere at the lagoon surface. Hence, a large ratio of surface area to volume is desirable. Aeration, however, may be used to increase oxygen supply which decreases substantially at night and in cold weather when algae depend solely on oxygen. Dissolution of oxygen in the pond also depends on mixing of contents. The oxygen concentration is uniformly dispersed throughout the pond depth during mixing, but during stratification, oxygen is only found in the upper 0.5cm of the pond, the major part of the remaining is anaerobic. The situation now arises where, during summer, if the wind velocities are insufficient to break the stratification, algae concentration is low. Hence, the rate oxygen is produced is low and is not dispersed throughout the pond. At the same time, BOD feed-back from the sludge is high and the rate of oxygen depletion is high, if the dissolved oxygen capacity is insufficient to meet the increased oxygen demand. The pond forms anaerobic and where the pond does not form anaerobic, sludge rising to the surface may result to odour problems.

2.3 TYPES OF WASTE STABILIZATION PONDS

WSP systems comprise a single string of anaerobic, facultative and maturation ponds in series, or several such series in parallel. In essence, anaerobic and facultative ponds are designed for removal of biochemical oxygen demand (BOD), and maturation ponds for pathogen removal, although some BOD removal also occurs in maturation ponds and some pathogen removal in anaerobic and facultative ponds. In most cases, only anaerobic and facultative ponds will be needed for BOD when the effluent is to be used for restricted crop irrigation and fish pond, fertilization as well as when weak sewage is to be treated prior to its discharge to surface waters. Maturation ponds are only required when the effluent is to be used for unrestricted irrigation, thereby having to comply with the WHO guideline of > 1000 faecal coliform bacteria/100ml (Kayombo et al., 2005). The WSP does not require mechanical mixing, needing only sunlight to supply most of its oxygenation. Its performance may be measured in terms of its removal of BOD and faecal coliform bacteria (Kayombo et al., 2005).

Figure 2.1: A Typical Waste Stabilization Pond at the University of Nigeria, Nsukka

Source : Authorôs Field Work (2014)

2.3.1 Anaerobic ponds

Anaerobic ponds are commonly 2 ï 5m deep and receive wastewater with high organic loads (i.e. usually greater than 100g BOD/m^3.day, equivalent to more than 3000kg/ha.day for a depth of 3m). They are devoid of dissolved oxygen and contain little or no algae (Agunwamba, 2001a). In anaerobic ponds, BOD removal is achieved by sedimentation of solids, and subsequent anaerobic digestion in the resulting sludge. The process of anaerobic digestion is more intense at temperature above 15^{o}C. The anaerobic bacteria are sensitive to pH < 6.2. Thus, acidic water must be neutralized prior to its treatment in anaerobic ponds. A properly designed anaerobic pond will achieve about 60% removal (Agunwamba, 2001a).

2.3.2 Facultative Ponds

A facultative pond is designed principally for BOD removal of 60 ï 80% (Agunwamba, 2001a). Facultative ponds are of two types: Primary facultative ponds that receive raw wastewater, and secondary facultative ponds that receive particle-free wastewater (usually from anaerobic ponds, septic tanks, primary facultative ponds, and shallow sewerage systems). The process of oxidation of organic matter by aerobic bacteria is usually dominant in primary facultative ponds or secondary facultative ponds.

The processes in anaerobic and secondary facultative ponds occur simultaneously in primary facultative ponds, as shown in Figure 2.1. It is estimated that about 30% of the influent BOD leaves the primary facultative pond in the form of methane (Marais, 1970). A high portion of the BOD that does not leave the pond as methane ends up in algae. This process requires more time, more land area, and possibly 2-3 weeks water retention time, rather than 2-3 days in the anaerobic pond. In the secondary facultative pond and the upper layers of primary facultative ponds, sewage BOD is converted into ñAlgal BOD,ò and has implications for effluent quality requirements. About 70-90%

of the BOD of the final effluent from a series of well-designed WSPs is related to the algae they contain.

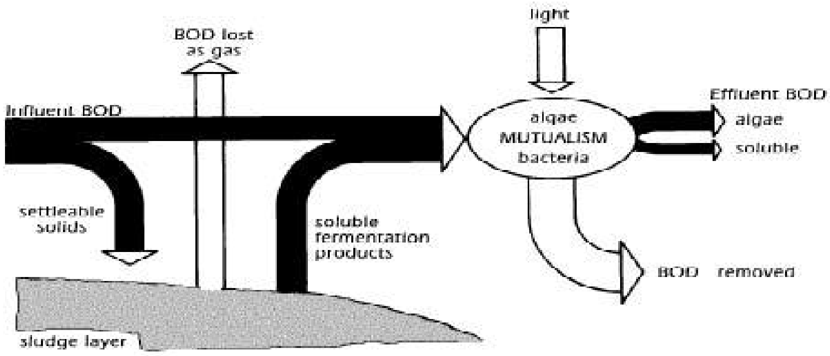

Figure 2.2: Pathways of BOD Removal in Primary Facultative Ponds
Source : Marais (1970)

In secondary facultative ponds that receive particle-free sewage (anaerobic effluent), the remaining non-settleable BOD is oxidized by heterotrophic bacteria (*Pseudomonas, Flavobacterium, Archromobacter and Alcaligenes spp.*). The oxygen required for oxidation of BOD is obtained from photosynthetic activity of the micro-algae that grow naturally and profusely in facultative ponds.

Facultative ponds are designed for BOD removal on the basis of a relatively low surface loading (100-400 kg BOD/ha.day), in order to allow for the development of a healthy algal population, because the oxygen for BOD removal by the pond bacteria is generated primarily via algal photosynthesis. The facultative pond relies on naturally-growing algae. The facultative ponds are usually dark-green in colour because of the algae they contain. Motile algae (*Chlamydomonas* and *Euglena*) tend to predominate the turbid water in facultative ponds, compared to non-motile algae (*Chlorella*).

The algae concentration in the pond depends on nutrient loading, temperature and sunlight, but is usually in the range of 500-2000µg chlorophyll *a* per litre (Mara, 1987). Because of the photosynthetic activities of pond algae, there is a diurnal variation in dissolved oxygen concentration. The dissolved oxygen concentration in the water gradually rises after sunrise, in response to photosynthetic activity, to a maximum level in the mid-afternoon, after which it falls to a minimum during the night, when photosynthesis ceases and respiratory activities consume oxygen.

At peak algal activity, carbonate and bicarbonate ions react to provide more carbon dioxide for the algae, leaving an excess of hydroxyl ions. As a result, the pH of water can rise to above 9, which can kill faecal coliform (Mara and Pearson, 1998; Kayombo et al., 2005). Good water mixing, which is usually facilitated by wind within the upper water layer, ensures a uniform distribution of BOD, dissolved oxygen, bacteria and algae, thereby leading to a better degree of waste stabilization.

2.3.3 Maturation Pond

The maturation pond usually follows the facultative pond in series (Agunwamba, 2001a). Maturation ponds (low-cost polishing ponds, which succeed the primary or secondary facultative pond) are primarily designed for tertiary treatment, i.e., the removal of pathogens, nutrients and possibly algae. They are very shallow usually around 1m depth, although Mara believes that at this reduced depth emergent plant growth and mosquito breeding problems can result) to allow light penetration to the bottom and aerobic conditions throughout the whole depth. The ponds follow a secondary treatment, a facultative pond. The size and number of maturation ponds needed in series is determined by the required retention time to achieve a specified effluent pathogen concentration. In the absence of effluent limits for pathogens, maturation ponds act as a buffer for facultative pond failure and are useful for nutrient removal (Mara and Pearson, 1998).

Another technology that may replace maturation ponds to improve WSP system performance is the use of constructed wetlands. Wetlands are areas which support the growth of a variety of plant species adapted to flooded conditions for part of, or the year. The plants are densely spaced and, together with the shallow water, provide habitats for animal, bird and insect communities. Constructed wetland systems are designed to simulate and optimize filtering and biodegradation processes that occur in natural wetlands. They are a possible solution to improve the performance of pond systems, as they can "polish" wastewater effluent before its discharge to a waterway.

During summer months, such a system may even result in zero discharge to waterways, due to evaporation and evapotranspiration of the water component from the wetland.

2.3.4 High Rate Agal Pond

The high rate algal pond is designed to maximize algal growth and so achieve high protein yields. It has high area to volume ratio, shallow depth of 0.2 - 0.6m and 2 - 4m wide. Mixing more than once daily to re-suspend any settled solids and removal of algae from tile final effluent are required. It is not actually a treatment pond. Besides, it requires skilled personnel operation and maintenance (Agunwamba, 2001a).

2.3.5 Microphyte Pond

Microphyte ponds are ponds containing floating plants (for instance, water hyacinth) or noted aquatic plants (e.g., phyramities). A microphyte pond is designed such that these aquatic plants form canopy on the ponds surface, and consequently reduce light penetration needed for the growth of algae. These ponds are used for removal of algae, and nutrients such as nitrate, ammonia and orthophosphate from waste waters (Agunwamba, 2001a). They are however associated with very high failure rate, low pathogen die off and high rate of sludge accumulation (Agunwamba, 2001a).

2.3.6 Other Types

In many countries of South-East Asia, certain types of primary facultative ponds called night soil ponds are used to treat batch loads of night soil (faeces and urine) (Mara and Pearson, 1986). Fish pond is another type of pond, which is designed to provide adequate nutrients for fish farming without encouraging eutrophication (Agunwamba, 2001a).

2.4 POND PARAMETERS DETERMINATION

2.4.1 Tracer Studies

A tracer may be a chemical or microbe that travels with the flow essentially mimicking the movement of the contaminants. A tracer study involves adding a slug (or a pulse) of a tracer at the inlet and then measuring its concentration at the outlet over a period of time (Shilton and Harrison, 2003). Agunwamba (2002) presented an optimal design of dispersion experiment. Dispersion number is usually determined experimentally by tracer studies (Polprasert et al., 1983; Marecos do Monte and Mara, 1987).

The slug dose method was used whereby the tracer was introduced at the influent flow of the pond. The constant distance variable time method was used in sample collection at the effluent. Analytical sodium chloride (Nacl) was used as tracer for all the experiments in accordance with the procedures proposed by Levenspiel and Smith (1957). These procedures have been used by Thirumurthi (1974). Samples containing tracer were collected at the pond outlet at regular intervals until such a time the concentration at the outlet reduced to an insignificant level. The experiment was repeated for several times with sodium chloride injected at the inlet as tracer. The concentration of the sodium chloride was determined by titration in accordance with the techniques specified in the standard methods for the examination of water and wastewater (APHA, 1998).

The data generated by the tracer studies were evaluated analytically. The relationship between dispersion and variance was derived analytically by the statistical moment method based on the approach of Levenspiel and Smith (1957) which is described in Equation (2.1):

$$\square = \frac{\square}{\square}[\sqrt{8\square^{\square} + 1} - 1] \qquad (2.1)$$

Where σ^2 = normalized variance given by:

$$\sigma^2 = \frac{1}{\overline{\theta}^2}\left[\frac{\sum_{i=1}^{n} ci\, t_i^2}{\sum_{i=1}^{n} ci} - \overline{\theta}^2\right] \qquad (2.2)$$

t_i = time after injection of tracer (seconds); C is tracer response concentration at the exit of the pond (mg/l); n is number of samples; and $\overline{\theta}$ the average flow time (Marecos do Monte and Mara, 1987) given by:

$$\overline{\theta} = \left(\begin{array}{c} \frac{\sum_{i}^{n} C_i \, t_i}{\sum_{i}^{n} C_i} \\ i = 1 \end{array} \right) \tag{2.3}$$

The dispersion coefficient was then obtained by the relationship:

Ů=ŭ.ux (2.4)

2.4.2 Velocity Measurement

A graduated measuring cylinder was used to collect the wastewater samples at the inlet point under a given time intervals (t). The inlet pipe was fitted with valves to enable the manipulation of the flow rate, in order to achieve desired velocity. A stop watch was used to measure the time interval for corresponding volumes collected in the graduated measuring cylinder. Also, the cross-sectional area of the inlet pipe was used in the determination of the velocity. The cross-sectional area of the inlet pipe was calculated as follows:

$$\square_{\square\square} = \frac{\square\square^{\square}}{\square} \tag{2.5}$$

where d is the diameter of the inlet pipe

The flow rate and velocity of the inlet were calculated from Equation (2.6) and Equation (2.7), respectively.

$$Q = \frac{\square}{\square} \tag{2.6}$$

and

$$U = \frac{\square}{\square} \tag{2.7}$$

where Q is the flow rate in m^3/s, t is the time taken for the sample to be collected in seconds, V is the volume of wastewater collected (m^3), U is the pond velocity in m/s.

2.5 EFFECTS OF DISPERSION NUMBER ON WASTE STABILIZATION PONDS

Shilton and Harrison (2003) stated that as the dispersion number tends to 0, more plug flow conditions exist ï as it increases a higher degree of mixing is represented. Dispersion is the minimization of the formation of stagnant regions and implies a reasonable uniform distribution of the organics, algae, bacteria, oxygen and the general pond content. Agunwamba et al. (2013b) stated that higher values will result in higher dispersion of pollutants in streams.

2.6 GEOMETRICAL FACTORS AFFECTING DISPERSION NUMBER

Rectangular shaped ponds are commonly used in most researches including variations in length to breadth ratios. The geometric characteristics affect the mixing potential, hydraulics and therefore the efficiency of waste stabilization pond.

The pond hydraulics is influenced by the presence of unused dead space (Polprasat and Bhattarai, 1985); length to width ratio (Mangelson and Walters, 1972); inlet and outlet positions (Mara and Pearson, 1987) and depth. In the design consideration of ponds, configuration that minimizes short circuiting is desirable. Short-circuiting can be reduced and hence hydraulic efficiency increased by introducing baffles (Mangelson and Walters, 1972; Olarewaju and Ogunrombi, 1992) and by limiting the length to width ratio to a value not less than 3.0. The dispersion coefficient decreases as L/W increases (Agunwamba, 2001a).

2.6.1 Inlet and Outlet Structures

The inlet and outlet positions are very important in determining the pond hydraulics, because the hydraulics of the pond influences the mixing characteristics and detention times and also its efficiency (Polprasert and Bhattarai, 1985).

According to Mara and Pearson (1987), good inlet structures should be simple and inexpensive, facilitate sampling and reduce short circuiting.

In the design of ponds, it is very important to choose configurations that will give minimum short circuiting. Short-circuiting can be reduced and hence hydraulic efficiency increased by introducing baffles (Mangelson and Watters, 1972; Olanrewaju and Ogunrombi, 1992). Inlet to the anaerobic and primary facultative ponds should discharge below the liquid level to reduce the quantity of scum, secondary facultative ponds and maturation pond should discharge either below or above the water liquid (Agunwamba, 2001a). The outlet of all ponds should be sited to reduce the discharge of scum. Mara and Pearson (1987) recommended the following take-off levels: anaerobic ponds, 30cm; facultative ponds 60cm; maturation ponds; 50cm.

2.7 ENVIRONMENTAL FACTORS AFFECTING WASTE STABILIZATION PONDS

Performance of the stabilization process is primarily dependent upon the extent of microbial activity present within the pond. The microbes of primary importance in this process are bacteria and algae. The extent of microbial activity, in turn, is dictated by a number of physical and chemical parameters (Klemetson, 1983). According to Van Haandel and Lettinga (1994), both physical and chemical factors affect the habitat of micro-organisms and consequently the anaerobic treatment process. Three of the major physical parameters affecting pond performance are temperature, solar radiation, and mixing. These parameters are dependent upon climatic conditions, making ponds essentially an uncontrolled process (Klemetson, 1983).

2.7.1 Temperature

Due to the effect of sunlight, the effective wavelength for microbial destruction are the near ultra-violent ray band 320nm to 490nm with a temperature of 12°C to 50°C, while Escherichia Coli will be inactivated by a much lower temperature and longer retention time. The useful temperature range for the pond is from 41°F to 95 °F (5 °C to 35°C). The optimum range being between 77°F and 95°F (25°C and 35°C) (Gloyna, 1976; Incropera, 1978). As temperature rises the rate of reaction also rises. Droste (1997) stated that methane production rates doubled for each 10°C temperature increase in the mesophilic range.

2.7.2 Solar Radiation

Mara and Pearson (1998) stated that the sun thus plays a threefold role in promoting faecal bacterial removal in WSP directly, by increasing the pond temperature and more indirectly, by providing the energy for rapid algal photosynthesis which not only raises the pond pH above 9 but also results in high dissolved oxygen concentrations which are necessary for its third role, that in promoting photo-oxidative damage.

There are two main mechanisms of oxygenation in pond systems: mass diffusion from the atmosphere and oxygen production by algae within the pond. It is, however, the oxygen provided by the algal population that is the most significant. The aeration provided by wind mixing is actually not as important as is commonly believed (Shilton and Harrison, 2003). The role of high light intensity and high dissolved oxygen concentration has recently been elucidated (Curtis et al*.,* 1992).

Solar radiation is the most effective factor that is responsible for the treatment of waste stabilization pond. Every other factor depends on solar radiation in treatment of wastewater. The growth of algae depends on solar radiation and production of oxygen by algae through photosynthesis is by sunlight, which the bacteria need for respiration and generation of energy. There are three types of solar radiation namely: beam radiation, diffuse or scattered radiation and reflected radiation.

The reflected radiation may be direct or diffuse radiation reflected from the ground onto the solar aperture. Due to the above behaviour of sunlight, solar pond has to be constructed for the treatment of wastewater, so that enough solar energy will be stored or collected for the treatment of the wastewater since it is one of the simplest devices for waste water treatment. Most natural ponds quickly looses that heat through vertical convection within the pond by evaporation and convection at the surface. Artificial solar pond prevents either vertical convection or surface evaporation and convection or both. Due to its massive thermal storage and measures taken to reduce heat loss, a typical pond takes several hours than it takes a solar pond to converts intermittent solar radiation into a steady source of thermal energy.

2.7.3 Mixing

Mixing is an important factor in pH control and maintenance of even environmental conditions. It distributes the buffering agent throughout the reactor volume and prevents localized build-up of high concentrations of intermediate metabolic products, which may inhibit methanogenic activity. In the contrary, inadequate mixing propitiates the development of adverse micro-environment. There are two mixing mechanisms: wind and thermal mixing (Marvis, 1970). Wind mixing is the more effective of the two in ponds as we know them today. Without mixing, the pond remains stratified, confining the aerobic layer to the top. Mixing redistributes the oxygen and non-motile algae throughout a greater pond depth resulting in more effective use of the pond (King, 1976; Marvis, 1970).

2.8 OTHER FACTORS AFFECTING THE EFFICIENCY OF WASTE STABILIZATION PONDS

The factors that affect the efficiency of waste stabilization ponds are as follows:

2.8.1 Pond position

The pond geometry is placed in the position where it will receive a good intensity of sunlight without disturbance. Therefore, it depends on the geometry of solar energy since sun is one of the most important factors of waste stabilization pond treatment. To locate the position of the pond, the movement of the sun is going to be monitored by knowing the two degrees of freedom, which can be specified by two angles that are sufficient information to locate the sun on the celestial sphere at any times. They are solar altitude angle and azimuth angles.

2.8.2 Solar Azimuth Angle

The azimuth angle is measured in the horizontal plane between the due south direction and the projection of the sun earth line onto the horizontal plane. It has a sign convention as do other solar angles, but for this purpose sign associated with solar are not needed. It depends on the same three angles as solar altitude angle.

2.8.3 Solar Altitude Angle

The solar altitude angel is measured upward from the level horizontal plane to a line between the observer and the sun. The maximum solar angle occurs at noon in all seasons of the year. This angle fluctuates from latitude to latitude as the solar declination, solar hour angle changes with time.

Solar altitude characterizes the sunös vertical angle, relative to the horizontal ground plane. Altogether, azimuth and altitude angles express the path of the sun as it rises from the east and falls to the West throughout the course of one day. It is important to note that the sunös position is dependent on the geographical location (*i.e.* latitude and longitude) of a particular site (Dong, 2009).

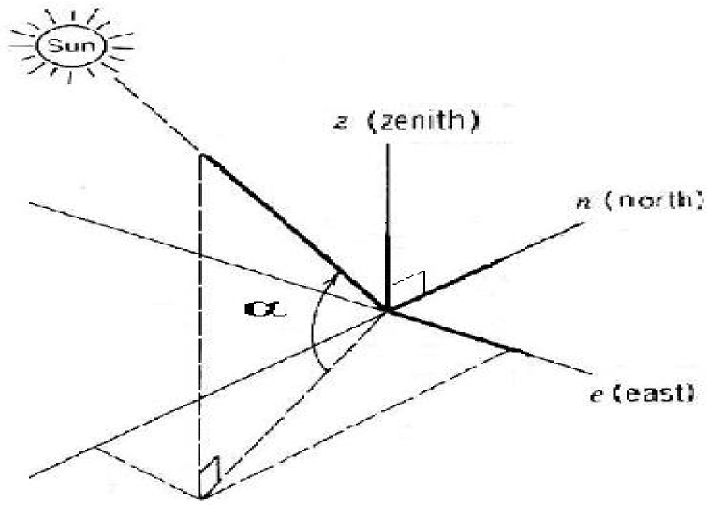

Figure 2.3: Solar Altitude Angle
Source: Bengtson (2003)

2.8.4 Hydrogen Ion Concentration (pH)

Zehnder et al. (1982) stated that the optimum pH range for all methanogenic bacterial is between 6.0 and 8.0, but the optimum value for the group as a whole is close to 7.0. Droste (1997) reported that the system must contain adequate buffering capacity to neutralize the product of volatile acids and carbon dioxide, which dissolves at the operating pressure.

2.9 THE KINETIC MODELS OF BACTERIA DIE-OFF

Literature has revealed that die-off bacteria in WSPs depend on environmental and climatological parameters. Several hypotheses have tried to explain the causes of bacterial reduction, including the presence of antibacterial substances produced by algae. The high pH levels common in the ponds, the production of toxic extracellular compounds by algae, the depletion of nutrients, the microbial antagonism, and the high oxidation reduction potential in algal-bacteria cultures.

It is hypothesized that reduction in enteric and pathogenic microorganisms is due to the release of bactericidal substances by algae (Parker, 1962; Davis and Gloyna, 1972); temperature (Mara and Silva, 1979), depletion of nutrients which cause starvation (Gann et al., 1968; Legendre et al., 1984; James, 1987); sedimentation (Mara, 1976; Chamberlin and Mitchell, 1978) and solar radiation (Modeller and Calkins, 1980; Mayo, 1989).

BOD removal is basically through methanogenesis, through the algal symbiotic reactions. The oxygen, photosynthetically produced by algae during the day-time, is used by bacteria in decomposing the organic matter. The decomposed products are further utilized by algae for photosynthesis (Warren, 1962).

Marais and Shaw (1961) proposed a model for the die-off of indicator bacteria in WSP. Because temperature was found to affect the bacterial removal efficiency substantially, Marais altered the model and derived a first-order equation in which the first-order rate constant was assumed to be temperature dependent. Other coliform decay models in WSP, developed by Ferrara and Harlmman (1980), were one of the first-order reactions in which the decay rate is temperature dependent.

In fact, the WSP should be considered as a complex system encompassing the existence of several living species, especially the interrelationship of algae and bacteria, which bring about an ecological pattern different from pure culture behaviour. Numerous authors have pointed to a need to improve existing models of coliform decay. The comprehensive model should include the relationship of coliform die-off to other major parameters: algal biomass concentration (C_s), temperature (T), organic loading (OL), sunlight intensity (I), Sunlight duration (L), hydraulic detention time (d), substrate degradation rate (K_s), and pond dispersion number (d). A research programme was undertaken to develop mathematical relationships of the bacterial die-off in WSP incorporating two proposed models, one for the algal concentration, Cs. Verification of the results obtained was made with experimental data from the full-scale WSP and some published data for existing ponds in northeast Brazil.

2.10 EFFLUENT STANDARDS

To achieve its aims wastewater treatment must produce an effluent of a certain quality (Metcalf et al., 1982). The required effluent quality should be established by a governmental agency. It becomes the duty of the design engineer to ensure that this design can achieve the established standards. In the absence of legal standards, the designer must still design the work to produce an effluent that: is suitable for its intended reuse (or will not pollute receiving water course); will not constitute a risk to public health.

2.11 WASTE STABILIZATION POND MODELS

Some researchers have assumed that a pond is best represented as a completely mixed reactor (Marais and Shaw, 1961; Mara and Pearson, 1998).

Marais (1974) presented equations for pond design assuming faecal coliform removal by the first order kinetic model in a completely-mixed reactor. The resulting equation for a single pond is given by:

$$N_e = \frac{N_o}{1 + K\theta} \qquad (2.8)$$

where N_e and N_o are the number of faecal coliform/100ml in the effluent and influent, K is the first order rate constant for faecal coliform removal (d^{-1}), and ɗ is the retention time (day). For a series of anaerobic, facultative and maturation ponds:

$$N_e = \frac{N_o}{(1 + K\theta_a)(1 + K\theta_f)(1 + K\theta_m)^n} \qquad (2.9)$$

where the subscripts a, f and m refer to anaerobic, facultative and maturation ponds and small n is the number of maturation ponds. Marais (1974) developed the model for the bacterial die off rate constant given as:

$$K \quad = \quad 2.6(1.19)^{T-20} \qquad (2.10)$$

Saqqar and Pescod (1992) developed an empirical equation for the computation of k as:

$$k = 0.5(1.02)^{Tw-20}(1.15)^{PH-6}(0.99784)^{LS-100} \qquad (2.11)$$

where T_w, pH and L_s are the water temperature, hydrogen ion concentration and concentration of soluble BOD_5 loading respectively.

For this research, Equation (2.11) was used because of its inclusion of a wide range of parameters investigated in the current study.

Arguing that WSP cannot be modeled accurately as a completely mixed reactor as Marais did, Thirumurthi (1974) recommended that ponds be designed as dispersed flow reactor because they are not in fact completely mixed. He therefore proposed the use of dispersion number and the first order equation of Wehner and Wilhelm (1956). This equation is stated as shown in Equation (2.12):

$$\frac{N_e}{N_o} = \left[\frac{4a\,\exp\left(\frac{1}{2d}\right)}{(1+a)^2\exp\left(\frac{a}{2d}\right) - (1-a)^2\exp\left(-\frac{a}{2d}\right)}\right] \qquad (2.12)$$

where $a^2 = 1+4K\theta d$

For rectangular ponds, Wehner and Wilhelm,1956: Agunwamba, 2001b, obtained Equation (2.13):

$$\frac{N_e}{N_o} = \frac{4a}{(1+a)^2}\exp\left[\frac{1-a}{2d}\right] \qquad (2.13)$$

Where $a^2 = 1+4K\theta d$, d is the dispersion number, K is the die-off rate coefficient, θ is the detention time (days), N_e and N_o are the number of faecal coliform/100ml in the effluent and influent, respectively.

Data obtained from the conventional pond was used to calibrate and verify Equation (2.13).

As an alternative, a number of researchers support the use of the Wehner-Wilhelm equation for non-ideal flow, which incorporates the use of a dispersion number (Thirumurthi and Nashashibi, 1967; Thirumurthi, 1969; Thirumurthi, 1974; Thirumurthi, 1991; Agunwamba, 2001b; Polprasert and Bhattarai, 1985; Nameche and Vasel, 1998).

Predictive equations for the dispersion number have been proposed (Arceivala, 1981; Ferrara and Harleman, 1981; Agunwamba, 1992a; Agunwamba et al., 1992; Polprasert and Bhattarai, 1985; Nameche and Vasel, 1998) but some of these have then been criticized when evaluated by others (Agunwamba, 1991a; Marecos do Monte, 1987). The drawback of this approach is that the dispersion number is a single factor that is expected to account for the wide range of influences on the fluid flow through the pond system (Shilton, 2001). Shilton and Harrison (2003) stated that hydraulic parameters, such as the mean hydraulic retention time or dispersion number, do not give a direct measure of treatment efficiency. Preul and Wagner (1987) said that the accuracy of such flow equations may vary substantially with actual pond conditions and therefore their application is limited.

The dispersed flow model is regarded as the best. Application of these models in pond design and improved methods of estimation of the dispersion number (d) are discussed elsewhere (Polprasert and Bhattarai, 1985; Agunwamba, 1992a; Agunwamba, 1997; Agunwamba et al., 1992). Attempts have been made to model the pond as a stochastic system where the initial bacterial concentration and other parameters were treated as random variables (Agunwamba, 1991b, 1991c).

Also, some empirical models have been developed to describe the kinetics of organic degradation in waste stabilization ponds (McGarry and Pescod, 1970; Larson, 1974; Gloyna, 1976). However, there is disparity between the observed values and the theoretical predictions in each case (Finney and Middlebrooks, 1980; Metacalf and Eddy, 1982).

The development of models as alternative methods of research cannot be over-emphasized.

2.12 INTEGRATED SOLAR AND HYDRAULIC JUMP ENHANCED WASTE STABILIZATION POND

An integrated solar and hydraulic jump enhanced waste stabilization pond (ISHJEWSP) is introduced as a new technology that incorporates solar reflector and the introduction of hydraulic jump through change in pond bed slope of the conventional waste stabilization pond.

The use of solar radiation for the treatment of chemically and biologically contaminated water is not a new phenomenon (Bunce, 1991; Conry et al., 1996; Davies-Colley et al., 1994; Malik et al., 1982; Safapour et al., 1999; Sinton et al., 2002). Solar radiation removes a wide range of organic chemicals and pathogenic organisms by direct exposure, is relatively inexpensive, and avoids generation of harmful by-products of chemically driven technologies (Bunce, 1991).

In the past, research has been conducted to improve pond efficiency, thereby maximizing land use by solar enhanced wastewater treatment in waste stabilization ponds (Utsev and Agunwamba, 2012; Agunwamba et al., 2009); solar and hydraulic jump with hydraulic jump provided by step (Agunwamba et al., 2013); using optimization techniques (Agunwamba and Tanko, 2005); using hydraulic jump (Agunwamba and Ogarekpe, 2010); using recirculation stabilization ponds in series (Shelef et al., 1978); step feeding (Shelef et al., 1987); incorporating an attached growth system (Shin and Polpraset, 1987) and more accurate estimation of pond design parameters (Agunwamba, 1992a, b; Sarikaya and Saatci, 1987; Sarikaya et al., 1987; Sweeney et al., 2007).

In addition, higher pond depths have been investigated for reduction of the pond surface area (Hosetti and Patil, 1987; Oragui et al., 1987; Silver et al., 1987). Agunwamba (2001b) investigated the effect of tapering on WSP performance. Also, several WSPs performance prediction models have been developed. Models have been developed to cover bacterial reduction, kinetics of organic degradation, bacterial kinetics, design, coliform decay, completely mixed-flow, plugð low, steady and non-steady dispersion, predicting effluent quality, design and dynamics, temperature profile, dispersion and multiple depth layer model.

However, a model for the prediction of the performance of the integrated solar and hydraulic jump enhanced waste stabilization pond has not been reported.

2.13 DESIGN OF THE INTEGRATED SOLAR AND HYDRAULIC JUMP ENHANCED WASTE STABILIZATION POND

2.13.1 Hydraulic Jump Consideration

A Hydraulic jump occurs when liquid at high velocity discharges into a zone of lower velocity, a rather abrupt rise (a step or standing wave) occurs in the liquid surface. A hydraulic jump is characterized by strong energy dissipation and air entrainment (Chanson, 2007). The rapid flowing liquid is abruptly slowed and increases in height converting some of the flow initial kinetic energy into an increase in potential energy, with energy irreversibly lost through turbulence to heat. There must be a flow impediment for hydraulic jump to occur. The downstream impediment could be a weir, a bridge abutment, a dam or simply channel friction. A hydraulic jump is defined by its inflow Froude number $Fr_1 = V_1$ / ã(gd_1) where V_1 is the inflow velocity, d_1 is the inflow depth and g is the gravity acceleration (Chanson and Murzyn, 2008). Air bubble entrainment in a hydraulic jump starts for $Fr_1 > 1$ to 1.3 (Chanson, 1997; Murzyn et al., 2007; Chanson and Murzyn, 2008).

The flow regime used for this research is shown in Figure 2.4. For hydraulic jump to occur, let design Froude Number (Fr) of pond be equals to 1.1.

Using inlet supply pipes of 1/2ò diameter (i.e 12.7mm):

$$F_r = \frac{V}{\sqrt{gd_1}} \tag{2.14}$$

$$1.1 = \frac{V}{\sqrt{9.81 * 0.0127}}$$

V = 0.388m/s

Applying the Continuity equation in order to determine the inlet discharge, we have:

$$Q = AV \qquad (2.15)$$

$$Q = \left(\frac{\pi d^2}{4}\right) V$$

Q = 49.15ml/s

Discharge per unit width, $q = vy_1 = 0.388 * 0.0127 = 0.00493\ m^3/s$ per m

$$y_c = \left(\frac{q^2}{g}\right)^{\frac{1}{3}} \qquad (2.16)$$

$$y_c = \left(\frac{0.00493^2}{9.81}\right)^{\frac{1}{3}}$$

y_c = 0.0135m

$$y_2 = \frac{y_1}{2}\left(\sqrt{1 + 8(Fr_1)^2} - 1\right) \qquad (2.17)$$

$$y_2 = \frac{0.0127}{2}\left(\sqrt{1 + 8(1.1)^2} - 1\right)$$

y_2 = 0.0144m

Where;

v is the flow inlet velocity of the fluid

q is the inlet discharge per unit width

y_c is the critical depth

y_1 is the depth of flow before hydraulic jump

y_2 is the depth of flow after hydraulic jump

Lj is the length of jump

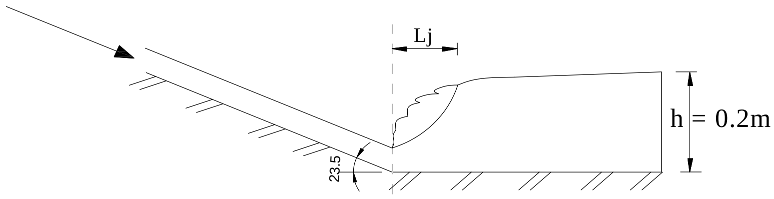

Figure 2.4: Fully Developed Hydraulic Jump

Similarly, inlet Froude Numbers of 1.2 and 1.3 were studied. The obtained velocities corresponding to the Froude numbers of 1.1, 1.2 and 1.3 were 0.39m/s, 0.42m/s and 0.46m/s, respectively.

2.13.2 Solar Reflector Consideration

The use of a plane reflector can increase the quantity of solar radiation energy by about 30% to 40% and sometimes even 50% to 60% (Genutis et al., 2003; Matsushima, et al., 2003; Poulek and Libra, 2000; Brogren et al., 2004).

The solar reflectors were constructed to increase the incident sunlight intensity. Agbiji (2011) reported high efficiency of treatment of the WSP by the use of foil paper as solar reflector. This is coupled with its low cost and ease of maintenance. Utsev and Agunwamba (2012) stated that the distribution and variation of both the physiochemical and biological characteristics inside the water body were found to be influenced as maximum temperature, DO, pH, algae count, as well as minimum BOD_5, COD, fecal coliform and E. coli was observed when the solar reflectors were placed at the outlet position.

The optimum angles between the WSPs and the solar reflectors were determined by considering two factors namely: the optimum solar energy and the law of reflection. The quantity of solar energy depends on geographical position, the trajectory of the sun, on the intensity of solar radiation energy, sunlight duration per day and per year, the reflection coefficient of sunray concentrator-reflector etc (Grigoniene and Karnauskas, 2009).

Therefore, due to the earthôs tilt about its axis, the rotation of the earth about its axis and the revolution of the earth around the sun, different optimal angles for solar reflectors in different seasons were obtained. In order to determine the position of the sun at solar noon for 365 days in a year, the solar altitude angles were determined using the equations obtained from the National Aeronautics and Space Administration Technical Memorandum, NASA (1968), shown in Equation (2.18) to Equation (2.21):

$$\sin \propto = \sin \emptyset \sin \square + \cos \emptyset \cos \square \cos \square \quad (2.18)$$

$$\square = \frac{[illegible] * \square\square\square}{\square\square\square.\square\square\square} \quad (2.19)$$

$$\square = 15(\square - \square) - \square \quad (2.20)$$

$$\square = 12 + 0.123570 \sin \square - 0.004289 \cos \square + 0.153809 \sin 2\square + 0.060783 \cos 2\square \quad (2.21)$$

The solar declination was obtained as shown in Equation (2.22). This equation has been used by researchers such as Ezeilo (1979):

$$\square = 23.45° \sin \left(360° \left(\frac{\square\square\square\square \square}{\square\square\square}\right)\right) \quad (2.22)$$

Where $\square$ is Solar elevation angle, Ø represent Latitude, D is solar declination, d is the angular fraction of a year (deg.), h is solar hour angle (deg.), n is the day number in the year, with January 1 as 1, T is time in GMT, M (hr) is the time of meridian passage or true solar noon, L is the Longitude.

At solar noon, the solar hour angle is zero and the sun attains its maximum altitude in the skies (Ezeilo, 1979). The summary of the solar altitude angles are shown in Appendix C. The input data included the solar noon at median passage for different days of the year at the geographical location of the experimental ponds (7.404^{o}E, 6.874^{o}N). It is an established fact that the solar radiation intensity falling on a horizontal flat surface, at a given time and location, increases with the increase in surface tilt angle at a solar hemispherical inclination

(Artlet et al., 1999). This principle was applied by the following researchers to identify the optimum angles for maximum solar energy collection of the given locations (Chau, 1982; Dang and Sharma, 1983; Morcos, 1994; Koray, 2006; Huseyin and Arif, 2007; Hamid et al., 2010). Therefore, the selection of the reflector tilts angles at solar noon to enhance optimum reflectance of maximum solar radiation into the experimental waste stabilization ponds. Considering the law of reflection, sunrays vertically incident on a reflector tilted at an angle of 60^o to the horizontal of an ISHJEWSP will be reflected at an angle of 30^o in the pond. By applying the law of reflection, the average weekly reflector tilts angles to the horizontal corresponding to the weeks of the year are shown in Appendix G.

Due to the fact that the sun rises from the east and falls to the west throughout the course of one day (Dong, 2009), the reflectors were position at the outlet, facing the west in order to enhance reflectance from the solar noon upwards.

It is important to note that the sunȏs position is dependent on the geographical location (*i.e.* latitude and longitude) of a particular site (Dong, 2009).

CHAPTER THREE

RESEARCH METHODOLOGY

Experimental research and design was adopted for this study.

3.1 STUDY AREA

Nsukka is a town and Local Government Area in South-East Nigeria in Enugu State (Figure 3.1). Nsukka urban is the home to the prestigious University of Nigeria. Located at the north-eastern end of the University campus about 800m from the junior staff quarters, the treatment plant at Nsukka consists of a screen (6mm bar racks set at 12 mm centres) followed by two Imhoff tanks, each measuring about 6.667 m X 4.667 m X 10m, and two facultative waste stabilization ponds. Sludge is discarded from the imhoff tank once every twenty eight days onto the drying beds, so that the beds are loaded at 40 days interval. The beds have a total area of 417 m^2. Although its efficiency has deteriorated, its effluent is used for uncontrolled vegetable irrigation by some village dwellers. The poor effluent quality is also partly attributable to overloading because of population growth.

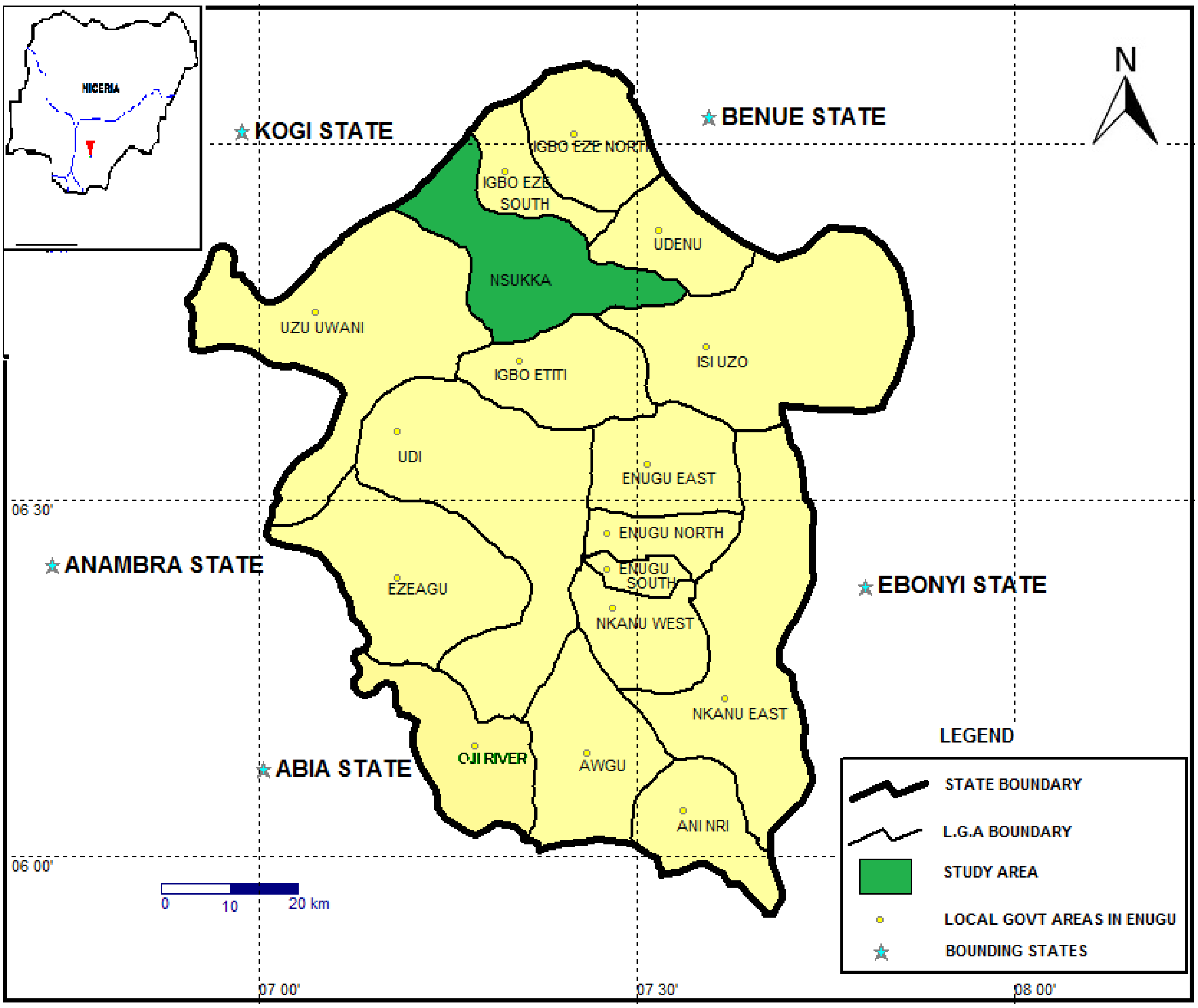

Figure 3.1: Map of Enugu State showing Nsukka Local Government Area

3.2 EXPERIMENTAL INVESTIGATION AND SETUP

In the course of carrying out the research, different sets of integrated solar and hydraulic jump enhanced ponds with dimensions as shown in Tables 3.1 to 3.3 and Figure 3.2 below, with one sewage tank(1.2m×1.2m×0.6m) that receives its influent from an overhead storage tank with (1.5m×1.5m×1.2m) were constructed for the experiment. Six out of the eight ponds were constructed with tilt frames of size 1.0m x 0.3m, fixed at varying angles in accordance with the relative position of the sun per week. This was to harness the solar radiation. The tilt frame was made of a flat wooden frame wrapped with aluminum foil paper. The aluminum foil paper was to act as solar reflector, with each of the six ponds having one reflector each at the outlet position (west facing). The reflectors provided reflectance in the outlet section of the pond. Also, six out of the eight ponds were constructed with a change in pond bed slope to create hydraulic jump. One out of the eight ponds was constructed without a change in slope and solar reflector to serve as control experiment while the other though without change in slope however was fitted with solar reflector in order to investigate the effect of solar radiation on the conventional WSP. In all, three sets were studied with each set comprising of eight ponds (A, B, C, D, E, F, G, and H) with varying locations of point of initiation of hydraulic jumps for each set for ponds C, D, E, F, G, and H. Half inches diameter inlet pipes were fitted centrally to the experimental ponds. The outlet pipes were centrally fitted to the experimental ponds. To control the inflow and outflow, valves were fitted at the inlet and outlet pipes of the experimental ponds. The two storage tanks were usually filled to supply the eight ponds with sewage effluent from the imhoff tank of the University of Nigeria, Nsukka sewage treatment plant through a hose with the aid of an electromechanical water pump. The influent samples for the laboratory analysis were obtained from the storage tank immediately after being filled. Also, the experimental ponds were immediately filled and samples collected at the outlets after two days. Figure 3.3 below shows the map of the location of the experimental setup while Figure 3.4 shows the picture of the experimental setup.

Table 3.1: Detailed Description of Various Ponds due to Width Effect

Experimental Ponds	Size	Characteristics	Purpose
A	1 x 0.3 x 0.2	No solar reflector, no change in slope	Control
B	1 x 0.3 x 0.2	No change in slope with reflector	Measure the effect of solar reflector
C	1 x 0.3 x 0.2	Change in slope without reflector	Measure the effect of hydraulic jump
D	1 x 0.3 x 0.2	Solar reflector and change in slope	Measure the effect of solar reflector and hydraulic jump
E	1 x 0.4 x 0.2	Solar reflector and change in slope	Measure the effect of width

F	1 x 0.2 x 0.2	Solar reflector and change in slope	Measure the effect of width
G	1 x 0.5 x 0.2	Solar reflector and change in slope	Measure the effect of width
H	1 x 0.6 x 0.2	Solar reflector and change in slope	Measure the effect of width

Table 3.2: Detailed Experimental Characteristics of the Various Ponds due to Variations in Location of Point of Initiation of Hydraulic Jump

Experimental Setups	Number of Experimental Ponds	Characteristics (Location of Point of Initiation of Hydraulic Jump from the Inlet)	Purpose
Set 1	8	0.5m	Effect of location of point of initiation of hydraulic jump
Set 2	8	0.4m	Effect of location of point of initiation of hydraulic jump
Set 3	8	0.3m	Effect of location of point of initiation of hydraulic jump

Table 3.3: Detailed Experimental Characteristics of the Various Ponds due to Varying Inlet Velocity

Experimental Setups	Number of Experimental Ponds	Characteristics (Velocity)	Purpose
Set 1	8	0.39m/s	Effect of inlet velocity
	8	0.42 m/s	Effect of inlet velocity
	8	0.46 m/s	Effect of inlet velocity
Set 2	8	0.39m/s	Effect of inlet velocity
	8	0.42 m/s	Effect of inlet velocity
	8	0.46 m/s	Effect of inlet velocity
Set 3	8	0.39m/s	Effect of inlet velocity
	8	0.42 m/s	Effect of inlet velocity
	8	0.46 m/s	Effect of inlet velocity

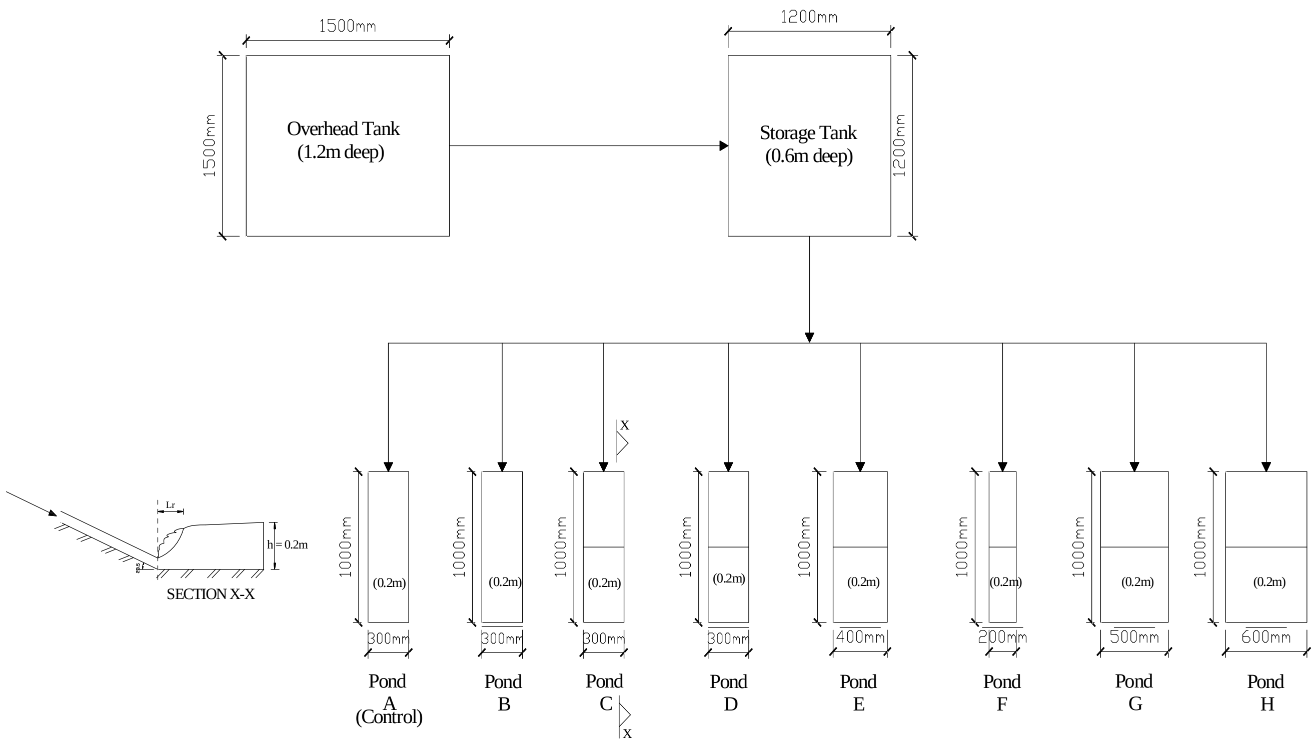

Figure 3.2: Schematic Diagram of Experimental Setup due to Width Variation

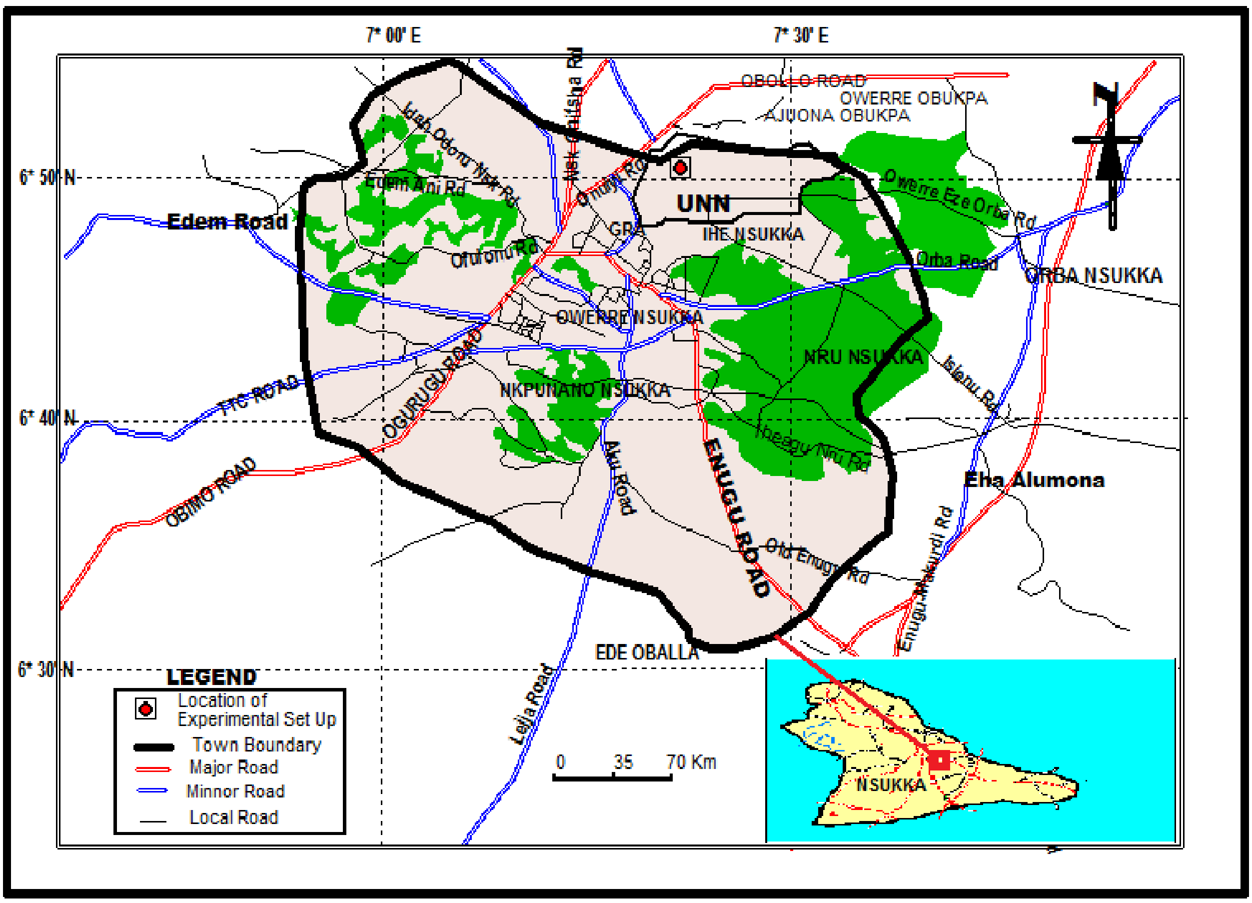

Figure 3.3: Map of Nsukka Urban showing the Location of Experimental Setup

Figure 3.4: Picture of Experimental Setup
Source : Authorôs Field Work (2013)

3.3 SAMPLE COLLECTION

Wastewater samples were collected from the inlet and outlet for varying inlet velocities and varying locations of point of initiation of hydraulic jump. Influent samples were collected before treatment in the experimental ponds. Effluent samples were collected after two days detention time from the outlet of the integrated solar and hydraulic jump enhanced ponds which were examined for physicochemical and biological characteristics for a period of nine months. The parameters examined were temperature, pH, detention time, dissolved oxygen, total coliform count, total suspended solids, E-coli, algal concentration, biochemical oxygen demand (BOD_5) and tracer studies.

3.4 DATA COLLECTION

Climatic data for the study area was obtained from the Centre for Atmospheric Research, National Space Research and Development Agency, Federal Ministry of Science and Technology, Anyigba, Nigeria/Geography Department, University of Nigeria, Nsukka as shown in Appendix E.

3.5 LABORATORY METHODS

3.5.1 Coliform Test

In carrying out the experiment, double strength of maconkey as nutrient medium was prepared by dissolving 45.5g of maconkey broth in 650ml of distilled water. 10ml of the medium was siphoned into 18 sets of test tubes, 3 fermentation tubes for each sample. Then equal volume of distilled water was added to the remaining portion of the medium as single strength. 1ml of the single strength medium was siphoned into another 18 sets of small test tubes, 3 fermentation tubes for each sample. Also, 0.1ml of the single strength medium was siphoned into another 18 sets of small fermentation tubes, 3 test tubes for each sample. The 10 ml, 1ml and 0.1ml portion of the samples were sterilized for 15min at 121^0C. Thereafter, the tubes were inoculated at 37°C for 48 hours. The tubes with gases were recorded as positive test indicating the presence of harmful bacteria in water where the number of coliforms corresponding to the positive tubes was read from the most probable number (MPN) table.

3.5.2 Biochemical Oxygen Demand

Dilution water was prepared by adding 4ml of phosphate buffer, magnesium sulphate, calcium chloride and ferric chloride solution for each 4 litres of water. The dilution water was saturated with air and several dilutions of the samples were prepared and siphoned into eighteen pairs of biochemical oxygen demand bottles for both 5 days incubation and the other for the determination of initial dissolved oxygen in mixture by using the dissolved oxygen meter. After five days incubation, oxygen demand was again determined for the second eighteen bottles (or five days dissolved oxygen) using the dissolved oxygen meter. The concentrations of biochemical oxygen demand were computed using the equation in Appendix A.

3.5.3 Dissolved Oxygen

Portable waterproof dissolved oxygen meter, HI 9142 (Hanna Instrument) was used for the determination of dissolved oxygen. The meter was calibrated with a buffer solution in according to the manufacturerôs specification. The protective cap was removed and the tip of the dissolved oxygen probe was dipped into the buffer solutions after switching on the equipment and the display was allowed to be stable. The tip of the probe was then immersed in the sample to be tested. For accurate dissolved oxygen measurements, a minimum water movement of 0.3m/s is required. This was to ensure that the oxygen-depleted membrane surface is constantly replenished. To quickly check if the water speed was sufficient, the reading was allowed to stabilize before moving the dissolved oxygen probe. For situations where the reading was still stable, the measurement was right.

During field measurements, this condition was met by manually agitating the probe while during laboratory measurements; the magnetic stirrer was used to achieve the velocity in the fluid. No reading was taken while the liquid was at rest.

3.5.4 Total Suspended Solids (TSS)

Total Suspended solid (TSS) was analyzed in the laboratory by placing filter paper in a beaker and weighing them on an electronic weighing balance. After putting the eighteen weighted beakers with filter papers inserted in the oven for one (1) hour at 105°C, they were then placed in the desiccator to cool them. Using filtration apparatus, the filter paper was used to filter 30ml of each sample. The filter paper was then put back to the original beakers and put in the oven again for 1 hour at 105°C to dry. After 1 hour, it was placed in the desiccator to cool, and then reweighed. The concentrations of TSS were computed using the equation in Appendix A.

3.5.5 E- Coli

Further inoculation was done after the colifom MPN results were obtained for the positive tubes. A loop full of broth and streak was removed for isolation on an EMB agar plate and incubated for 24 hours at 35°C. The presence of metallic sheen indicated the presence of E-coli. Data obtained was interpreted using the MPN chat in the standard method for the examination of water and wastewater.

3.5.6 Algae Concentration

Determination of chlorophyll *a* (trichromatic method): Spectrophotometric procedure - Extracts of the sample was transferred to a 1-cm cuvette and optical density (OD) measured at 750, 664, 647 and 630nm. A cell path length or dilution was chosen to give OD664 between 0.1 and 1.0. The optical density readings at 664, 647, and 630 nm was used to determine chlorophyll *a*. The OD reading at 750 nm is a correction for turbidity. This reading was subtracted from each of the pigment OD values of the other wavelengths before using them in the equation in Appendix A. Because the OD of the extract at 750 nm is very sensitive to changes in the acetone-to-water proportions, care was taken to adhere closely to the 90 parts acetone: 10 parts water (v/v) formula for pigment extraction. Turbidity was removed easily by centrifuging for 20 min at 500*g*. The concentrations of chlorophyll *a,* in the extract were calculated by inserting the corrected optical densities in the equation as shown in Appendix A.

3.5.7 pH

The pH of the samples was read using the pH meter. The electrode of the pH meter was standardized by calibrating in acidic and basic buffers of pH 4.0 and 9.0 and rinsed in distilled water in accordance with the manufacturerȏs specifications. The pH was read off after the electrodes were inserted into the beakers containing the wastewater samples.

3.5.8 Tracer Studies

These were conducted to determine the dispersion characteristics of the ponds for different detention times. Sodium chloride (NaCl) was used as the impulse tracer and the response tracer concentration was monitored at the exit of the experimental ponds. The amount of input impulse tracer was about 10g for each pond. The calculation of the dispersion number (d) was made with the relationship given by Levenspiel and Smith (1957) as shown in Appendix A.

3.6 ANALYTICAL METHODS

All the analyses were done using appropriate water testing meters and in accordance with the standard methods (APHA, 1998). Microsoft EXCEL was used to perform all statistical analyses.

3.7 FORMULATION AND DEVELOPMENT OF THE PERFORMANCE MODEL OF THE ISHJEWSP

Scheible (1987) showed that the impact of light on bacterial removal is given by Equation (3.1):

$$N_e = N_o \exp\left[\frac{uL}{2D}\left(1 - \left(1 + \frac{4K.D}{u^2}\right)^{\frac{1}{2}}\right)\right] + N_p \qquad (3.1)$$

where N_e is the bacteria density remaining after exposure to irradiation (organisms/100ml)

N_o is the initial and bacteria density, measured immediately before entry into the irradiated pond (organisms/100ml)

N_p represents the density associated with the particles, which shield the bacteria from being affected by irradiation light (organisms/100ml)

u is the velocity of wastewater as it travels through the reactor (m/s)

Ů denotes the dispersion coefficient (m^2/s)

L is the characteristic length, which is the average distance travelled by the wastewater while under direct exposure to light (m)

I is the intensity of solar radiation in KW/m^2

a, *b* site-specific sensitivity of micro-organism to UV

Froude number governs the dynamic similarity of the flow situations where gravitational force is most significant (Rajput, 2008), therefore velocity, u becomes u_c.

The density associated with the particles N_p is as shown in Equation (3.2) (Fenner, and komvuschara, 2005):

[illegible] (3.2)

Substituting Equation (3.2) and $u = u_c$ into Equation (3.1), we have:

[illegible] (3.3)

Due to the mixing effect created by the hydraulic jump and to account for the site-specific sensitivity of the micro-organisms to UV, Equation (3.3) is therefore factored by Equation (2.8), therefore, we have:

[illegible] (3.4)

where the terms are as defined in Equation (2.8) and where *a* is assumed to be $1m^2/kWs$ and *b* is 1.

Considering the change in slope causing the occurrence of the hydraulic jump, we have the length of channel L to be:

[illegible] (3.5)

Substituting Equation (3.5) into Equation (3.4), we have:

[illegible] (3.6)

where L is the characteristic length, which is the average distance travelled by the wastewater while under direct exposure to light (m)

N_p represents the density associated with the particles, which shield the bacteria from being affected by irradiation light (organisms/100ml)

ε denotes the dispersion coefficient (m^2/s)

u_c is the supercritical inlet velocity of wastewater before the occurrence of hydraulic jump (m/s)

N_o is the initial and bacteria density, measured immediately before entry into the irradiated pond (organisms/100ml)

N_e is the bacteria density remaining after exposure to irradiation (organisms/100ml)

k is the first order rate constant for faecal coliform removal (d^{-1})

θ is the retention time (day)

I is the intensity of solar radiation (KW/m^2)

θ_s is the angle denoting change in pond slope (^{o})

h is the depth of the ISHJEWSP (m)

x is the length of the horizontal section of the pond (m)

The faecal coliform die-off rate coefficient (k) was determined with the formula given by Saqqar and Pescod (1992):

$$k = 0.5(1.02)^{Tw-20}(1.15)^{pH-6}(0.99784)^{LS-100} \qquad (3.7)$$

where T_w, pH and L_s are the water temperature (^oC); hydrogen ion concentration and concentration of soluble BOD_5 (mg/l) loading, respectively.

Data obtained from the ISHJEWSP (pilot scale experiments ï Pond D) was used to calibrate and verify Equation (3.6) while Equation (2.13) was used to verify data obtained from the conventional WSP (Pond A).

3.8 FORMULATION AND DEVELOPMENT OF THE EMPIRICAL REGRESSION MODEL FOR THE PREDICTION OF THE BIOCHEMICAL OXYGEN DEMAND IN THE INTEGRATED SOLAR AND HYDRAULIC JUMP ENHANCED WASTE STABILIZATION POND FOR SEWAGE TREATMENT

In the past, regression models have been developed for the prediction of BOD removal in solar enhanced WSP (Utsev et al., 2013). In developing the model for the prediction of BOD_5 in the ISHJEWSP, it is assumed that y_{BOD5} is directly proportional to the pH, temperature, algal concentration, dissolved oxygen, inlet velocity, distance from inlet to the point of initiation of hydraulic jump, angle representing change in pond bed slope and intensity of solar radiation. Adding all the parameters duly factored with constants to replace proportionality, we have Equation (3.8):

$$\square_{\square\square\square_\square} = \square_\square + \square_\square\square_{\square\square} + \square_\square\square_{\square\square\square\,\square} + \square_\square\square_{\square\square\square\square\square} + \square_\square\square_{\square\square} + \square_\square\square_\square + \square_\square\square_{\square\,\square\square} + \square_\square\square_\square + \square_\square\square_\square \quad (3.8)$$

This is identical to the multiple regression model given by Equation (3.9):

$$y = \beta_0 + \beta_1\square_\square + \beta_2\square_\square + \beta_3\square_\square + \square_{\square\square_\square} + \square_{\square\square_\square} + \square_{\square\square_\square} + \square_{\square\square_\square} + \beta_8\square_\square + \square_{\square\square\square} \quad (3.9)$$

Where y = the dependent variable which is the BOD_5, $ɓ_0$ = regression constant, $ɓ_1$, $ɓ_2$ $ɓ_3$ é .. $ɓ_n$ are the regression coefficients that measure the strength of the contribution of the associated variable in the prediction of the concentration of BOD óyô. The data used for the regression analysis are as shown in Appendix D.

Linear regression analysis was applied to test the validity of the model. The process involved estimating the model parameters $\square_\square$, $\square_\square$, $\square_\square$, $\square_\square$, $\square_\square$, $\square_\square$, $\square_\square$, $\square\square\square\square_\square$ and the error called the standard error of estimates. There are two generally accepted methods: One is the least square method (Draper, 1981; Zar, 1999; Nwaogazie, 1999). Where the procedures are correctly and logically followed, the final results should be the same (Kerlinger, 1986).

In practice however, the most popular and widely applied method is the least square method. The least square method was adopted for this model.

CHAPTER FOUR

RESULTS AND DISCUSSION

The first sample collection was made on the 1st of May, 2013. The results of temperature, pH, detention time, total suspended solids, dissolved oxygen, biochemical oxygen demand (BOD_5), algae concentration, coliform, E-coli, tracers studies were obtained; calculated and tabulated in appendices A and B, respectively.

4.1 EFFECT OF POND WIDTH ON TREATMENT EFFICIENCY

4.1.1 Temperature

Temperature has been found to be one of the most important variables affecting biological processes (Klemetson, 1983; Kayombo et al., 2005). The changes in temperature resulted in the variation of such parameters as dissolved oxygen, pH, E-coli, total suspended solids, biochemical oxygen demand, algal concentration with width as shown in Figures 4.1 to 4.108. The temperature was higher in pond F, the smallest width pond (Klemetson, 1983) than the other experimental ponds (Figures 4.2, 4.14, 4.26, 4.38, 4.50, 4.62, 4.74, 4.86 and 4.98). This is due to its high reflector surface area to volume ratio. An increased surface area to volume ratio also means increased exposure to the environment (Vogel, 1988).

The maximum and minimum temperature values for Pond D corresponding to Set 1, Set 2 and Set 3 are 34.5°C and 28.0°C, 36.5°C and 30.2°C and 37.5°C and 29.5°C, respectively. Also, the maximum and minimum temperature values for Pond A corresponding to Set 1, Set 2 and Set 3 are 32.5°C and 25.1°C , 34.0°C and 27.2°C and 35.0°C and 26.5°C, respectively.

4.1.2 Dissolved oxygen (DO)

The dissolved oxygen in pond F was higher than others (Figures 4.1, 4.13, 4.25, 4.37, 4.49, 4.61, 4.73, 4.85 and 4.97). This is due to its high reflector surface area to volume ratio that exposes the wastewater to specific solar intensity; consequently the high algal bloom in pond F (Utsev and Agunwamba, 2012). After sunrise, the dissolved oxygen level gradually rises, in response to photosynthetic activity, to a maximum in the mid-afternoon, after which it falls to a minimum during the night when photosynthesis ceases and respiratory activity consumes oxygen (Mara and Pearson, 1998). The main mechanism of oxygenation in pond systems is the oxygen provided by the algal population (Shilton and Harrison, 2003; Mara and Pearson, 1998). The DO concentration can rise to more than 20 mg/l (i.e., highly supersaturated conditions) and the pH to more than 9.4. These are both important factors in the removal of faecal bacteria and viruses (Curtis et al., 1992). High dissolved oxygen values have been reported in WSPs (McDonnell, 1989).

The maximum and minimum dissolved oxygen values for Pond D corresponding to Set 1, Set 2 and Set 3 are 9.8mg/l and 8.5mg/l, 10.4mg/l and 8.7mg/l and 10.6mg/l and 8.8mg/l, respectively. Also, the maximum and minimum temperature values for Pond A corresponding to Set 1, Set 2 and Set 3 are 8.4mg/l and 6.6mg/l, 8.3mg/l and 7.0mg/l and 8.5mg/l and 6.8mg/l, respectively.

4.1.3 pH

The pH of the experimental ponds show marked variation with width. The pH increased with decrease in width of the ponds (Figures 4.3, 4.15, 4.27, 4.39, 4.51, 4.63, 4.75, 4.87 and 4.99). The pH in pond F, the smallest width pond, was higher than in the other experimental ponds (Klemetson, 1983; Utsev and Agunwamba, 2012). Photosynthesis controls pH values. The increase in temperature and algae concentration as the width decreases results in a corresponding increase in photosynthetic activities. High pH values above 9 occur in ponds due to rapid photosynthesis by the pond alga which consumes CO_2 faster than it can be replaced by bacterial respiration; as a result carbonate and bicarbonate ions dissociate (Mara and Pearson, 1998; Kayombo et al., 2005). Both anaerobic and facultative ponds operate most efficiently under slightly alkaline conditions (Beyene and Redaie, 2011). High pH values have been reported in WSPs (McDonnell, 1989; Troussellier and Legendre, 1989; Troussellier et al., 1986). Values of pH up to 11 are not uncommon in WSPôs, with the highest levels being reached in the late afternoon (Kayombo et al., 2005).

The maximum and minimum pH values for Pond D corresponding to Set 1, Set 2 and Set 3 are 10.9 and 7.2, 11.0 and 8.3 and 11.2 and 8.4, respectively. Also, the maximum and minimum pH values for Pond A corresponding to Set 1, Set 2 and Set 3 are 8.8 and 6.3, 9.0 and 6.5 and 9.2 and 6.5, respectively.

4.1.4 Algae Concentration

The results obtained for algae concentration are presented in Figures 4.4, 4.16, 4.28, 4.40, 4.52, 4.64, 4.76, 4.88 and 4.100. The results show that the algae concentration increases as the width decreases. As expected, this was due to the smallest sized pond being warmest throughout the average day (Klemetson, 1983; Utsev and Agunwamba, 2012). Algal activity is also retarded at low temperatures. Even under conditions of high solar radiation, intensity of algal growth is affected by low temperatures (Marvis, 1970). The concentration of algae in a facultative pond depends on loading and temperature, but is usually in the range 500-2000 µg chlorophyll *a* per litre (Mara and Pearson, 1998). High alga values have been reported in WSPs (McDonnell, 1989; Troussellier and Legendre, 1989; Troussellier et al., 1986).

The maximum and minimum algae concentration values for Pond D corresponding to Set 1, Set 2 and Set 3 are 376.6µg chlorophyll *a* per litre and 182.6µg chlorophyll *a* per litre, 510.8µg chlorophyll *a* per litre and 216.5µg chlorophyll *a* per litre and 575.4µg chlorophyll *a* per litre and 194.4µg chlorophyll *a* per litre, respectively. Also, the maximum and minimum algae concentration values for Pond A corresponding to Set 1, Set 2 and Set 3 are 166.9µg chlorophyll *a* per litre and 76.71µg chlorophyll *a* per litre, 243.4µg chlorophyll *a* per litre and

121.0µg chlorophyll *a* per litre and 263.9µg chlorophyll *a* per litre and 98.9µg chlorophyll *a* per litre, respectively.

4.1.5 Total Coliform Count (TCC)

Pond F with the least geometry had the least coliform than the other experimental ponds (Figures 4.9, 4.21, 4.33, 4.45, 4.57, 4.69, 4.81, 4.93 and 4.105). Comparing pond F which had the smallest dimension for all the cases, the results show that the average efficiency of coliform removal was higher in Pond F. This was followed by Pond D, Pond E, Pond B, Pond G, Pond H, and Pond C as shown in Figures 4.10, 4.22 and 4.34 for Set 1. For Sets 2 and 3, Pond F had the highest treatment efficiency followed by Pond D, Pond B, Pond E, Pond G, Pond H, and Pond C as shown in Figures 4.46, 4.58, 4.70, 4.82, 4.94 and 4.106. Pond A had the least efficiency of treatment for all sets. This is due to its high reflector surface area to volume ratio. An increased surface area to volume ratio also means increased exposure to the environment (Vogel, 1988). Good linear relationships between the numbers of FC in a pond and the direct and indirect (via increases in algal biomass and pH) effects of sunlight have been reported (Troussellier and Legendre, 1989; Troussellier et al., 1986).

The maximum and minimum coliform values for Pond D corresponding to Set 1, Set 2 and Set 3 are 460 per 100ml and 28 per 100ml (58% ï 92%), 460 per 100ml and 28 per 100ml (58% ï 94%) and 460 per 100ml and 28 per 100ml (58% - 94%), respectively. The average efficiencies of Total Coliform removal for Pond D corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 82.3%, 80.7%, 86.6%, 83.9%, 85.7%, 88.7%, 88.7%, 83.2% and 83.5%, respectively Also, the maximum and minimum coliform values for Pond A corresponding to Set 1, Set 2 and Set 3 are 1100 per 100ml and 120 per 100ml (0 ï 81%), 1100 per 100ml and 120 per 100ml (0 ï 89%) and 1100 per 100ml and 120 per 100ml (0 ï 86%), respectively. The average efficiencies of Total Coliform removal for Pond A corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 49.2%, 40.3%, 51.9%, 51.3%, 52.4%, 52.6%, 52.6%,51.3% and 51.7%, respectively.

4.1.6 Biochemical Oxygen Demand (BOD_5)

The results obtained revealed that there was higher degree of removal of BOD_5 in Pond F because of its small width and the use of solar reflector which increased the temperature leading to increased microbiological activities. This was followed by Pond D, Pond E, Pond B, Pond G, Pond H, Pond C and Pond A as shown in Figures 4.8, 4.20 and 4.32 for Set 1. For Sets 2 and 3, Pond F had the highest treatment efficiency followed by Pond D, Pond B, Pond E, Pond G, Pond H and Pond C as shown in Figures 4.44, 4.56, 4.68, 4.80, 4.92, and 4.104. Pond A had the least efficiency of treatment. The weekly variation of BOD_5 corresponding to Set 1, Set 2 and Set 3 are shown in Figures 4.7, 4.19, 4.31, 4.43, 4.55, 4.67, 4.79, 4.91, and 4.103, respectively.

The maximum and minimum BOD_5 values for Pond D corresponding to Set 1, Set 2 and Set 3 are 80mg/l and 30mg/l (63% ï 90%), 75mg/l and 25mg/l (74% ï 91%) and 90mg/l and 20mg/l (74% ï 93%), respectively. The average efficiencies of BOD_5 removal for Pond D corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 81.1%, 79.2%, 81.3%, 83.2%, 84.8%, 85.4%, 86.7%, 82.6% and 83.5%, respectively. Also, the maximum and minimum BOD_5 values for Pond A corresponding to Set 1, Set 2 and Set 3 are 190mg/l and 120mg/l (29% ï 60%), 190mg/l and 120mg/l (25% ï 75%) and 210mg/l and 115mg/l (38% ï 59%), respectively. The average efficiencies of BOD_5 removal for Pond A corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 43.8%, 41.6%, 44.5%, 45%, 46.5%, 48.5%, 50.8%,44.9% and 45.9%, respectively.

4.1.7 Total Suspended solids (TSS)

Pond F with the least geometry had the least suspended solid than the other experimental ponds (Figures 4.5, 4.17, 4.29, 4.41, 4.53, 4.65, 4.77, 4.89 and 4.101). For the different samples collected over the duration of this study, it was observed that Pond F (0.2m width) had more treatment compared with the other ponds (Figures 4.6, 4.18, 4.30, 4.42, 4.54, 4.66, 4.78, 4.90 and 4.102). The results thereby imply that the efficiency of the ISHJEWSPs decreased with increase in width. This was followed by Pond D, Pond E, Pond B, Pond G, Pond H, Pond C and Pond A for Set 1. For Sets 2 and 3, Pond F had the highest treatment efficiency followed by Pond D, Pond B, Pond E, Pond G, Pond H and Pond C. Pond A had the least efficiency of treatment.

The maximum and minimum TSS values for Pond D corresponding to Set 1, Set 2 and Set 3 are 80mg/l and 30mg/l (73% ï 89%), 73mg/l and 20mg/l (75% ï 92%) and 77mg/l and 17mg/l (73% ï 93%), respectively. The average efficiencies of TSS removal for Pond D corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 82.4%, 82.1%, 83.3%, 84.9%, 86.7%, 88.2%, 89.1% 83.9% and 85.1%, respectively. Also, the maximum and minimum BOD values for Pond A corresponding to Set 1, Set 2 and Set 3 are 213mg/l and 130mg/l (31% ï 53%), 190mg/l and 100mg/l (35% ï 58%) and 190mg/l and 97mg/l (34% ï 62%), respectively. The average efficiencies of TSS removal for Pond A corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 39.7%, 38.8%, 42.7%, 44.4%, 46.1%, 48.9%, 51.2%, 42.6% and 44.8%, respectively.

4.1.8 E-Coli

Similar to the results obtained for the total coliform count, Pond F which had the smallest dimension for all the cases had the highest average efficiency of E-coli removal. This was followed by Pond D, Pond E, Pond B, Pond G, Pond H, Pond C and A as shown in Figures 4.12, 4.24 and 4.36 for Set 1. For Sets 2 and 3, Pond F had the highest treatment efficiency followed by Pond D, Pond B, Pond E, Pond G, Pond H and Pond C as shown in Figures 4.48, 4.60, 4.72, 4.84, 4.96 and 4.108. Pond A had the least efficiency of treatment.

The weekly variation of E-coli corresponding to Set 1, Set 2 and Set 3 are shown in Figures 4.11, 4.23, 4.35, 4.47, 4.59, 4.71, 4.83, 4.95 and 4.107.

The maximum and minimum E-coli values for Pond D corresponding to Set 1, Set 2 and Set 3 are 210 per 100ml and 14 per 100ml (54% ï 94%), 210 per 100ml and 14 per 100ml (54% - 94%) and 210 per 100ml and 14 per 100ml (74% - 94%), respectively. The average efficiencies of E-coli removal for Pond D corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 81.9%, 80.3%, 84.1%, 82.1%, 83.1%, 85.6%, 85.8%,81.9% and 83.1%, respectively Also, the maximum and minimum E-coli values for Pond A corresponding to Set 1, Set 2 and Set 3 are 460 per 100ml and 28 per 100ml (0 ï 88%), 460 per 100ml and 23 per 100ml (0 ï 90%) and 460 per 100ml and 23 per 100ml (0 ï 90%), respectively. The average efficiencies of E-coli removal for Pond A corresponding to Set 1 (V_1, V_2, V_3), Set 2 (V_1, V_2, V_3), Set 3 (V_1, V_2, V_3) are 43.6%, 37.6%, 48.3%, 45.3%, 47.1%, 49.9%, 49.4%, 47.3% and 47.8%, respectively.

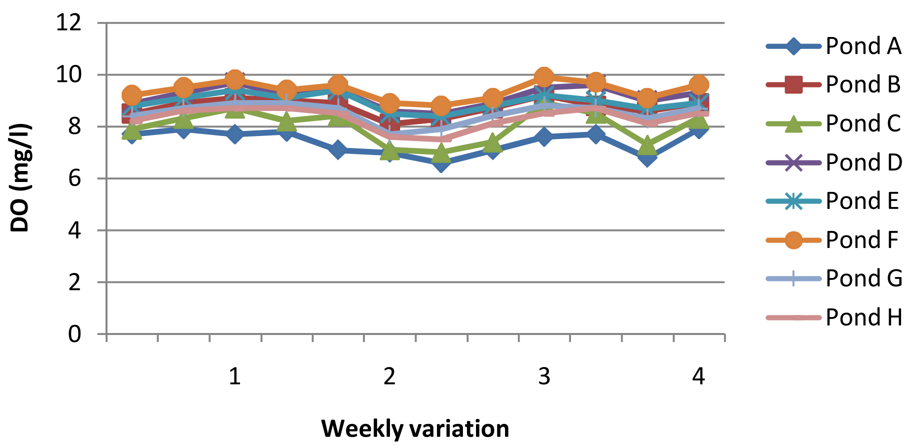

Figure 4.1: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

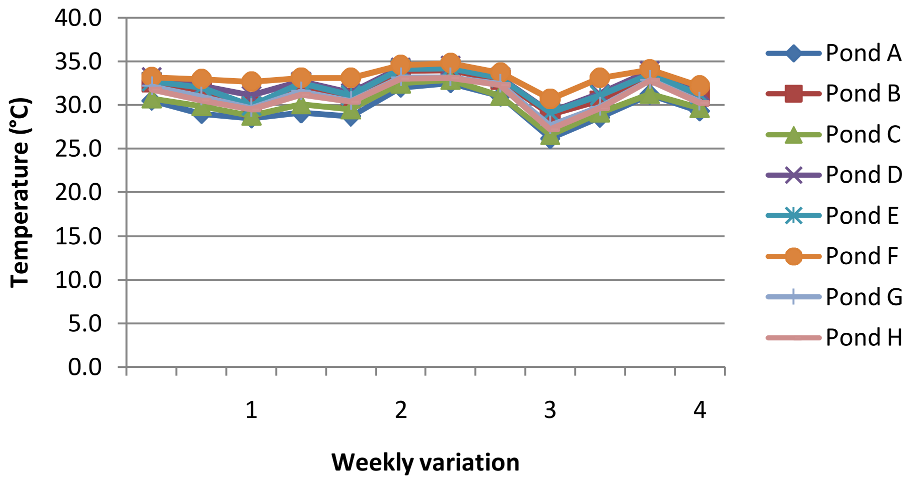

Figure 4.2: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

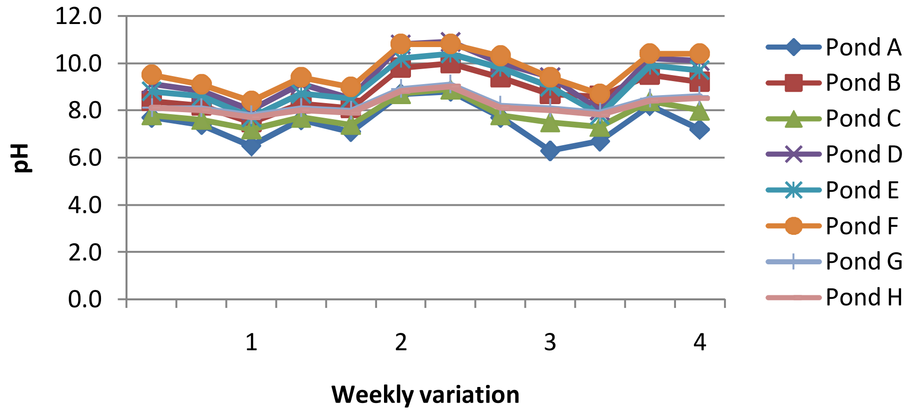

Figure 4.3: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

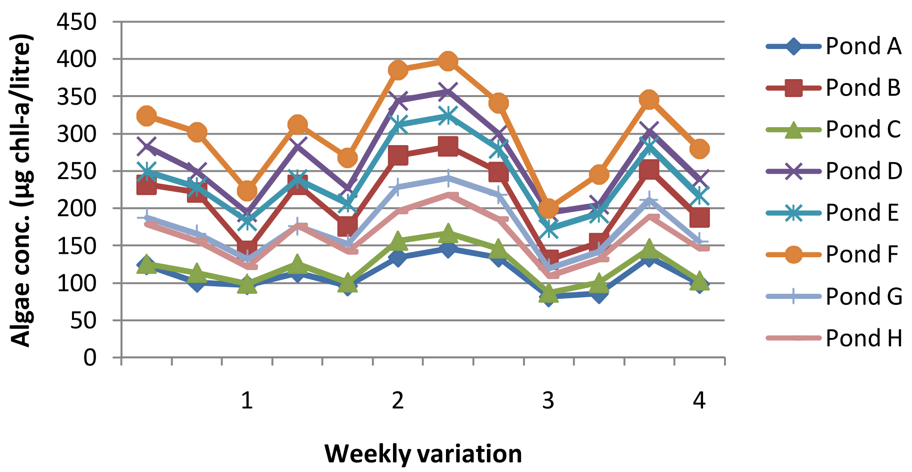

Figure 4.4: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

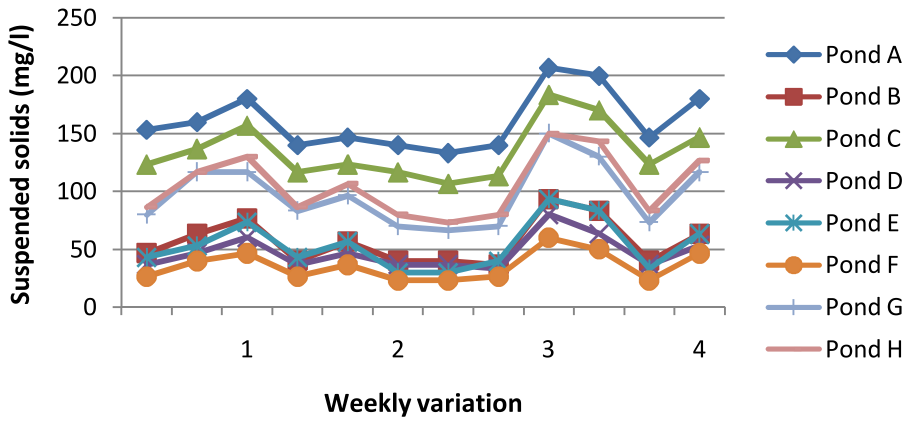

Figure 4.5: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

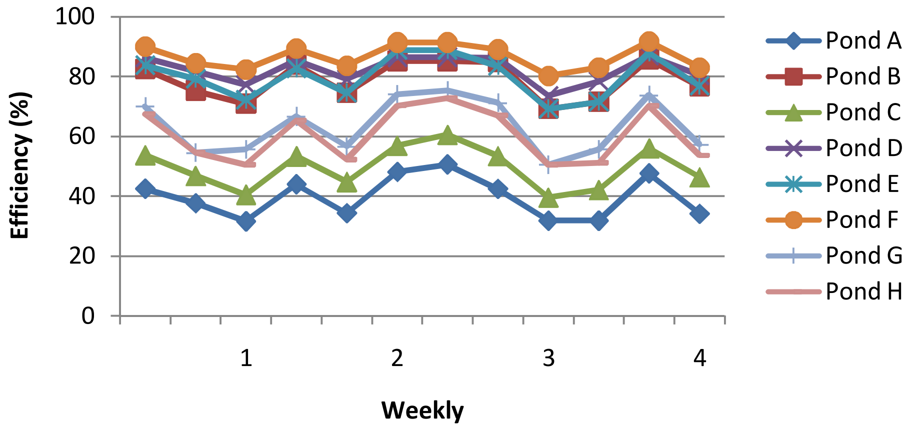

Figure 4.6: Efficiency of Suspended Solids Removal with Time (Set 1, V_1)

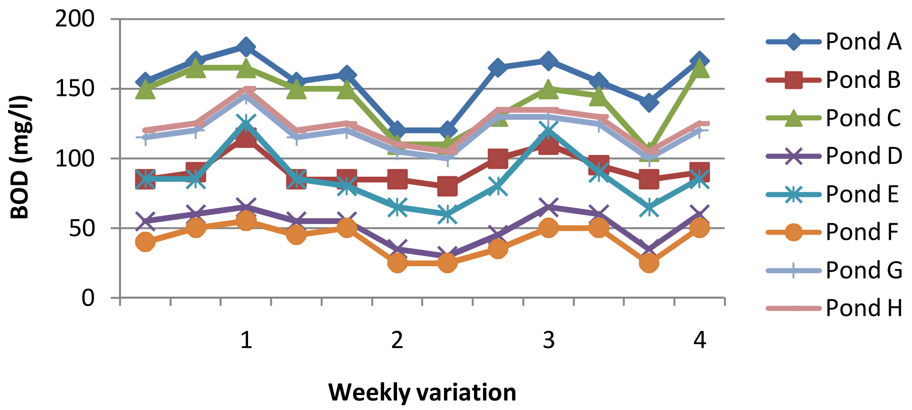

Figure 4.7: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

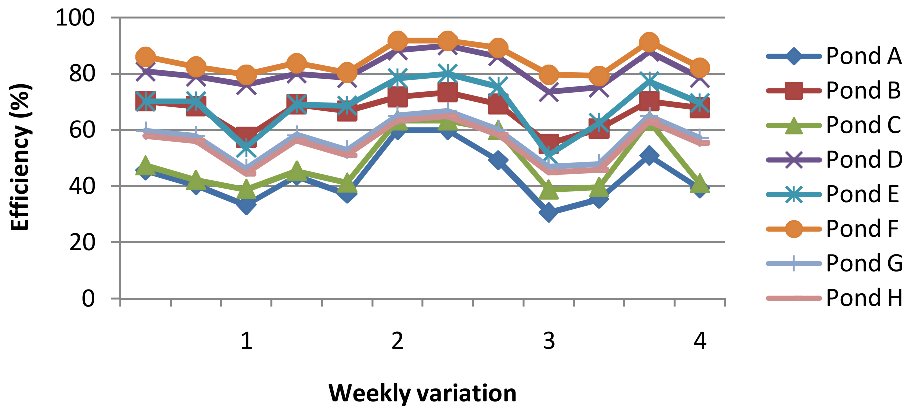

Figure 4.8: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 1, V_1)

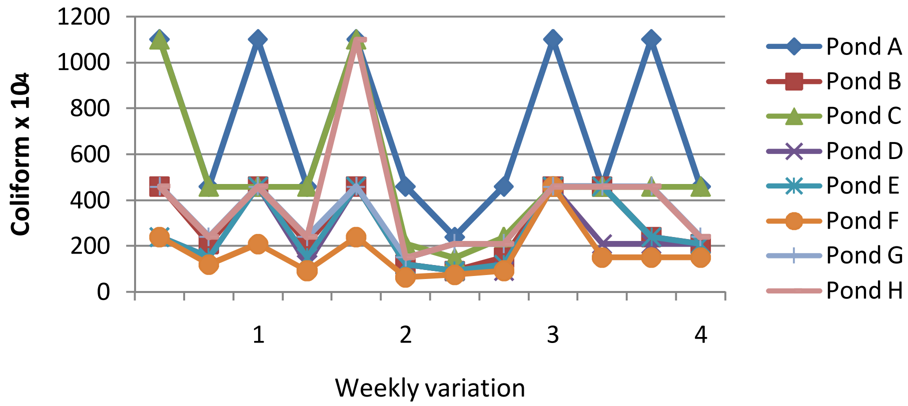

Figure 4.9: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

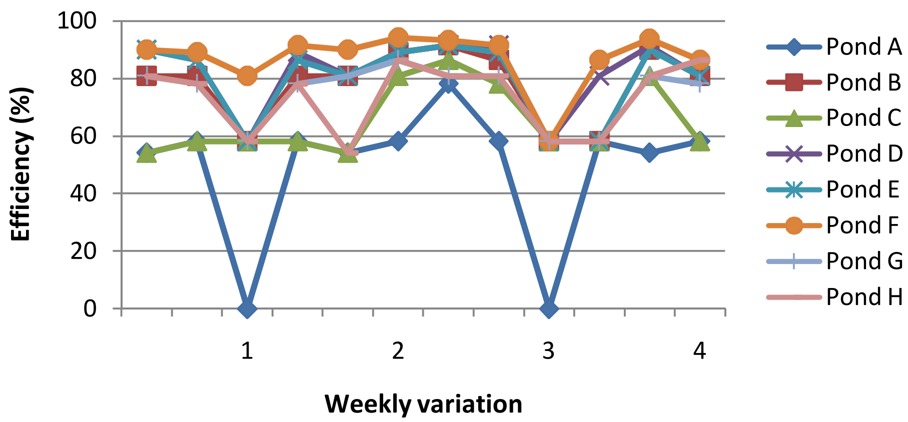

Figure 4.10: Efficiency of Coliform Removal with Time (Set 1, V_1)

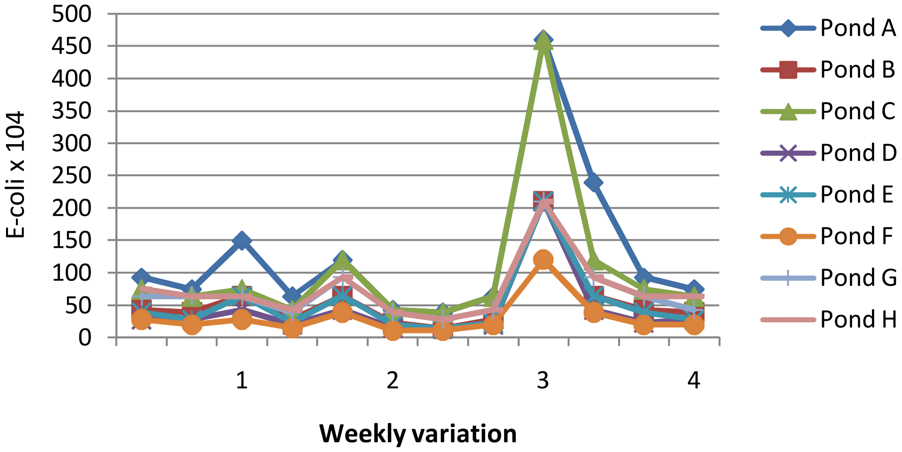

Figure 4.11: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 1, V_1)

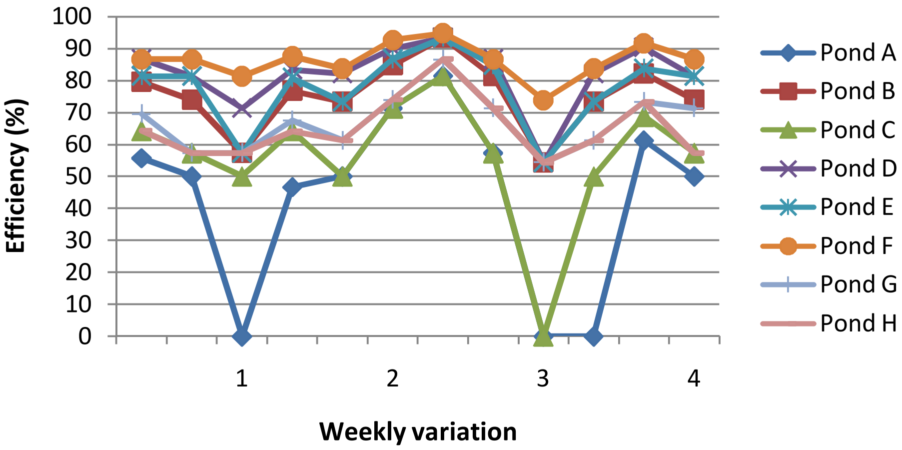

Figure 4.12: Efficiency of E-coli Removal with Time (Set 1, V_1)

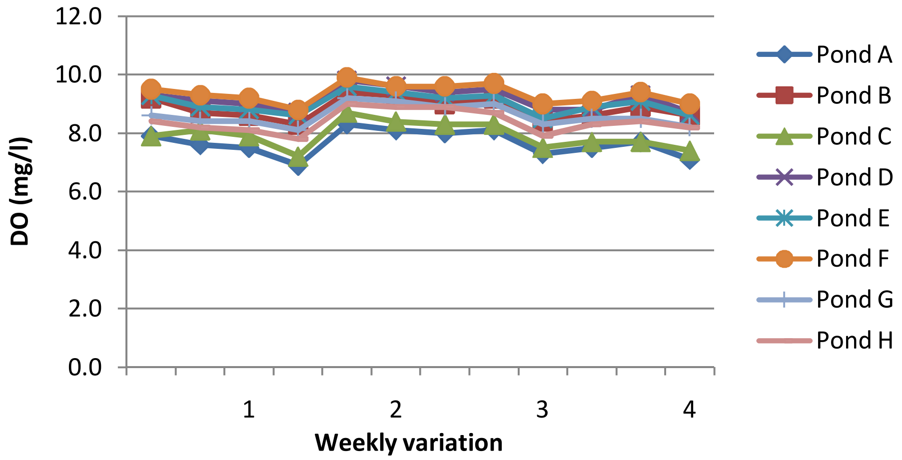

Figure 4.13: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

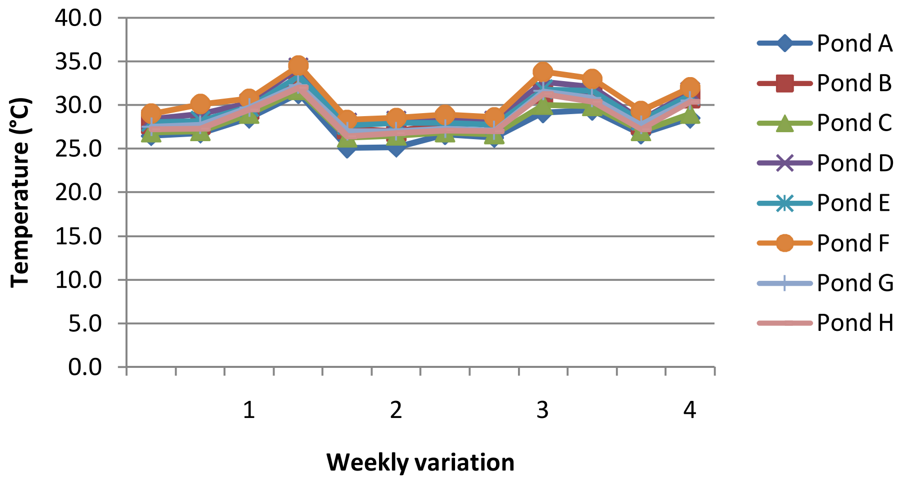

Figure 4.14: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

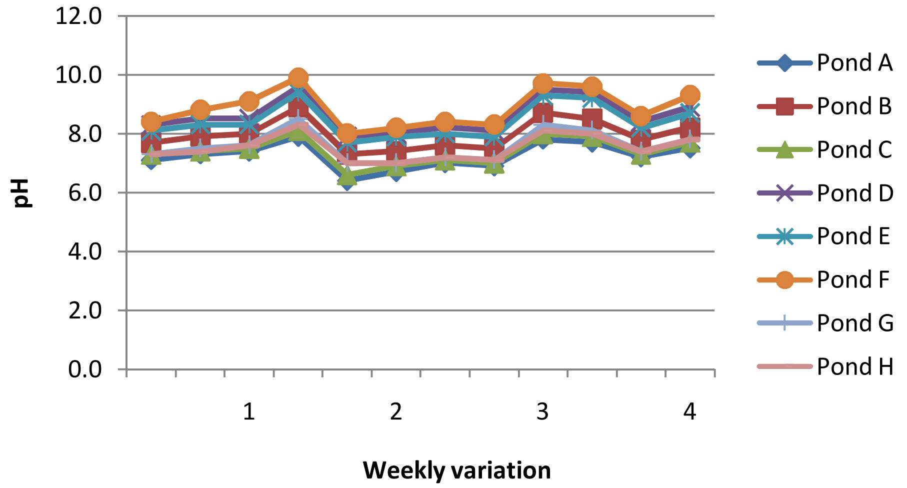

Figure 4.15: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

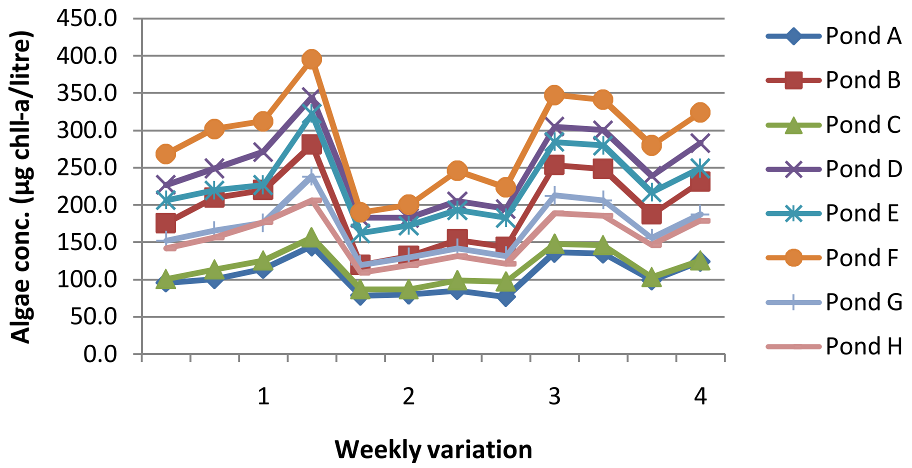

Figure 4.16: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

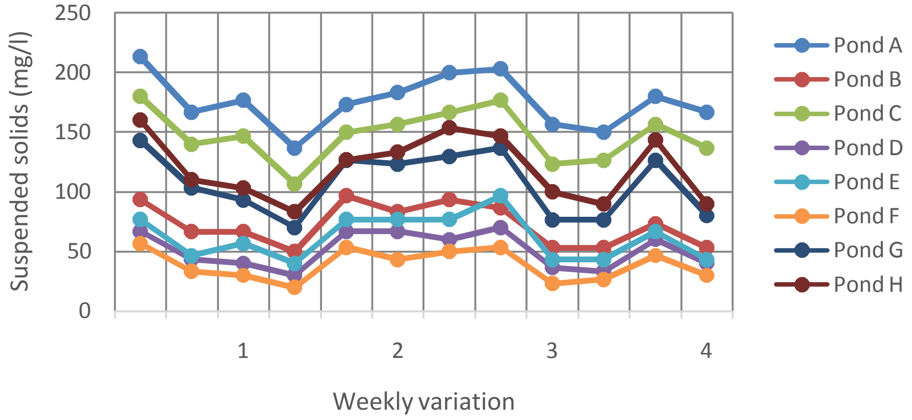

Figure 4.17: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

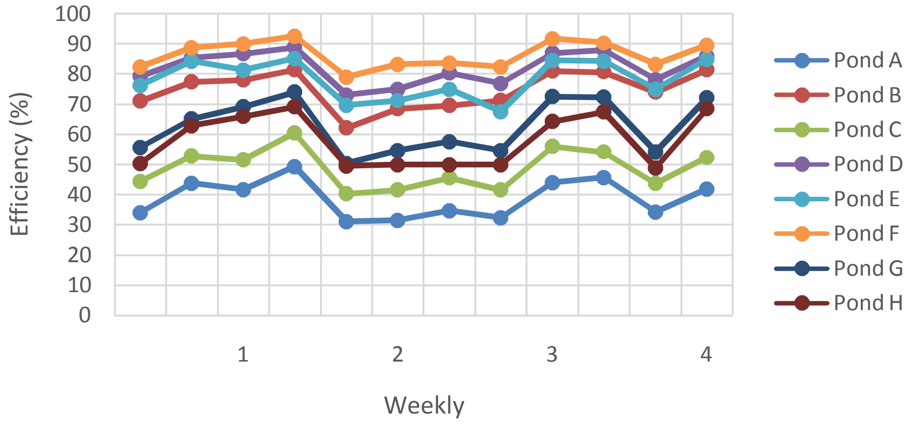

Figure 4.18: Efficiency of Suspended Solids Removal with Time (Set 1, V_2)

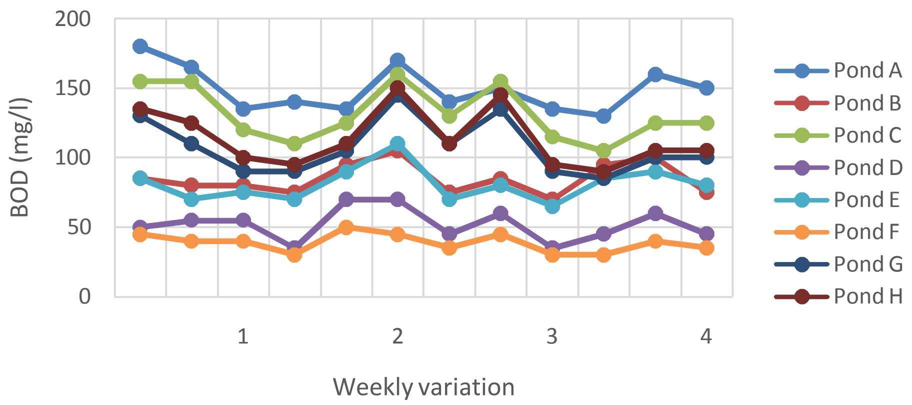

Figure 4.19: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

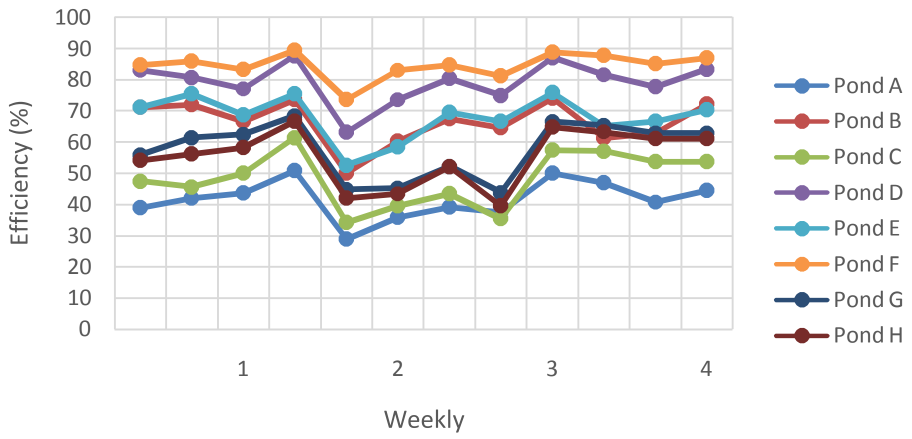

Figure 4.20: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 1, V_2)

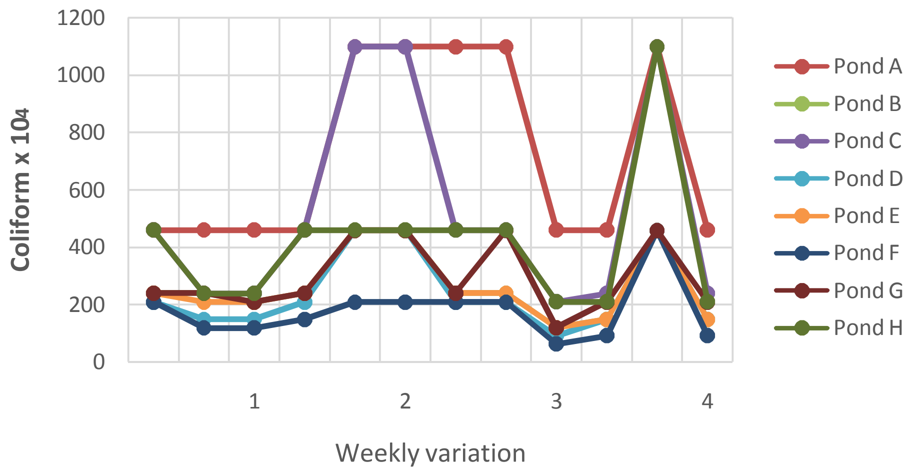

Figure 4.21: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

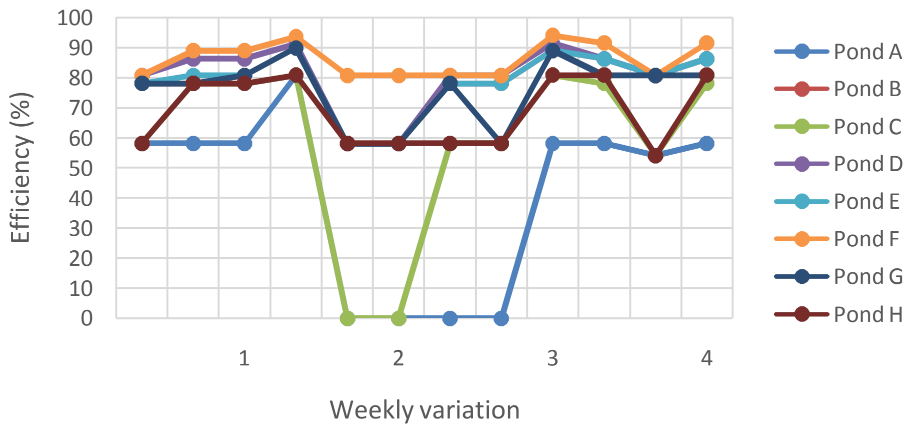

Figure 4.22: Efficiency of Coliform Removal with Time (Set 1, V_2)

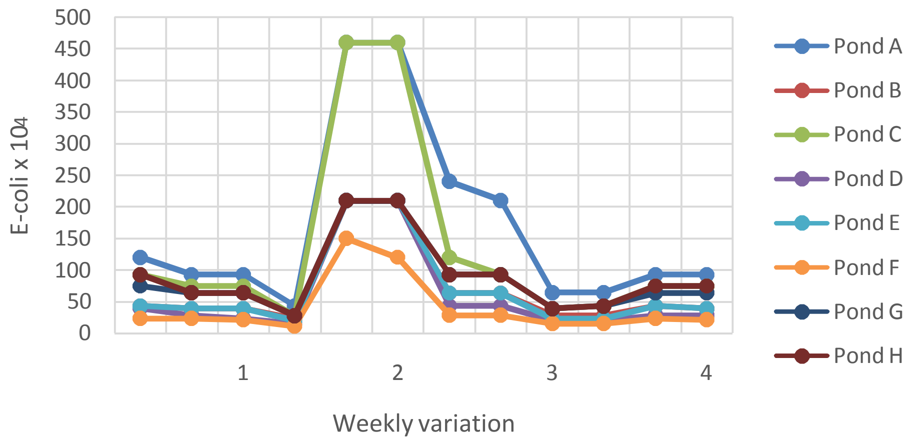

Figure 4.23: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 1, V_2)

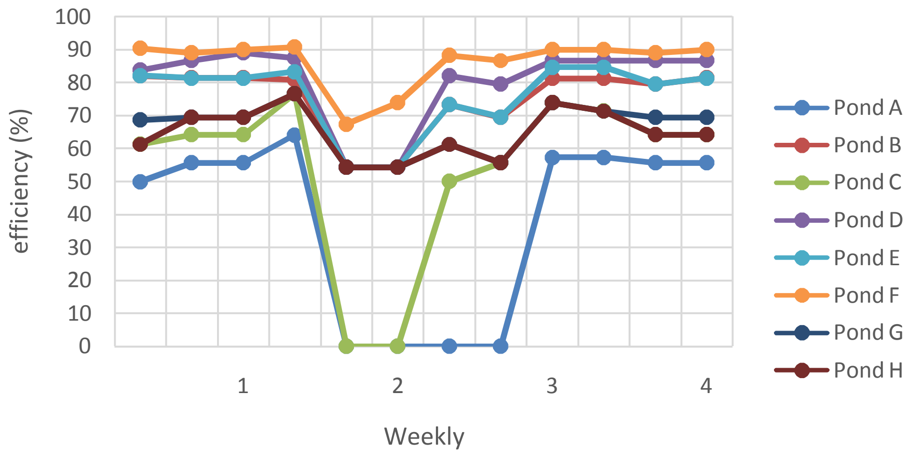

Figure 4.24: Efficiency of E-coli Removal with Time (Set 1, V_2)

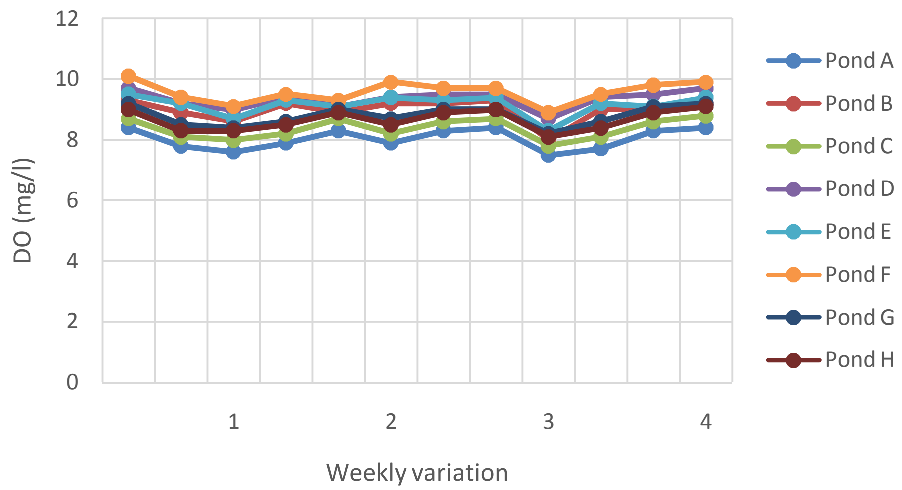

Figure 4.25: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

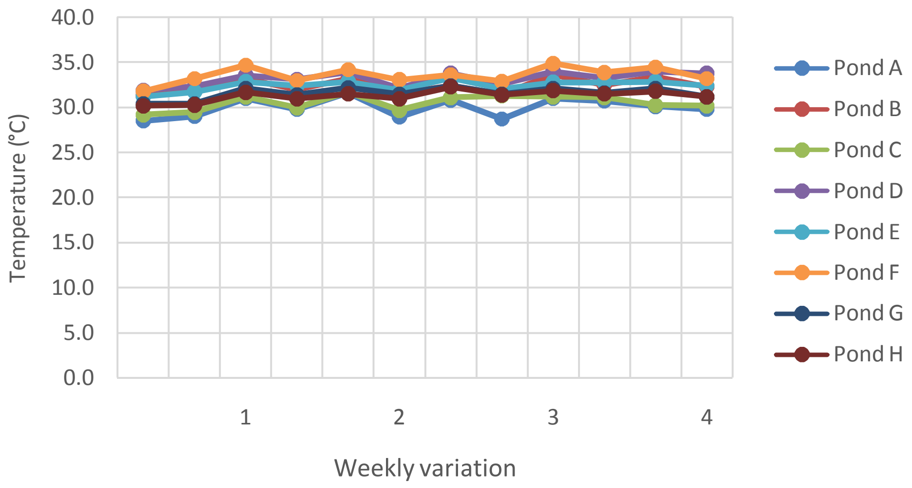

Figure 4.26: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

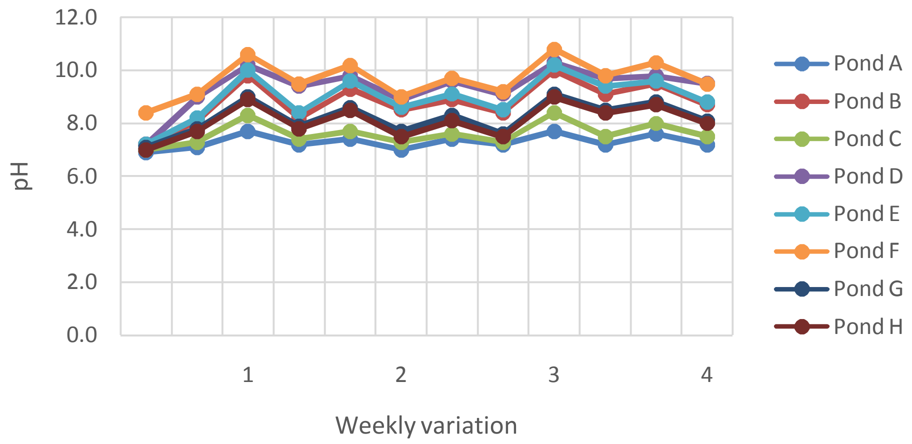

Figure 4.27: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

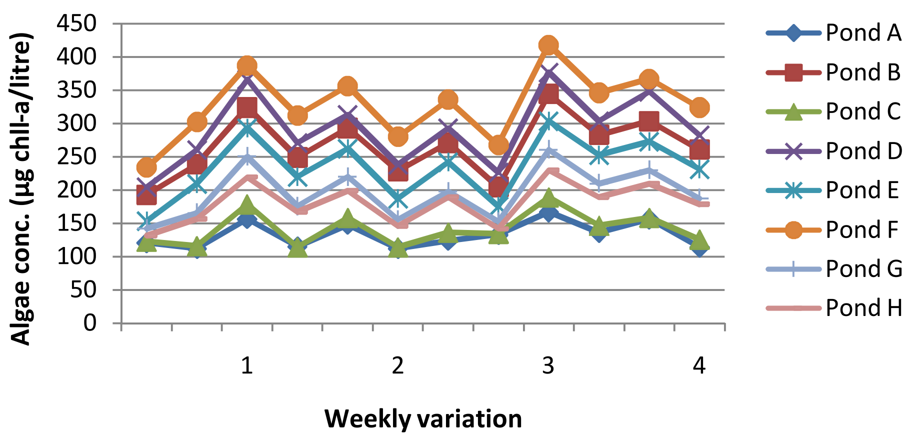

Figure 4.28: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

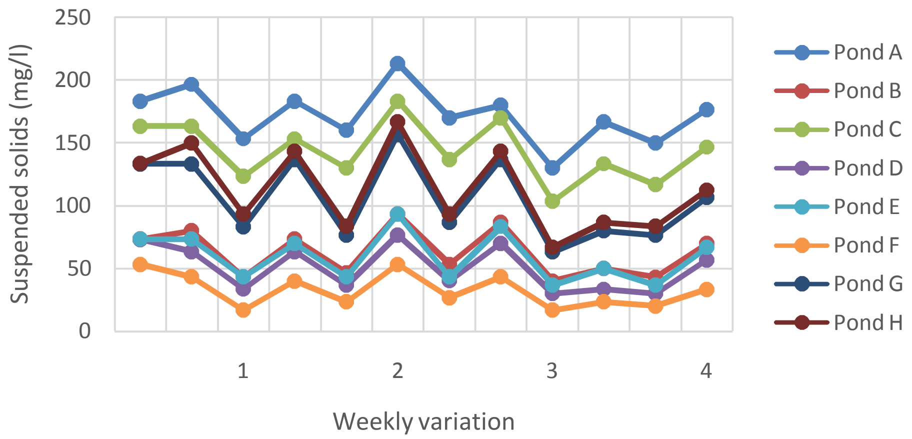

Figure 4.29: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

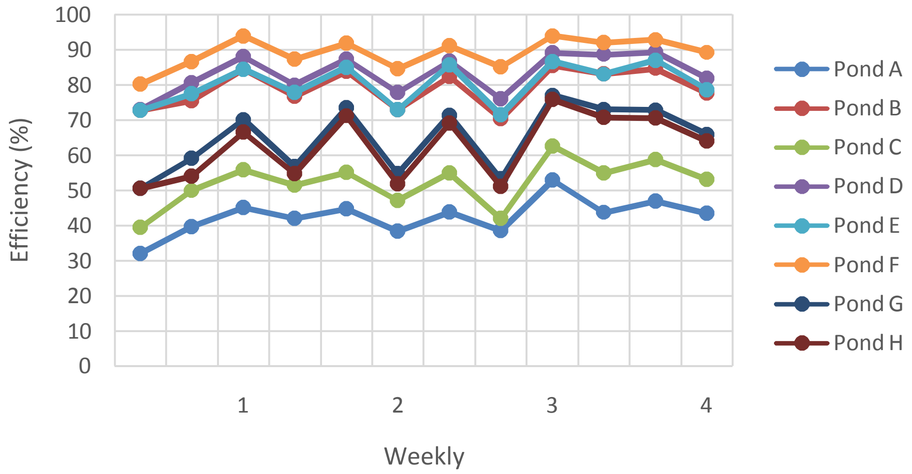

Figure 4.30: Efficiency of Suspended Solids Removal with Time (Set 1, V_3)

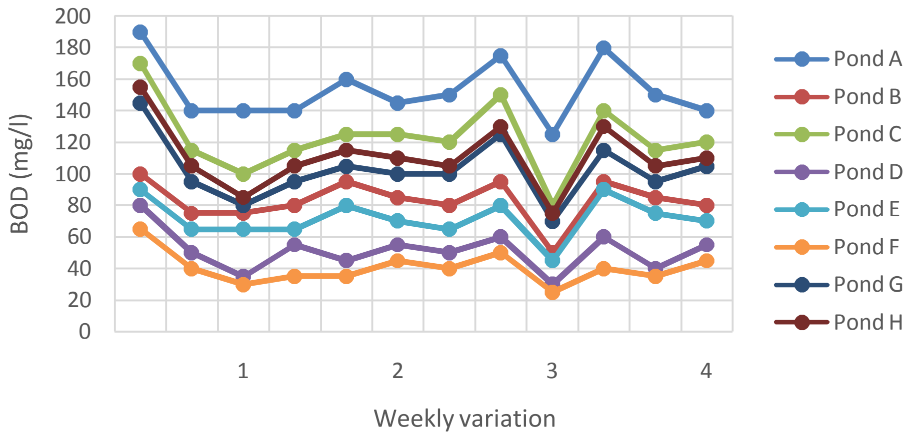

Figure 4.31: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

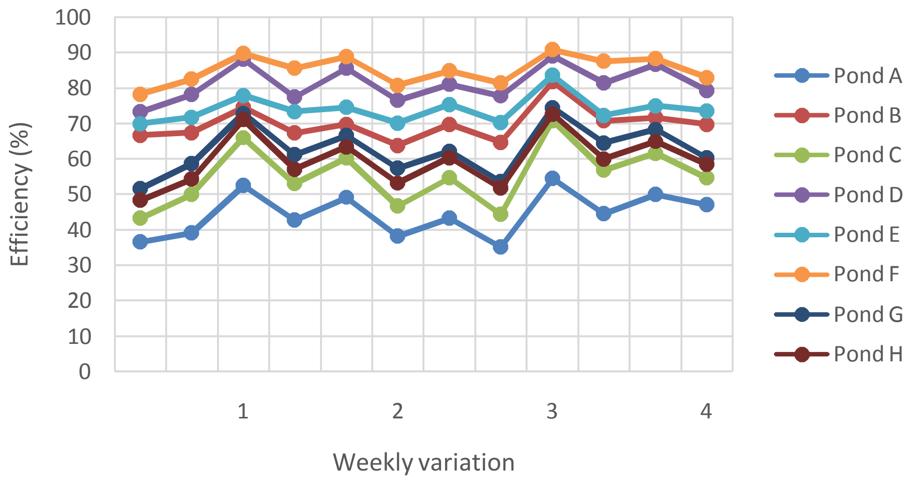

Figure 4.32: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 1, V_3)

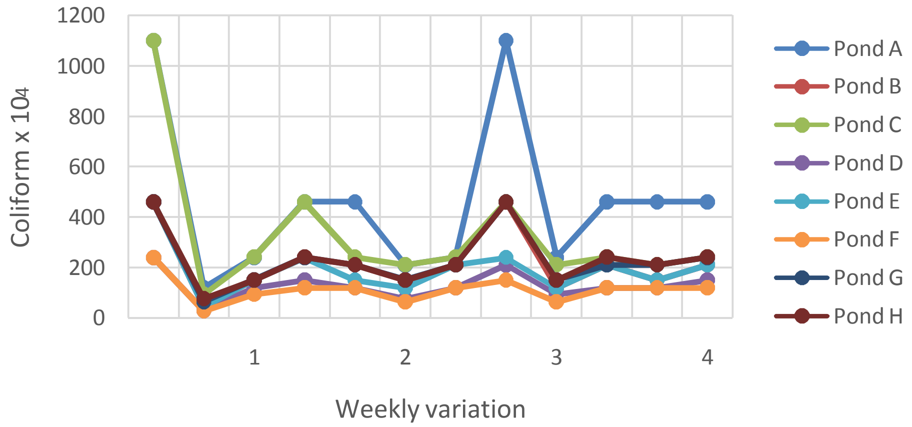

Figure 4.33: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

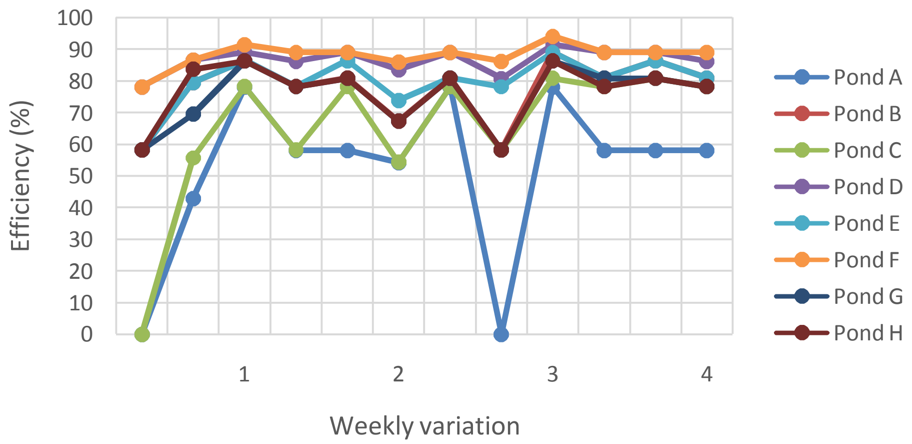

Figure 4.34: Efficiency of Coliform Removal with Time (Set 1, V_3)

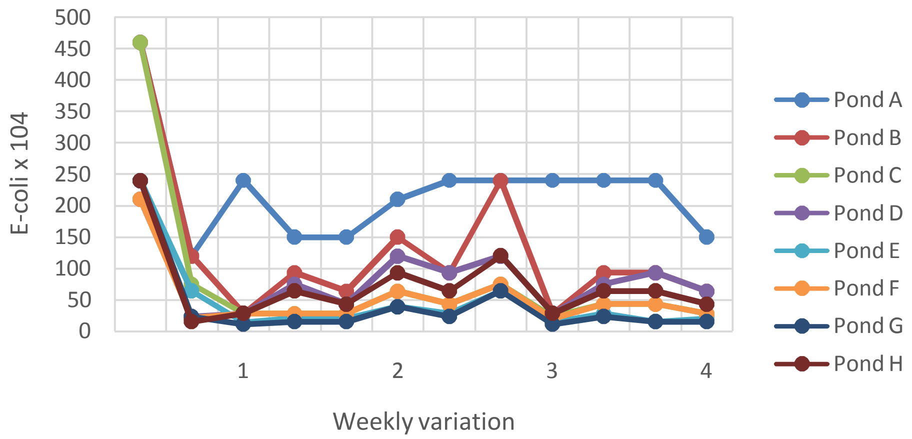

Figure 4.35: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 1, V_3)

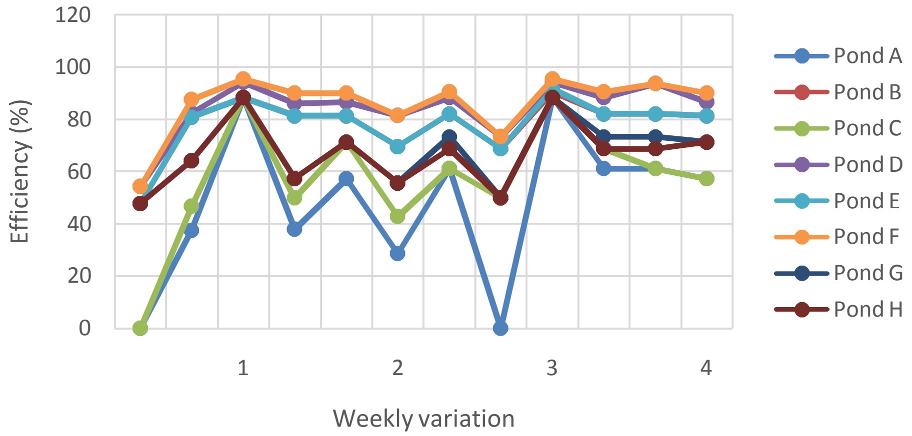

Figure 4.36: Efficiency of E-coli Removal with Time (Set 1, V_3)

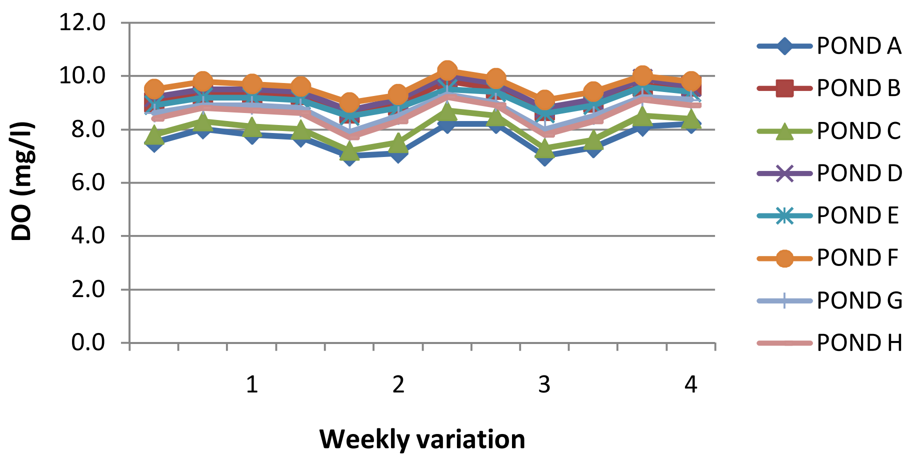

Figure 4.37: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

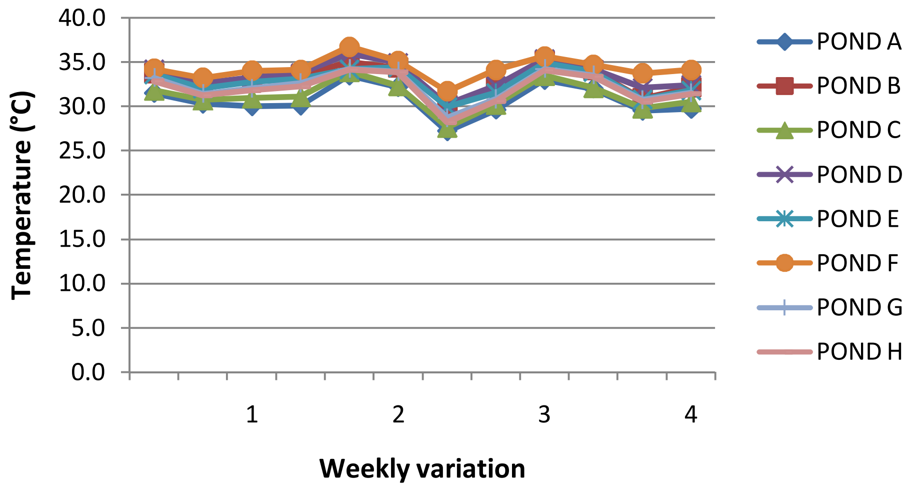

Figure 4.38: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

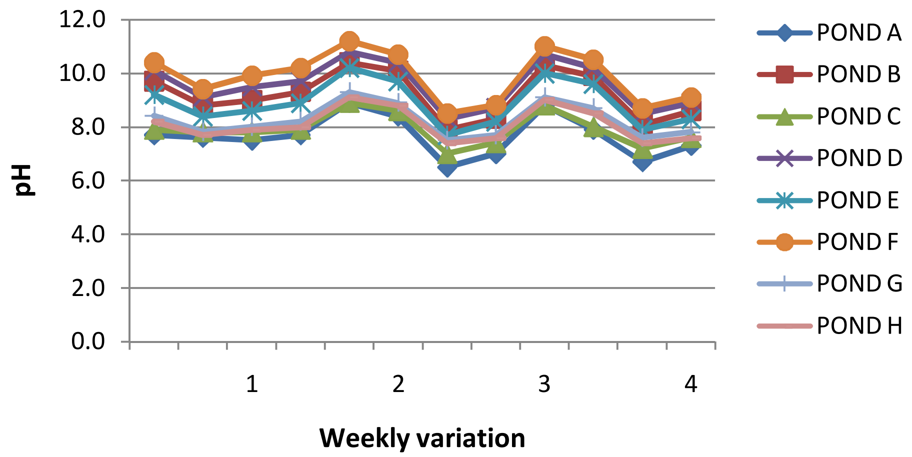

Figure 4.39: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

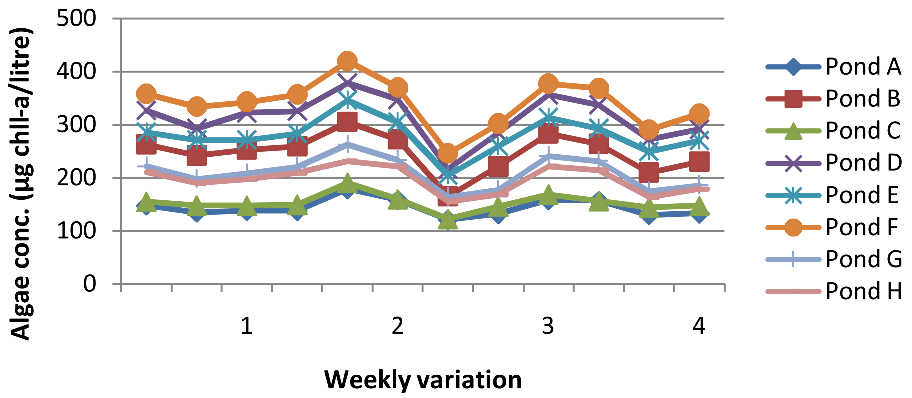

Figure 4.40: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

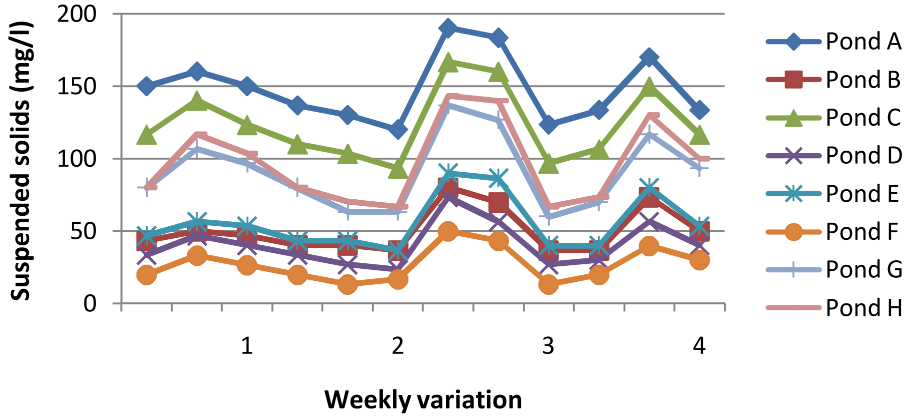

Figure 4.41: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

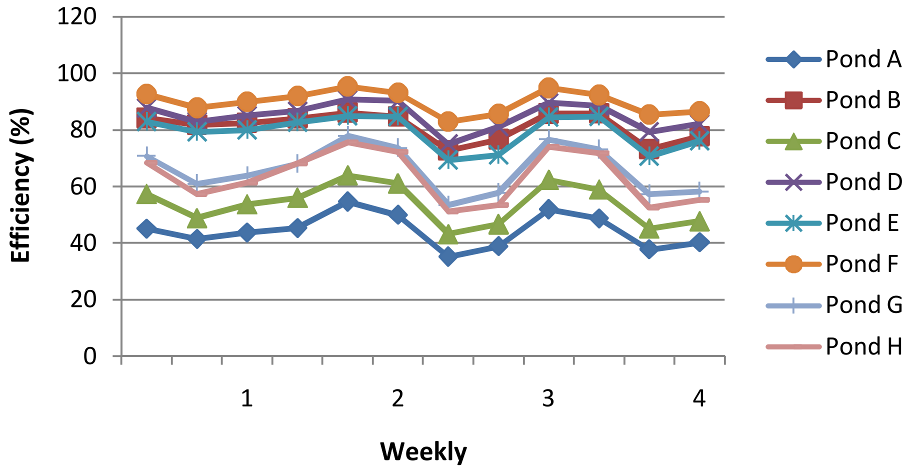

Figure 4.42: Efficiency of Suspended Solids Removal with Time (Set 2, V_1)

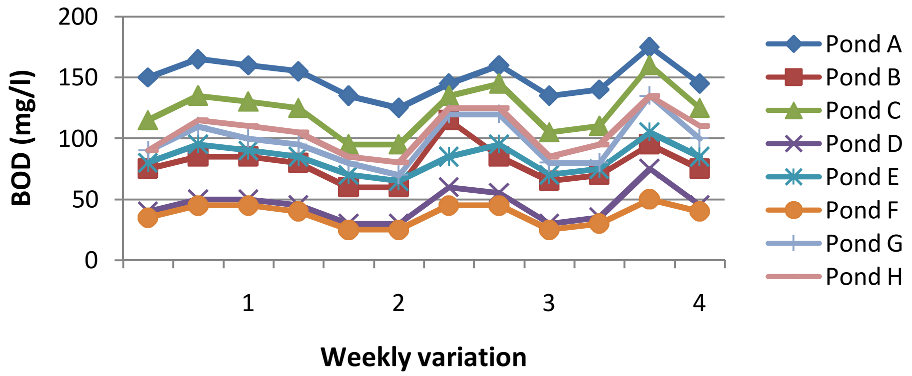

Figure 4.43: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

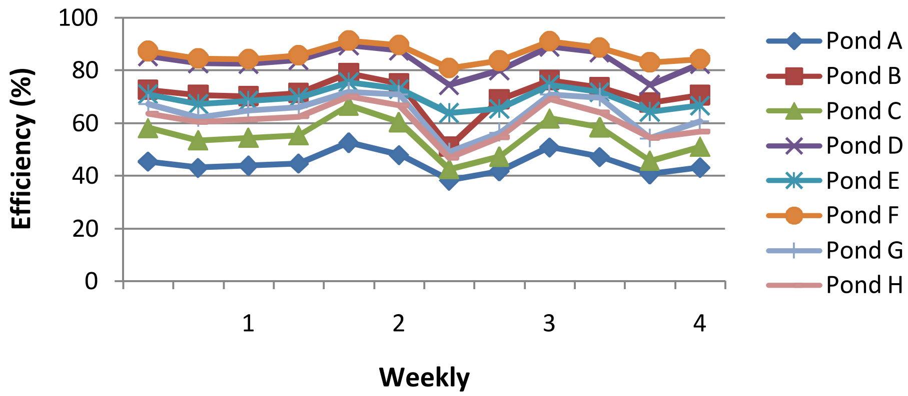

Figure 4.44: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 2, V_1)

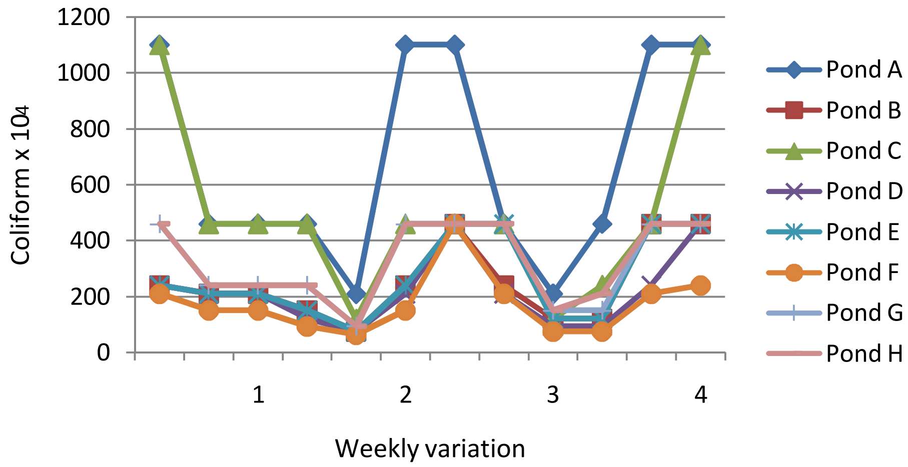

Figure 4.45: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

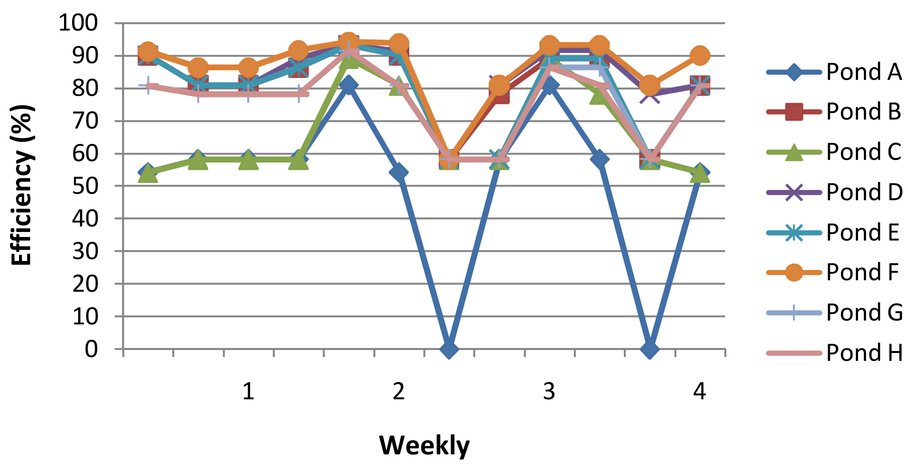

Figure 4.46: Efficiency of Coliform Removal with Time (Set 2, V_1)

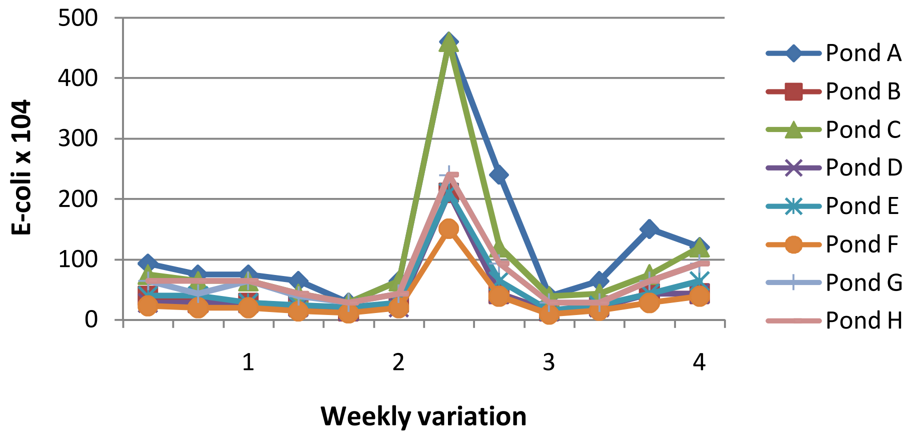

Figure 4.47: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 2, V_1)

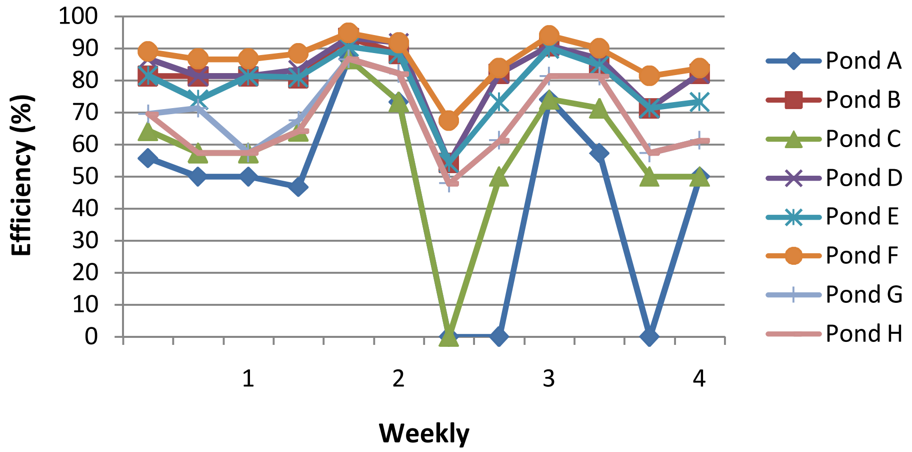

Figure 4.48: Efficiency of E-coli Removal with Time (Set 2, V_1)

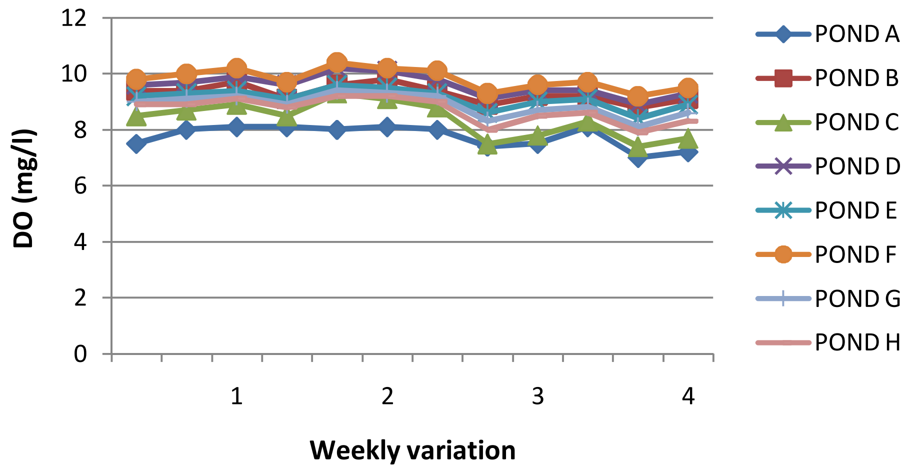

Figure 4.49: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

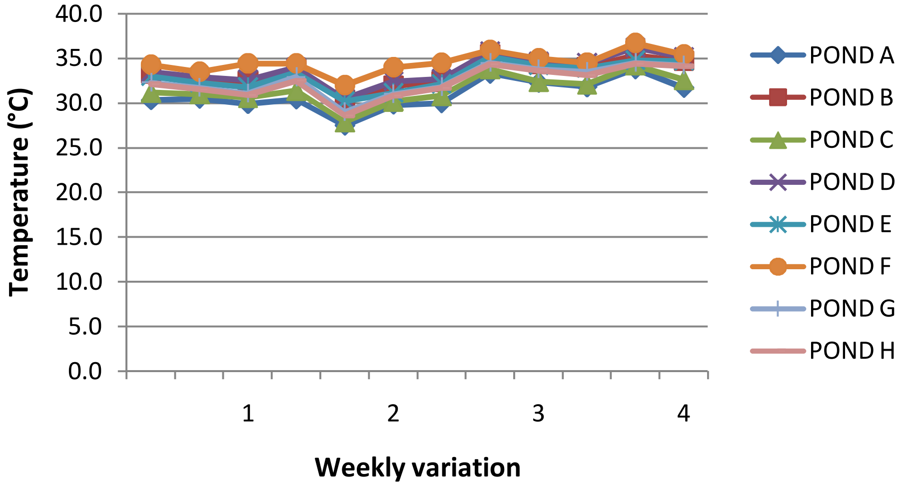

Figure 4.50: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

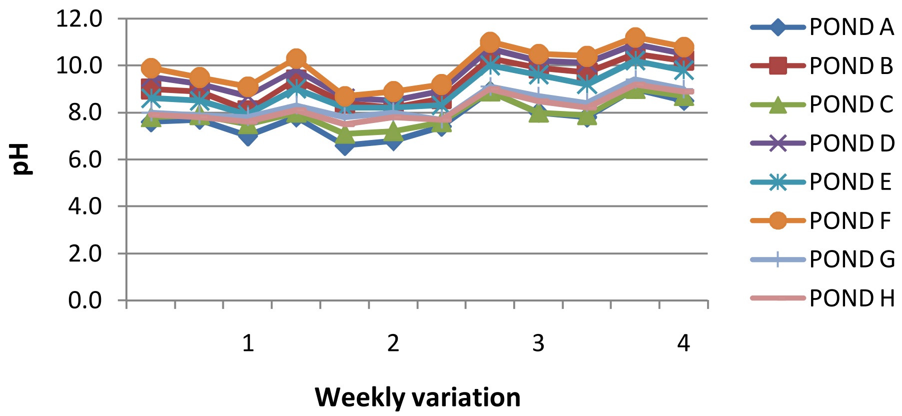

Figure 4.51: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

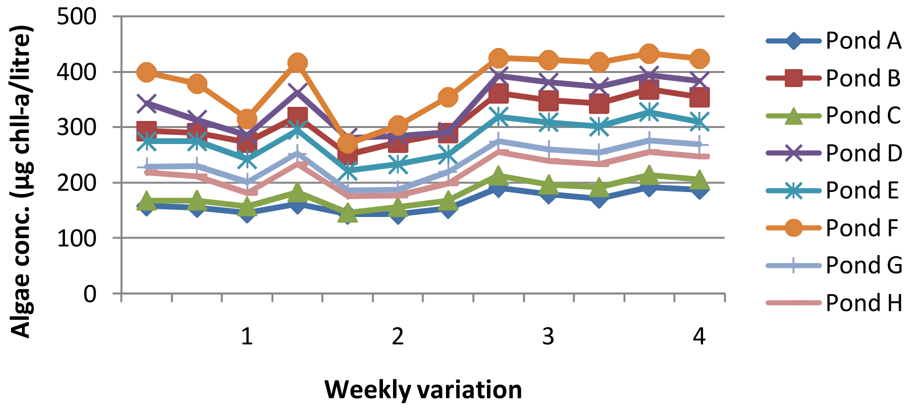

Figure 4.52: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

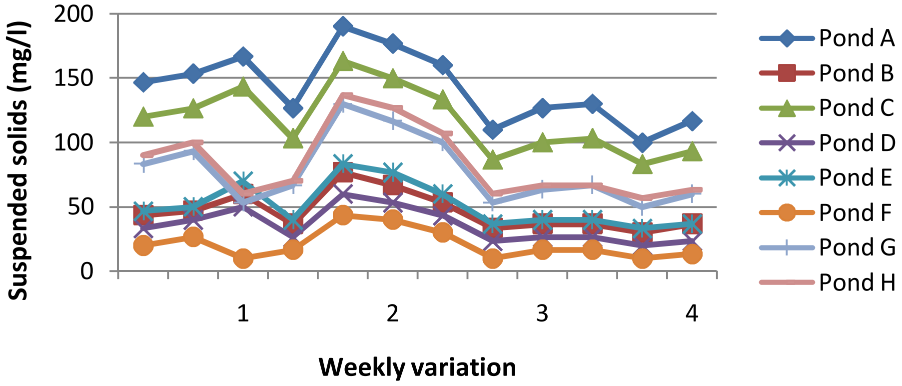

Figure 4.53: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

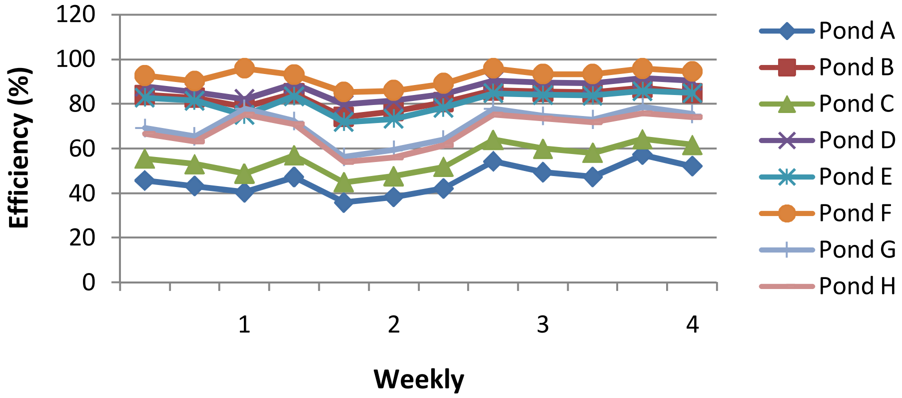

Figure 4.54: Efficiency of Suspended Solids Removal with Time (Set 2, V_2)

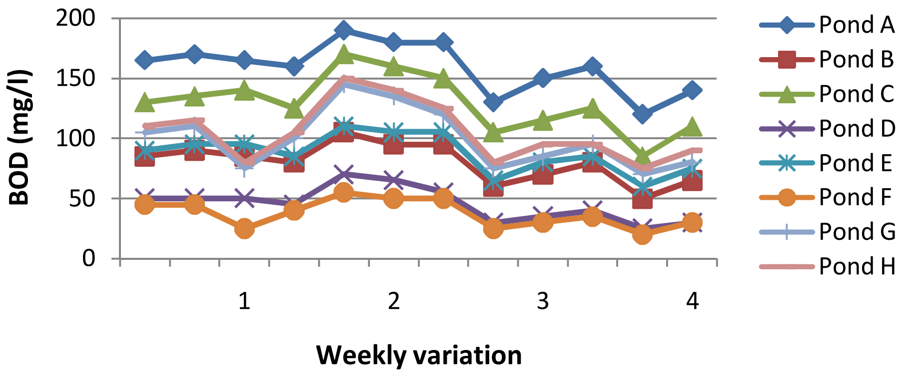

Figure 4.55: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

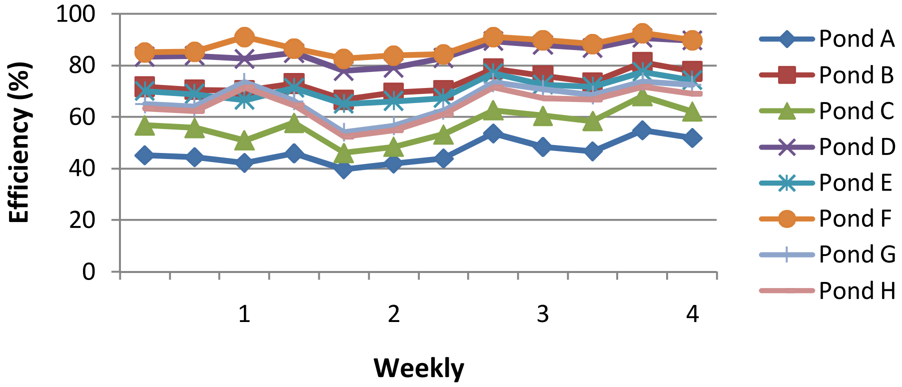

Figure 4.56: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 2, V_2)

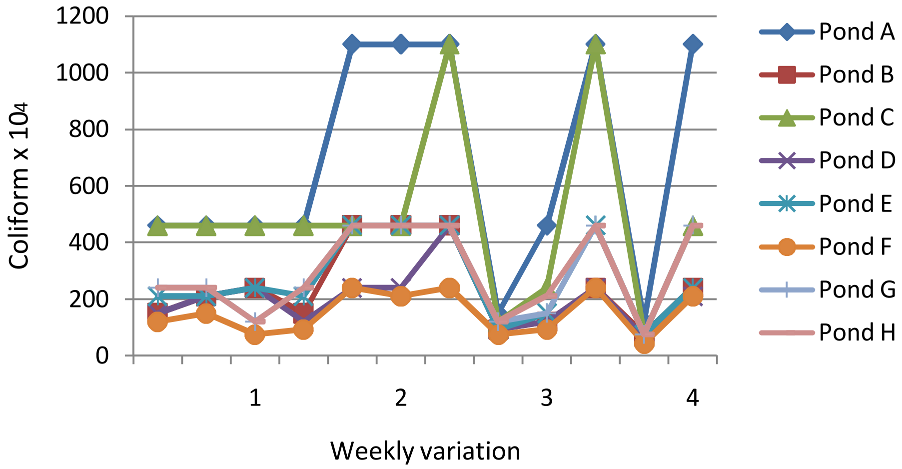

Figure 4.57: Weekly Coliform Variation in ISHJEWSP Effluent with Time (Set 2, V_2)

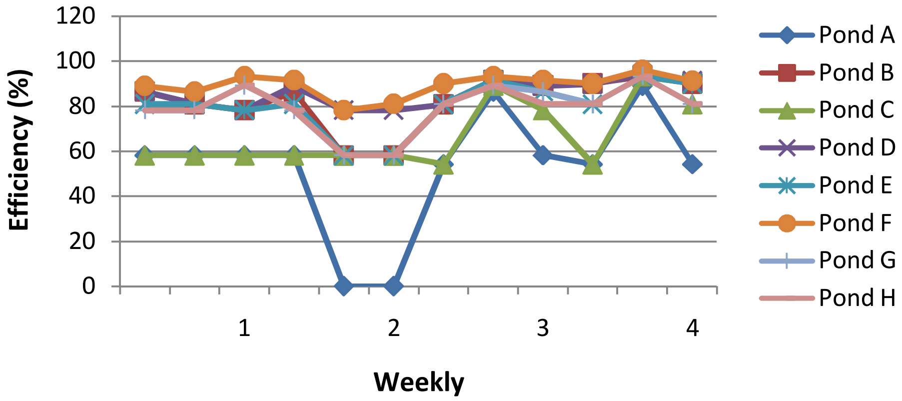

Figure 4.58: Efficiency of Coliform Removal with Time (Set 2, V_2)

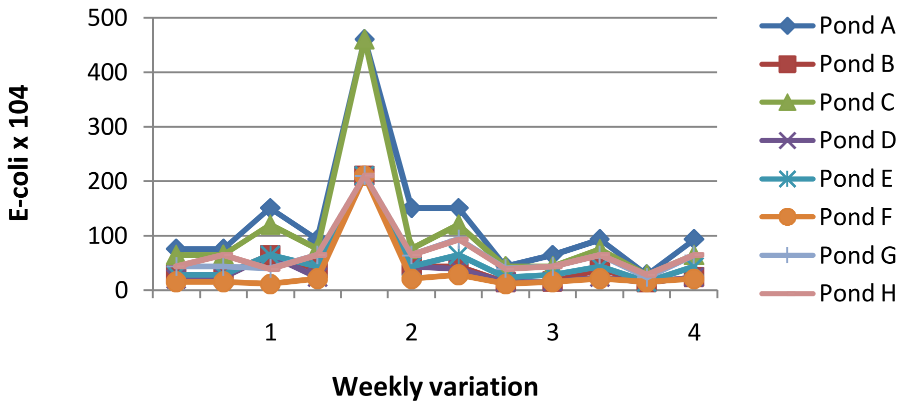

Figure 4.59: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 2, V_2)

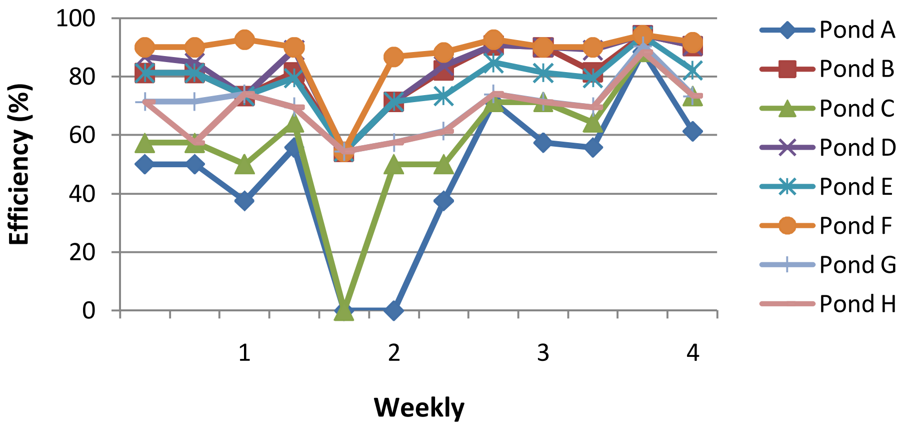

Figure 4.1.60: Efficiency of E-coli Removal with Time (Set 2, V_2)

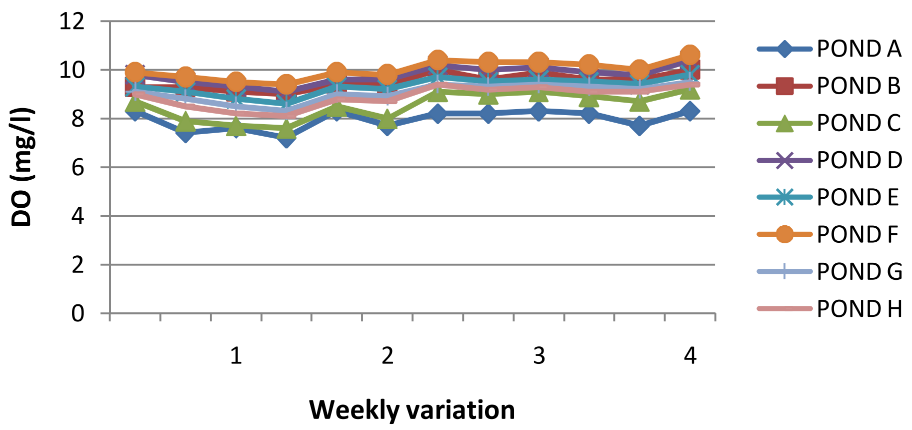

Figure 4.61: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

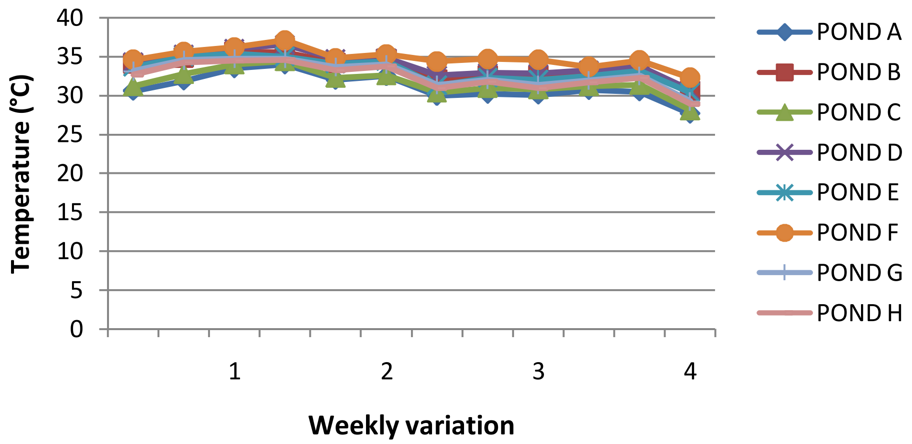

Figure 4.62: Weekly Temperature Variation in ISHJEWSs Effluent with Time (Set 2, V_3)

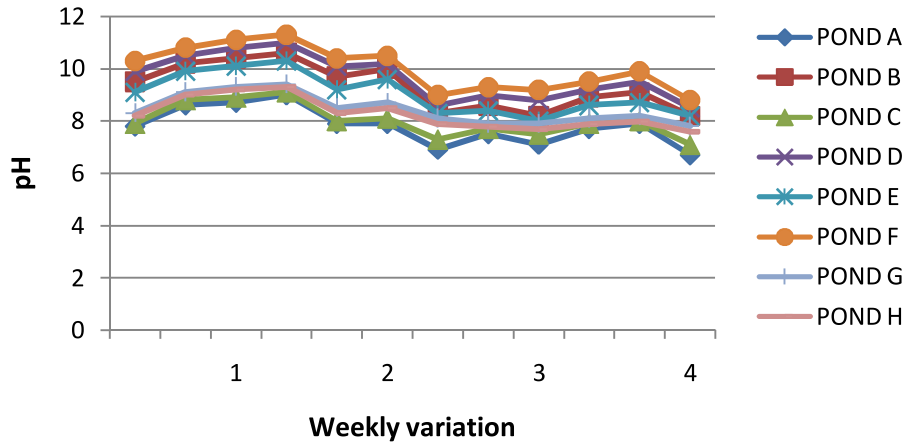

Figure 4.63: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

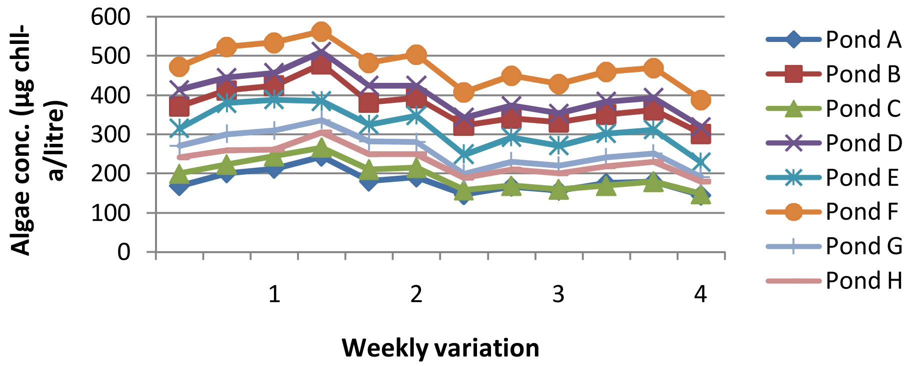

Figure 4.64: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

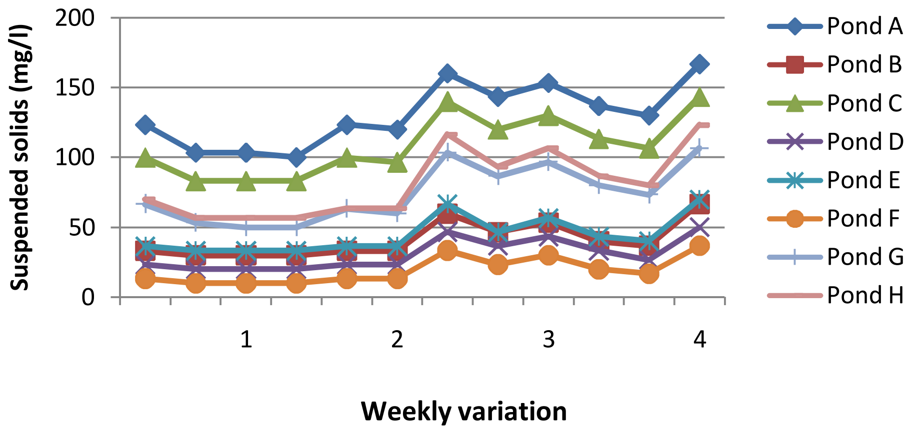

Figure 4.65: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

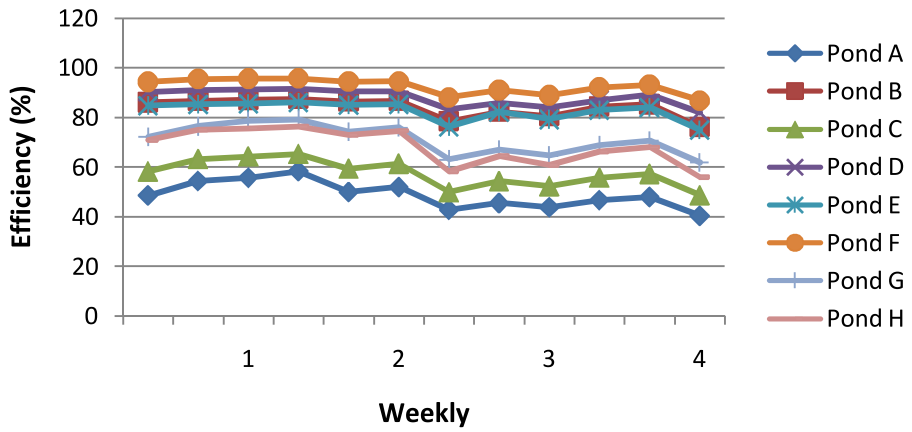

Figure 4.66: Efficiency of Suspended Solids Removal with Time (Set 2, V_3)

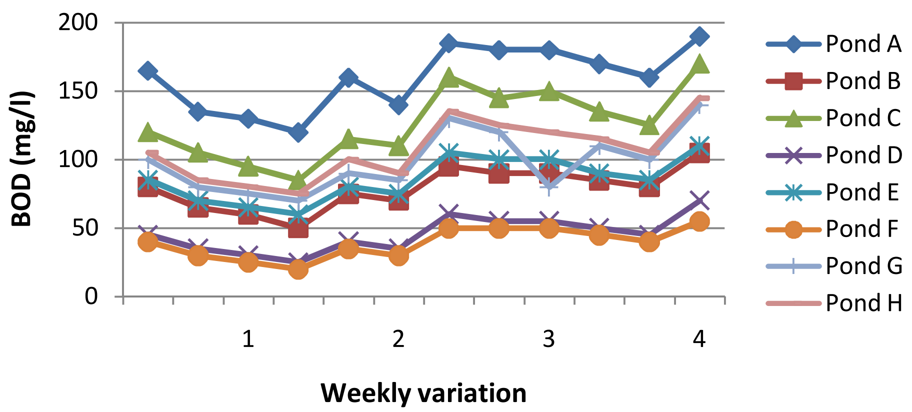

Figure 4.67: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

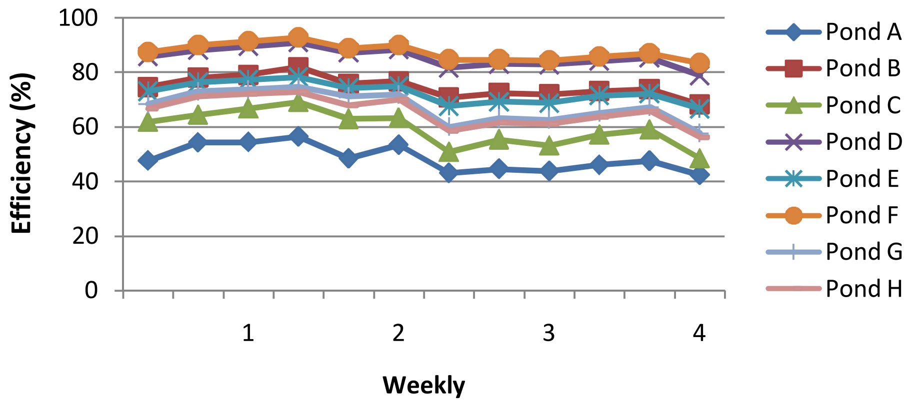

Figure 4.68: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 2, V_3)

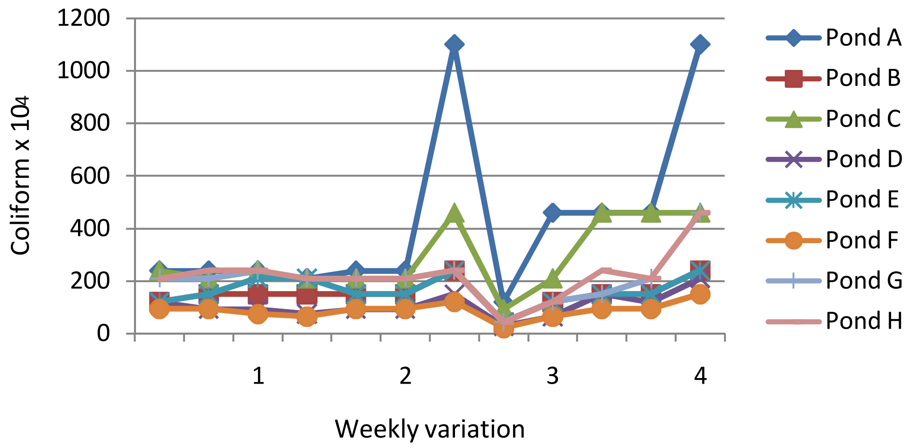

Figure 4.69: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

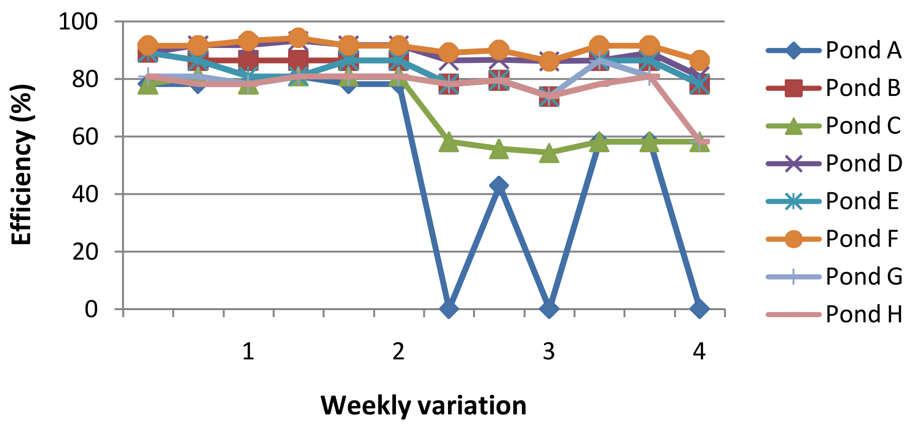

Figure 4.70: Efficiency of Coliform Removal with Time (Set 2, V_3)

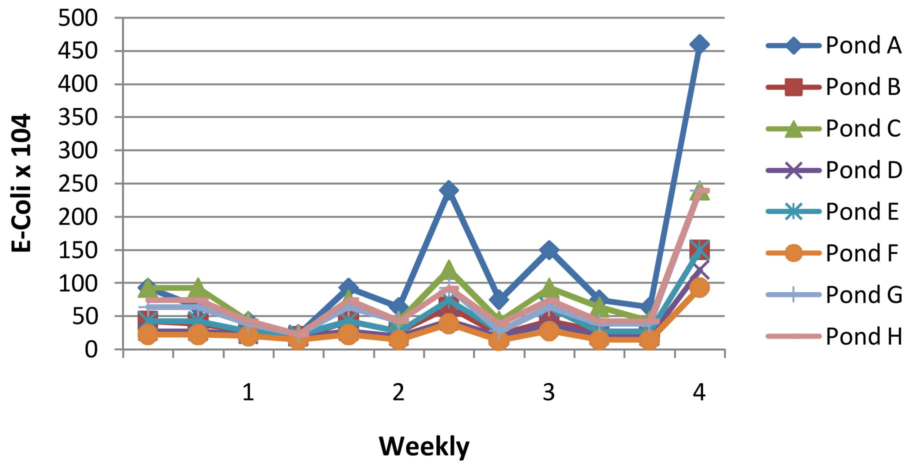

Figure 4.71: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 2, V_3)

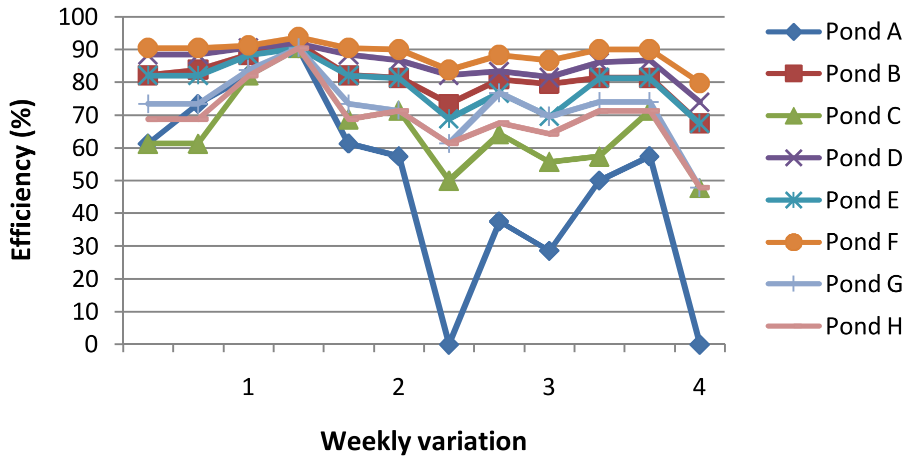

Figure 4.72: Efficiency of E-coli Removal with Time (Set 2, V_3)

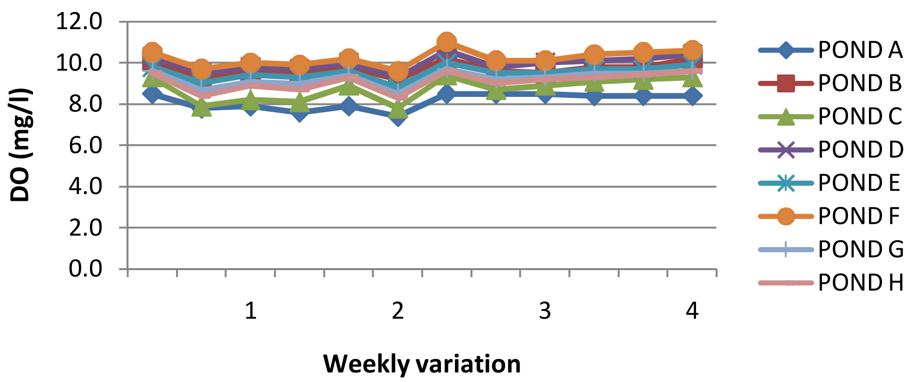

Figure 4.73: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

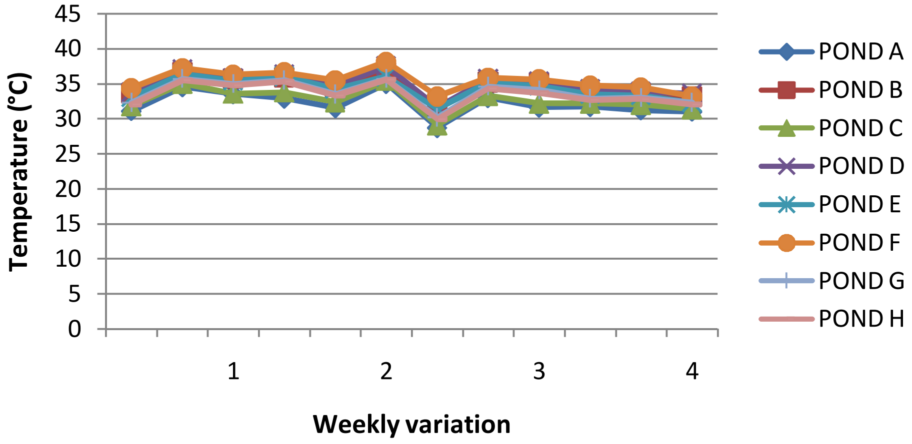

Figure 4.74: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

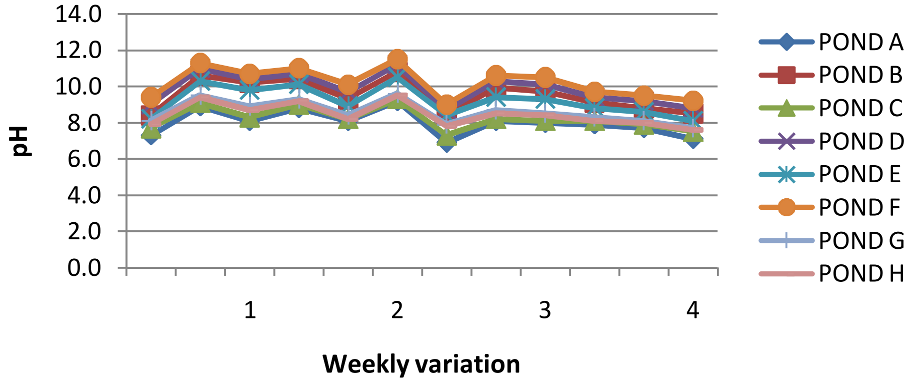

Figure 4.75: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

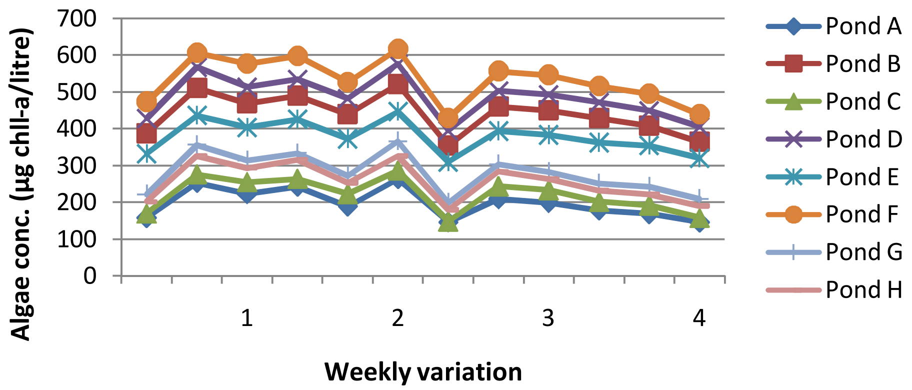

Figure 4.76: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

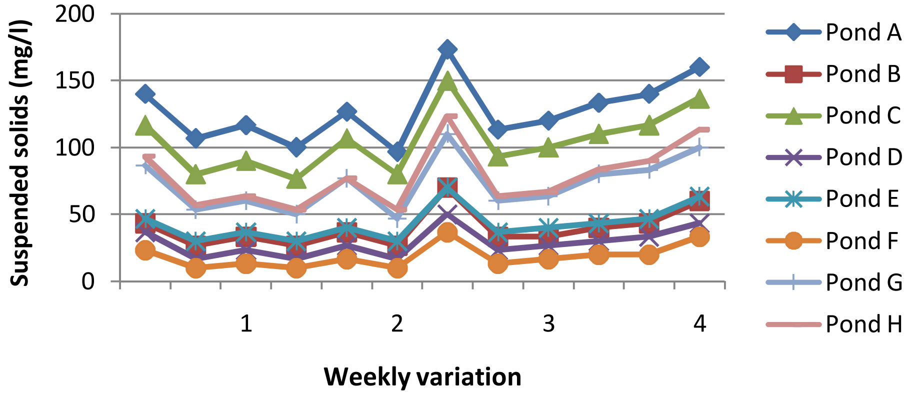

Figure 4.77: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

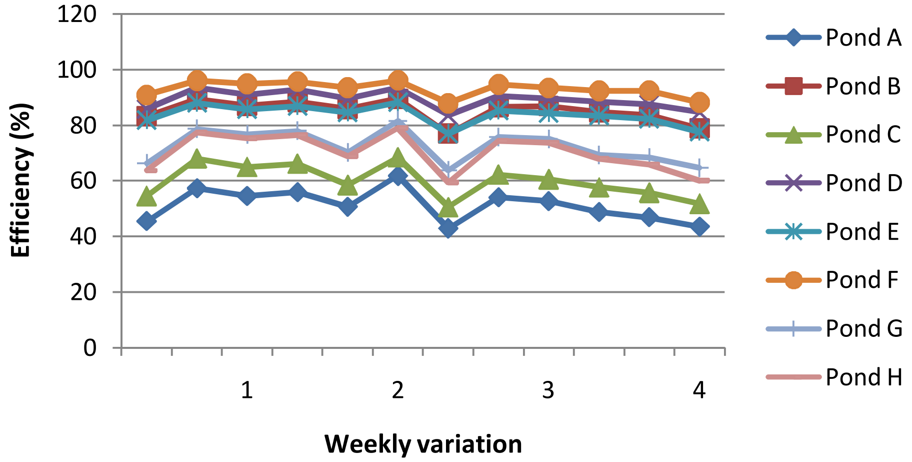

Figure 4.78: Efficiency of Suspended Solids Removal with Time (Set 3, V_1)

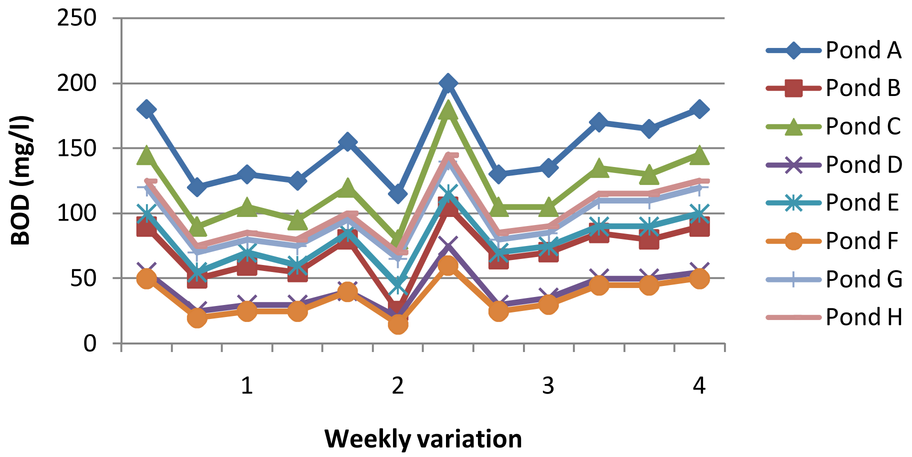

Figure 4.79: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

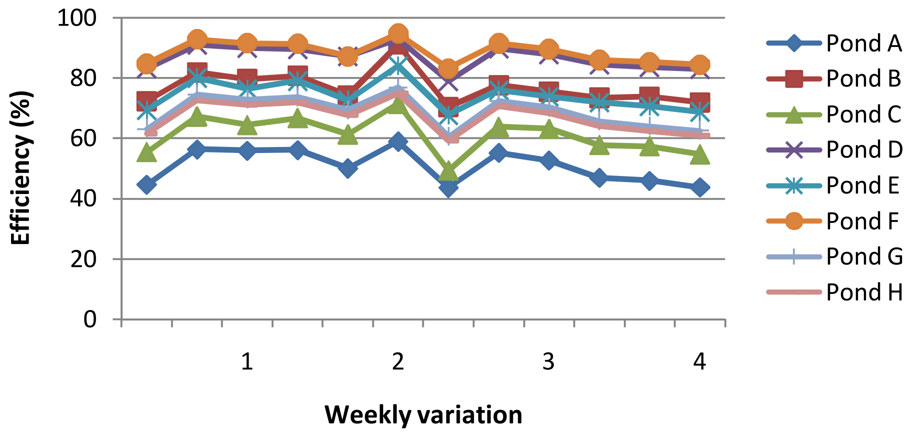

Figure 4.80: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 3, V_1)

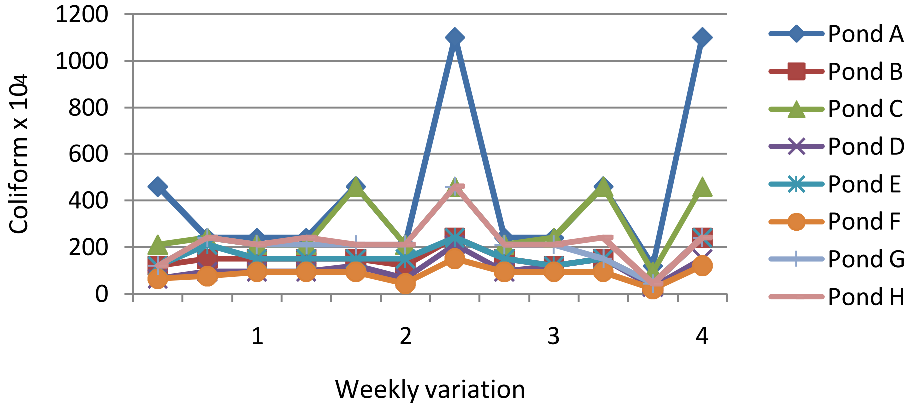

Figure 4.81: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

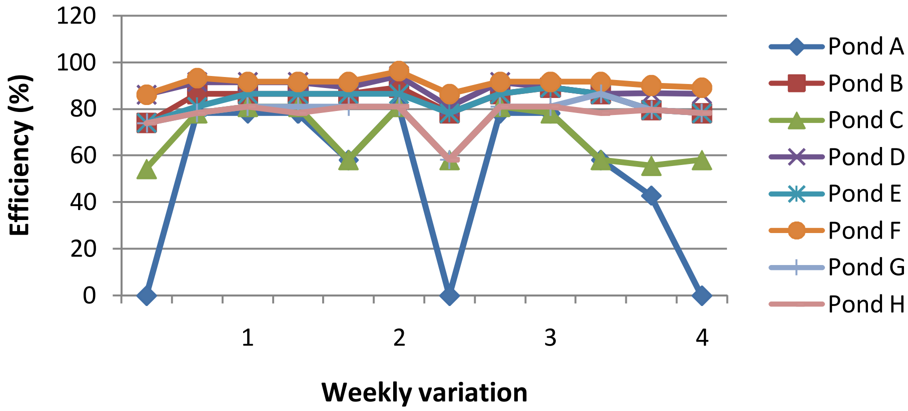

Figure 4.82: Efficiency of Coliform Removal with Time (Set 3, V_1)

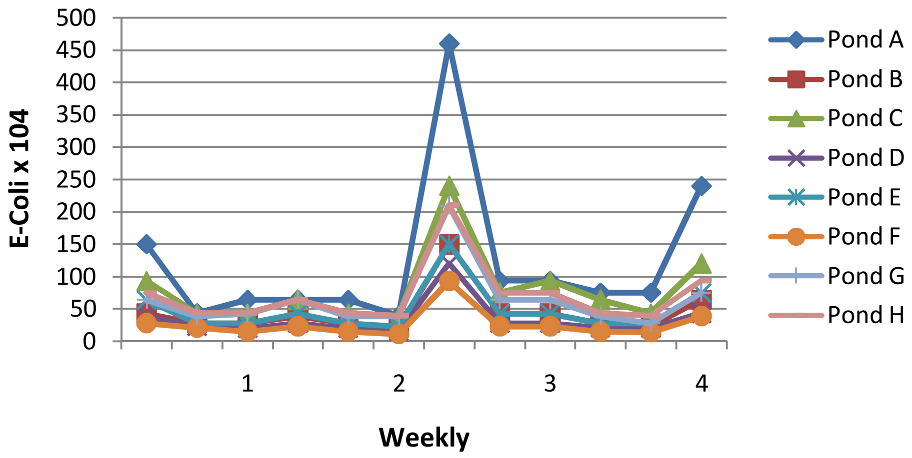

Figure 4.83: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 3, V_1)

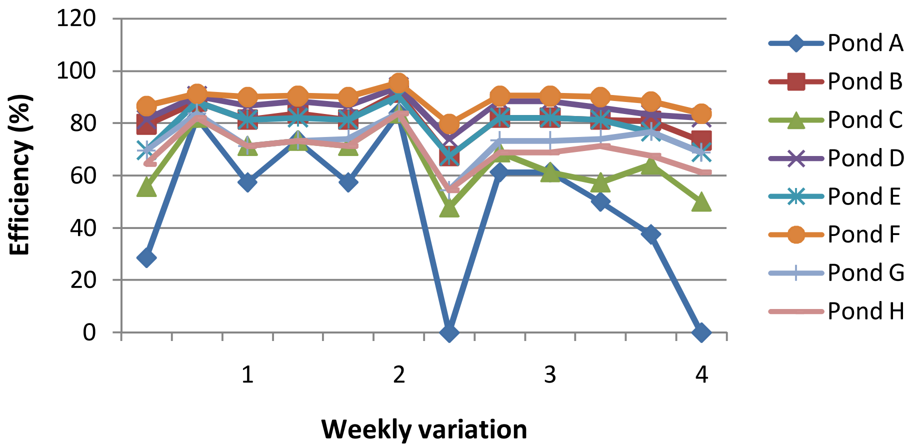

Figure 4.84: Efficiency of E-coli Removal with Time (Set 3, V_1)

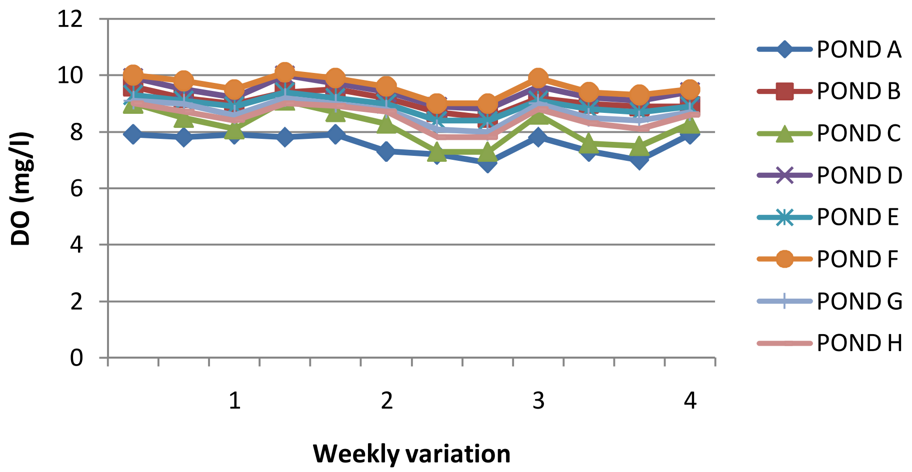

Figure 4.85: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

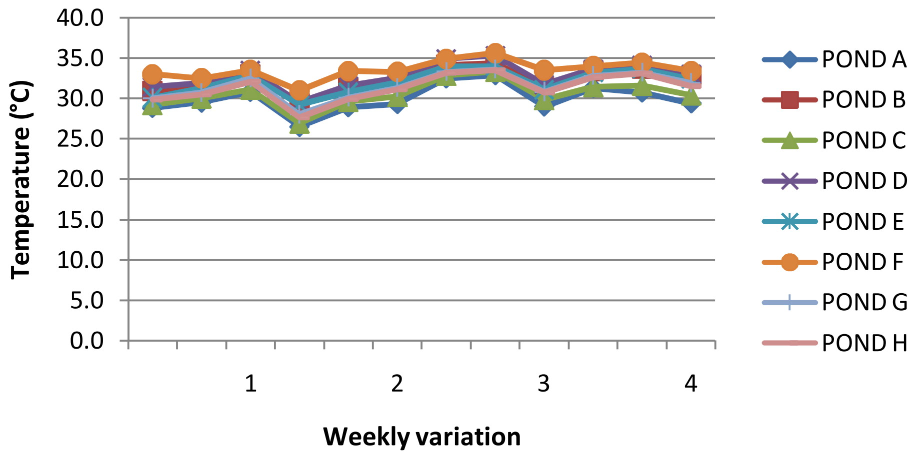

Figure 4.86: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

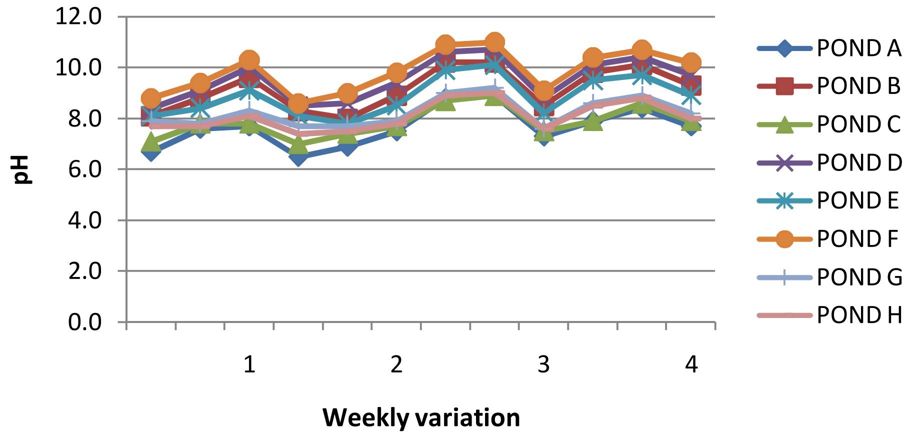

Figure 4.87: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

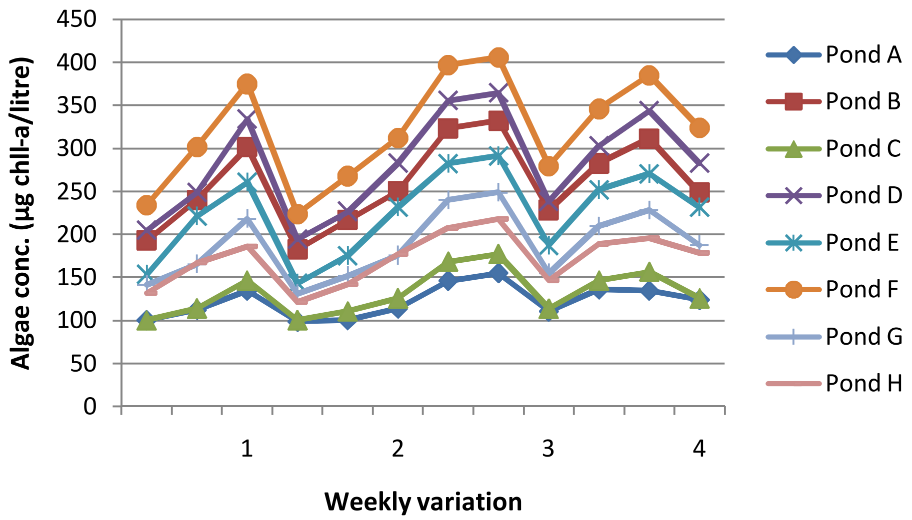

Figure 4.88: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

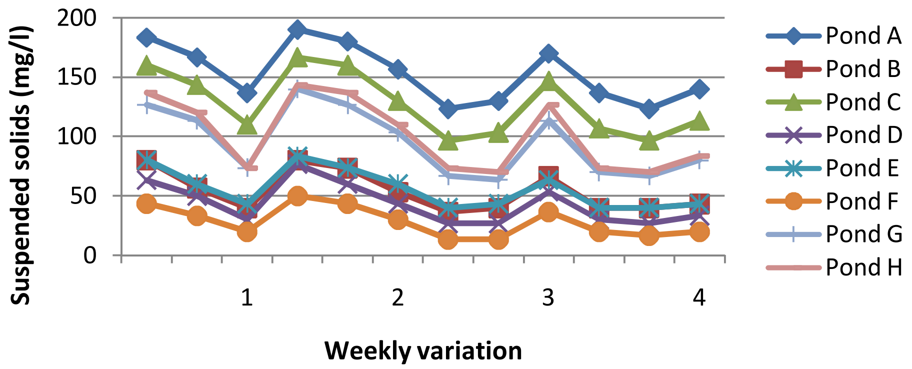

Figure 4.89: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

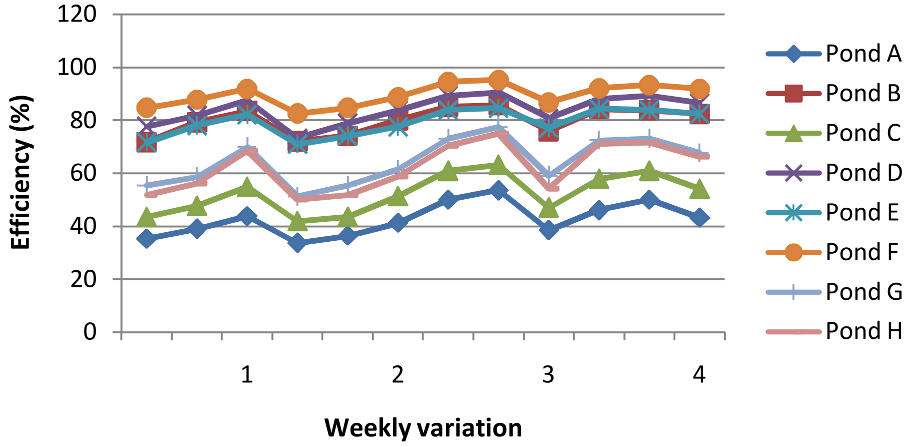

Figure 4.90: Efficiency of Suspended Solids Removal with Time (Set 3, V_2)

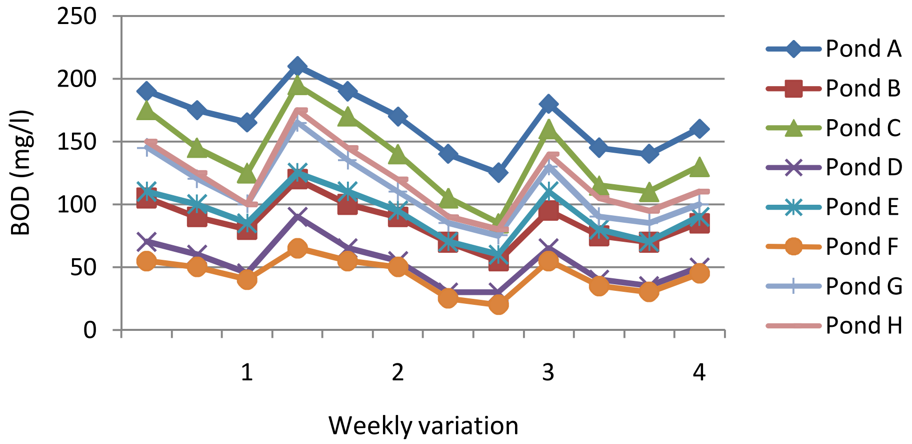

Figure 4.91: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

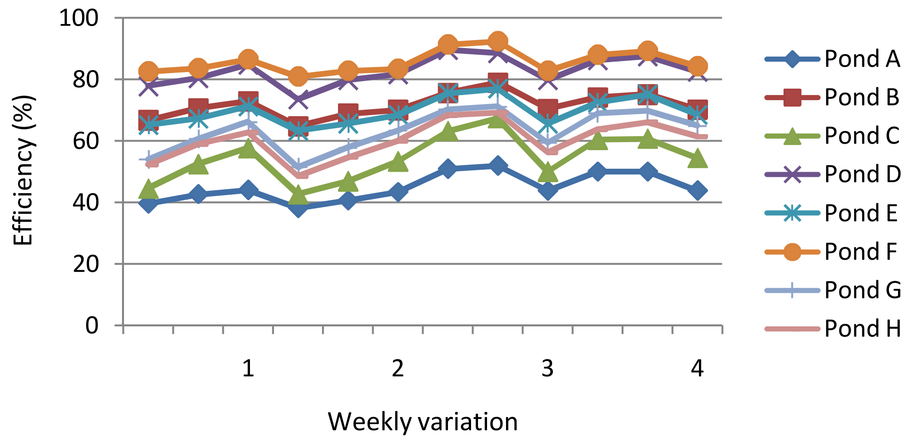

Figure 4.92: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 3, V_2)

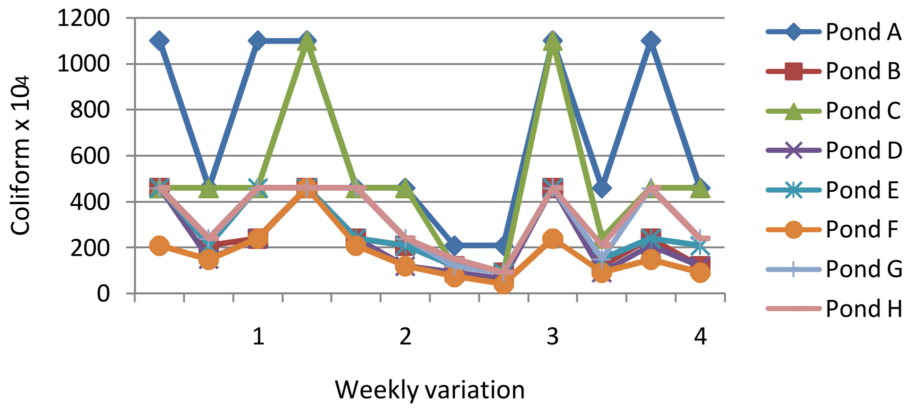

Figure 4.93: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

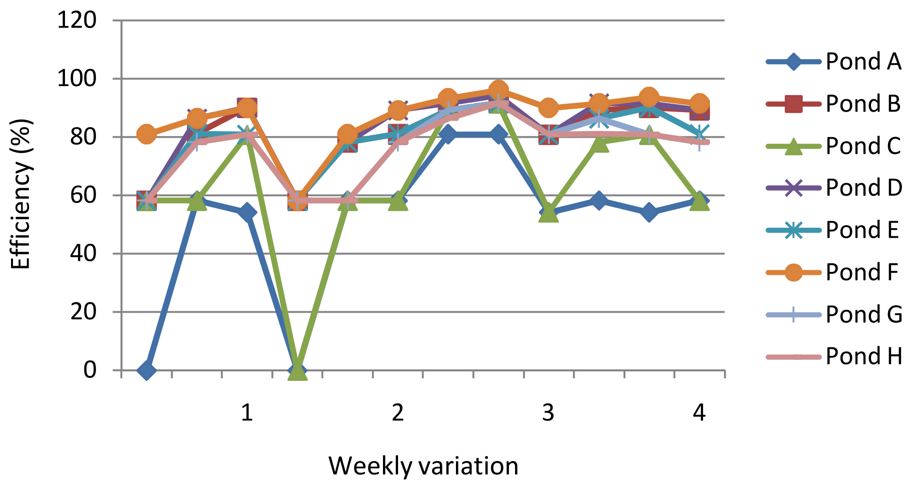

Figure 4.94: Efficiency of Coliform Removal with Time (Set 3, V_2)

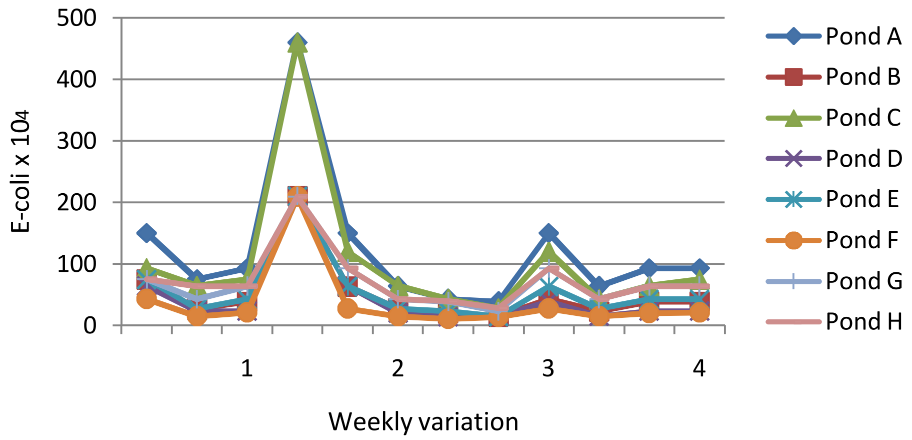

Figure 4.95: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

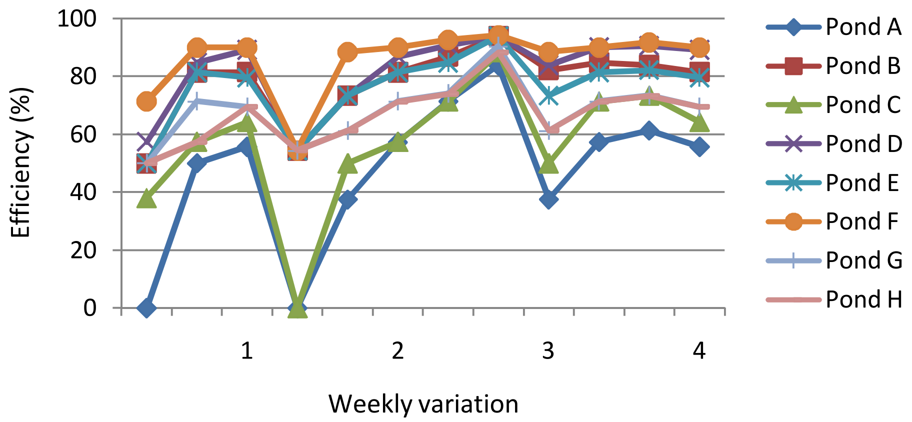

Figure 4.96: Efficiency of E-coli Removal with Time (Set 3, V_2)

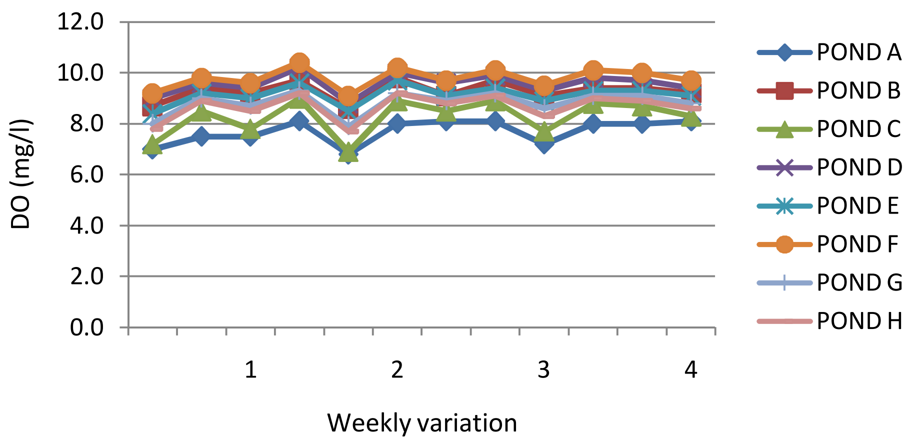

Figure 4.97: Weekly Dissolved Oxygen Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

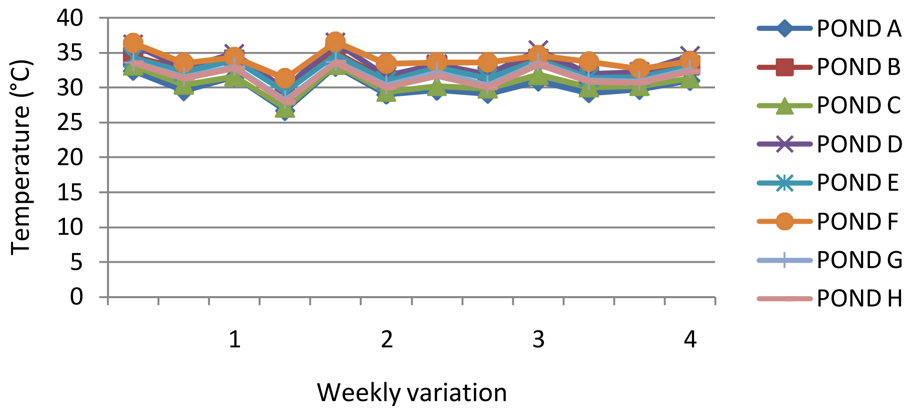

Figure 4.98: Weekly Temperature Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

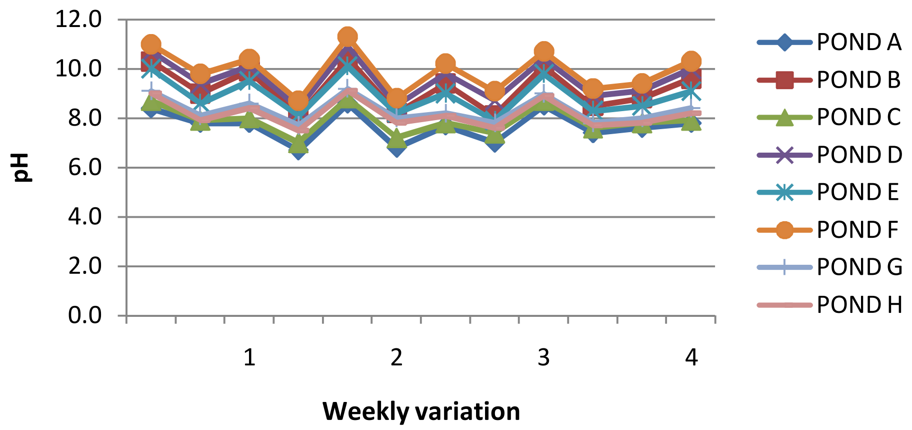

Figure 4.99: Weekly pH Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

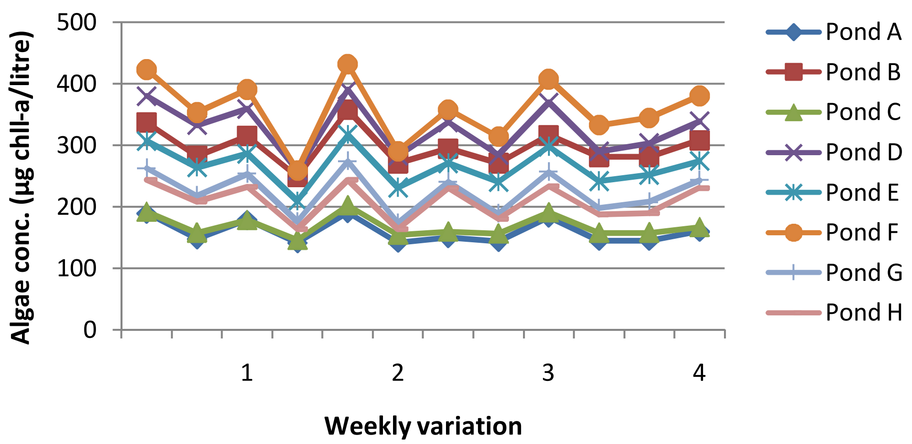

Figure 4.100: Weekly Algae Concentration Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

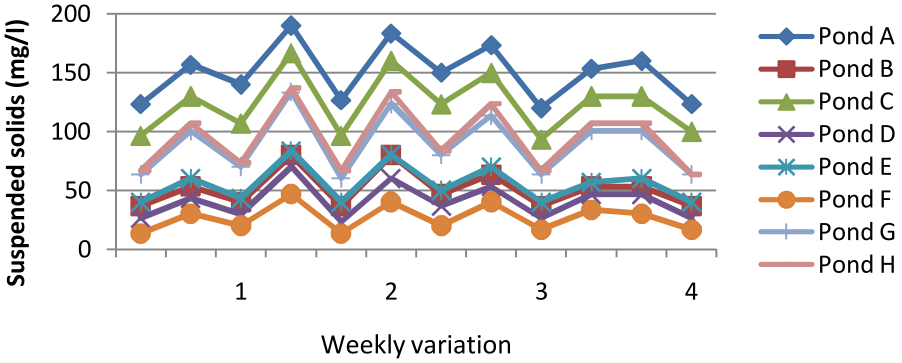

Figure 4.101: Weekly Suspended Solids Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

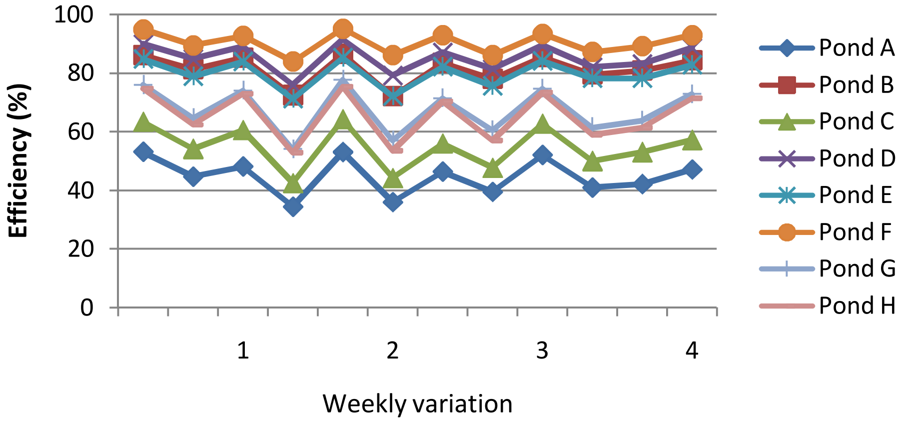

Figure 4.102: Efficiency of Suspended Solids Removal with Time (Set 3, V_3)

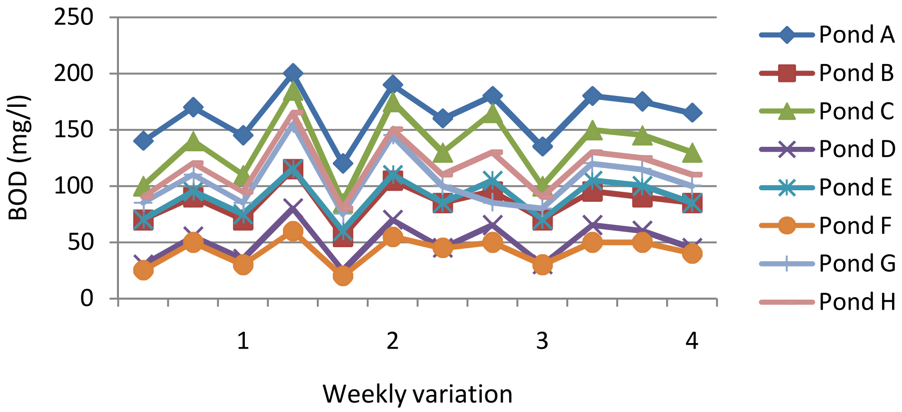

Figure 4.103: Weekly Biochemical Oxygen Demand Variation in ISHJEWSPs Effluent with Time (Set 3, V_2)

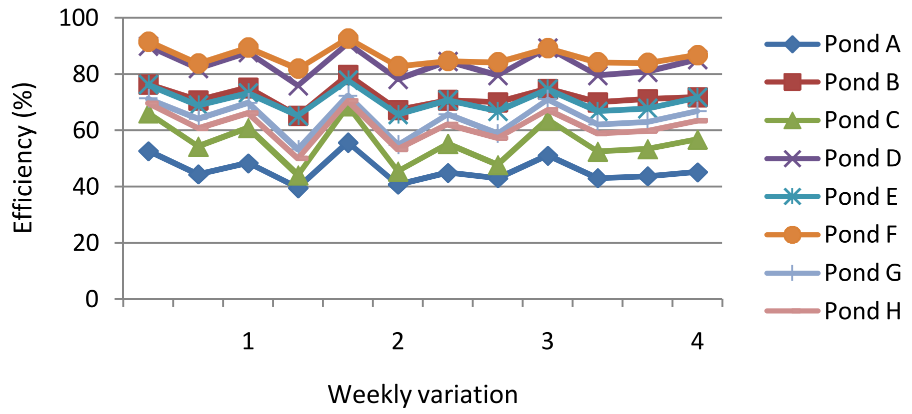

Figure 4.104: Efficiency of Biochemical Oxygen Demand Removal with Time (Set 3, V_3)

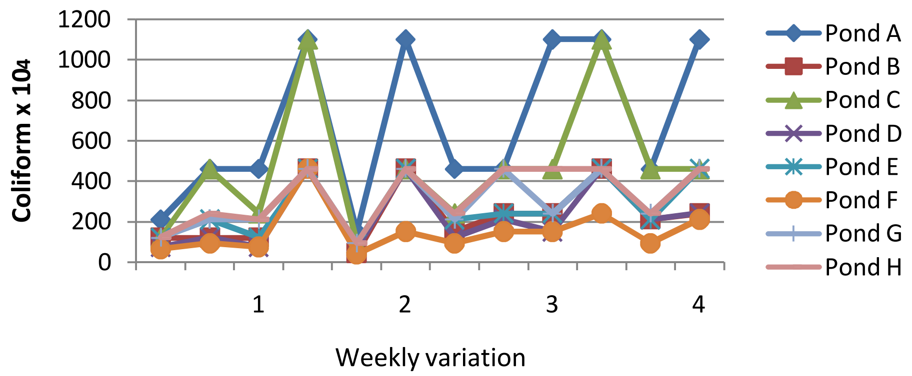

Figure 4.105: Weekly Coliform Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

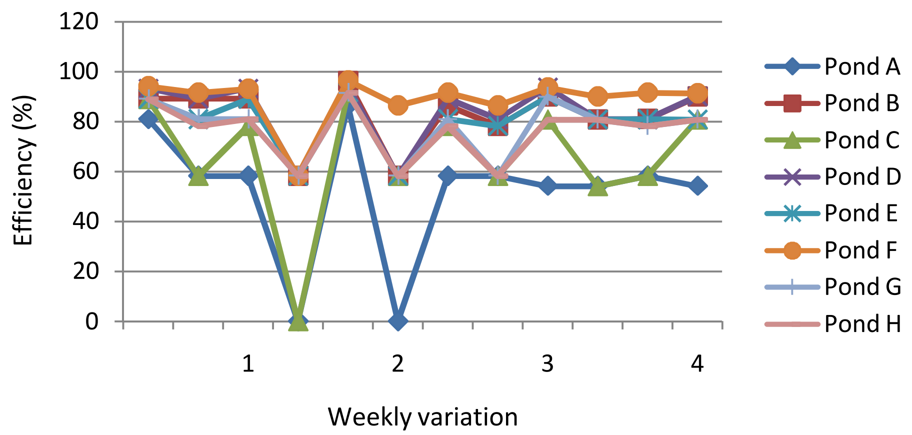

Figure 4.106: Efficiency of Coliform Removal with Time (Set 3, V_3)

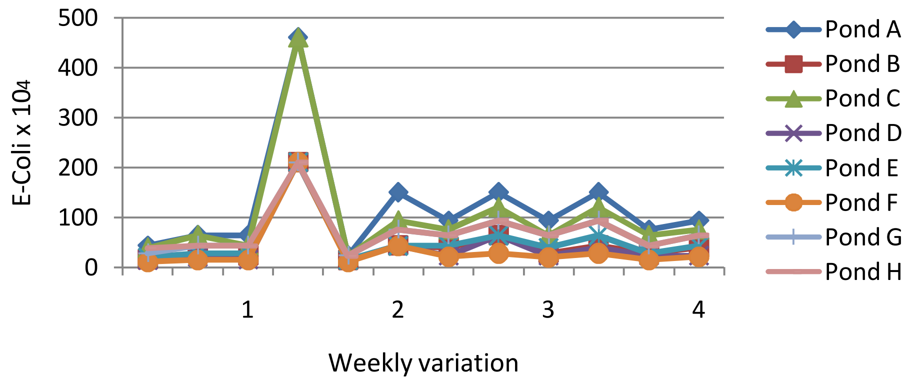

Figure 4.107: Weekly E-coli Variation in ISHJEWSPs Effluent with Time (Set 3, V_3)

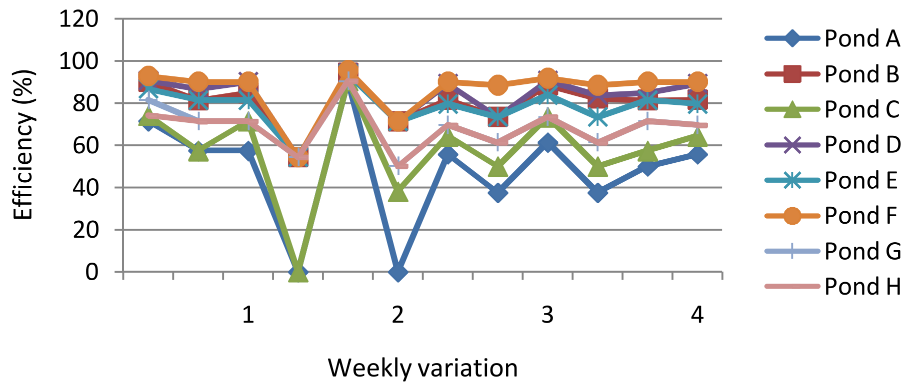

Figure 4.108: Efficiency of E-coli Removal with Time (Set 3, V_3)

4.2 EFFECT OF INLET VELOCITY ON TREATMENT EFFICIENCY

The inlet velocity was observed to directly affect the turbulence of the Integrated Solar and Hydraulic Jump Enhanced Waste Stabilization Pond within the scope of this research. A hydraulic jump is characterized by strong energy dissipation and air entrainment (Chanson, 2007).

The varying width was observed to have no influence on the flow pattern within the scope of the research. In the past, similar results have been reported by researchers. Chanson (2007) stated that the aspect ratio, or relative channel width W/d_1, was found to have no influence on the basic flow patterns within the range of the experiments. Ohtsu and Yasuda (1991) stated that at an abrupt structure the effect of channel width is negligible. For corresponding sets studied, the ponds were geometrically and dynamically similar in terms of inflow velocity, position of hydraulic jump, depth of inflow, and depth of pond. However, it was generally observed that the treatment efficiency increased with increase in the inlet velocity for all sets studied (Figures 4.109 to 4.120) though with precedence to the solar radiation intensity and temperature.

For Set 1, V_3 was observed to yield the highest average efficiencies of coliform, BOD, E-coli and total suspended solids removal. This was followed by V_1 and then V_2. For Set 2, V_3 yielded the highest average efficiencies of coliform, BOD, E-coli and suspended solids removal. This was followed by V_2 and then V_1. For Set 3, V_1 yielded the highest efficiencies of coliform, BOD, E-coli and suspended solids removal. This was followed by V_3 and then V_2 (Figures 4.109 to 4.120). The research revealed that the average treatment efficiencies of the ISHJEWSPs generally increased with increase in the velocity. However, the precedence of the intensity of solar radiation and temperature to velocity was generally observed as seen in the average efficiencies for V_1 and V_2 in Set 1 and Set 3.

The average efficiencies of coliform bacteria removal of all the ponds (i.e. average of ponds A, B, C, D, E, F, G and H) corresponding to Set 1: V_1, V_2, V_3 are 73.7%, 71.0% and 74.9%, respectively. Corresponding results for Set 2: V_1, V_2, V_3 and Set 3: V_1, V_2, V_3 are 75.1%, 76.0%, 77.8%, 77.9%, 74.8%, and 75.6%, respectively.

The average efficiencies of E-coli bacteria removal of all the ponds corresponding to Set 1: V_1, V_2, V_3 are 69.1%, 67.2% and 70.8%, respectively. Corresponding results for Set 2: V_1, V_2, V_3 and Set 3: V_1, V_2, V_3 are 71.0%, 71.3%, 73.9%, 74.1%, 70.2%, 71.2%, respectively.

The average efficiencies of BOD removal of all the ponds corresponding to Set 1: V_1, V_2, V_3 are 63.2%, 62.6% and 65.9%, respectively. Corresponding results for Set 2: V_1, V_2, V_3 and Set 3: V_1, V_2, V_3 are 66.7%, 68.4%, 70.1%, 71.7%, 66.5%, 67.4%%, respectively.

The average efficiencies of Total Suspended Solids removal of all the ponds corresponding to Set 1: V_1, V_2, V_3 are 67.4%, 66.2% and 69.3%, respectively. Corresponding results for Set 2: V_1, V_2, V_3 and Set 3: V_1, V_2, V_3 are 70.3%, 72.3%, 74.2%, 75.5%, 69.2%, 71.1%, respectively (Appendix B).

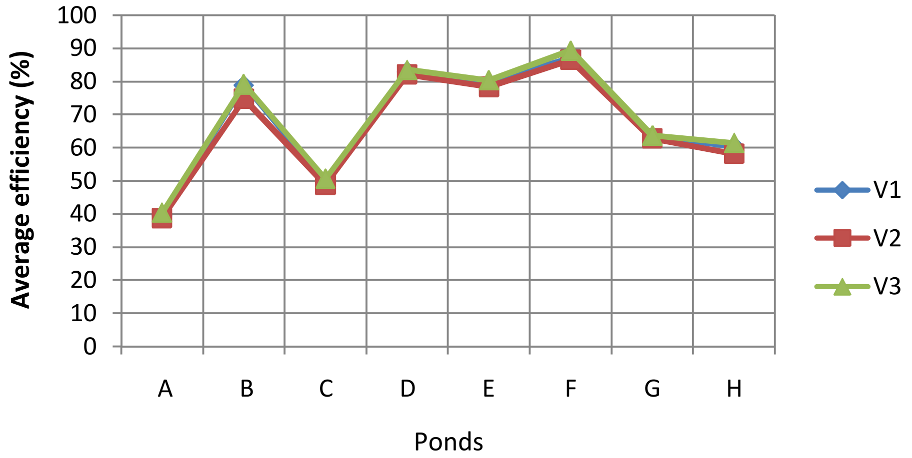

Figure 4.109: Average Efficiency of Suspended Solids Removal for different Velocities (Set 1)

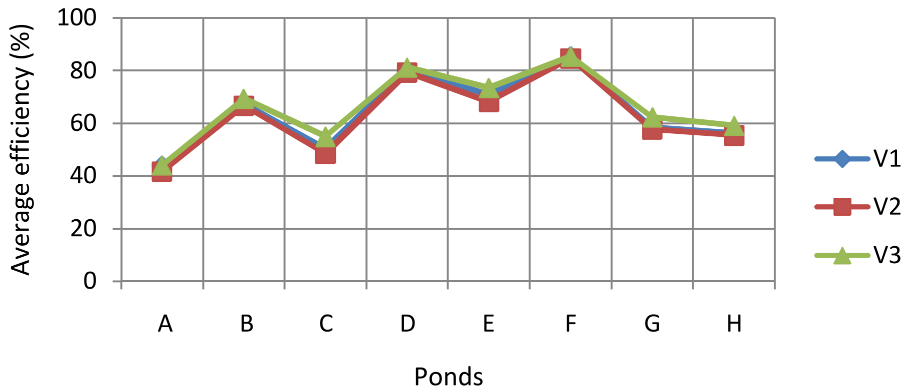

Figure 4.110: Average Efficiency of Biochemical Oxygen Demand Removal for different Velocities (Set 1)

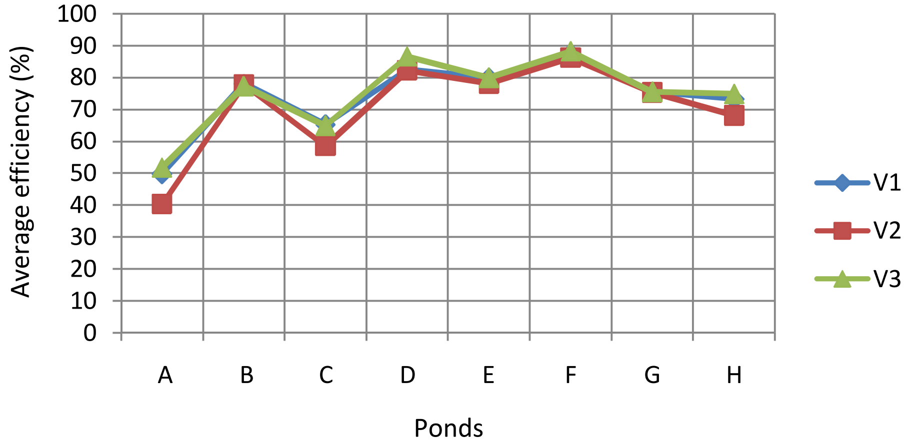

Figure 4.111: Average Efficiency of Coliform Removal for different Velocities (Set 1)

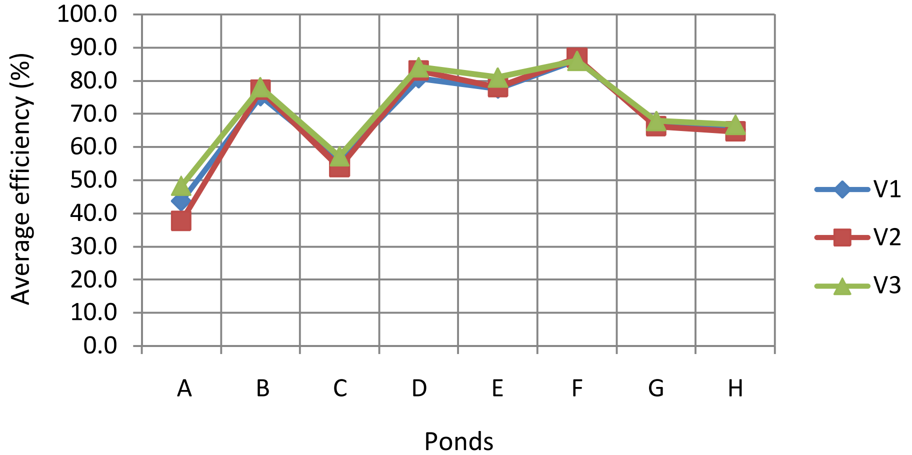

Figure 4.112: Average Efficiency of E-coli Removal for different Velocities (Set 1)

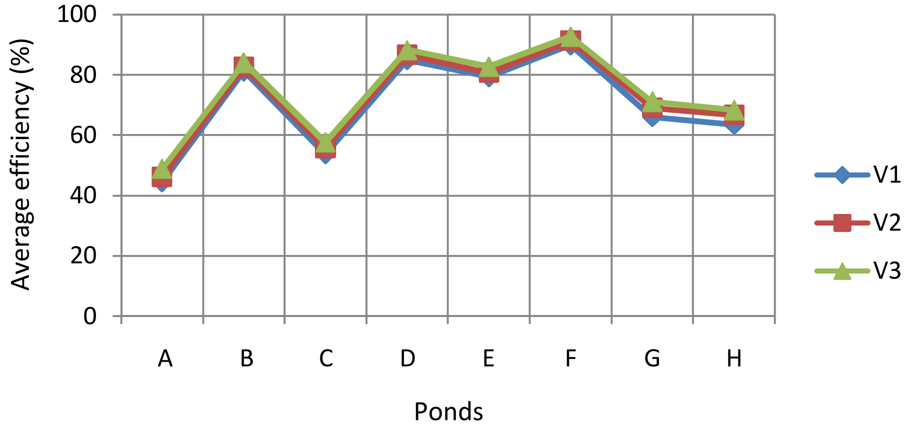

Figure 4.113: Average Efficiency of Suspended Solids Removal for different Velocities (Set 2)

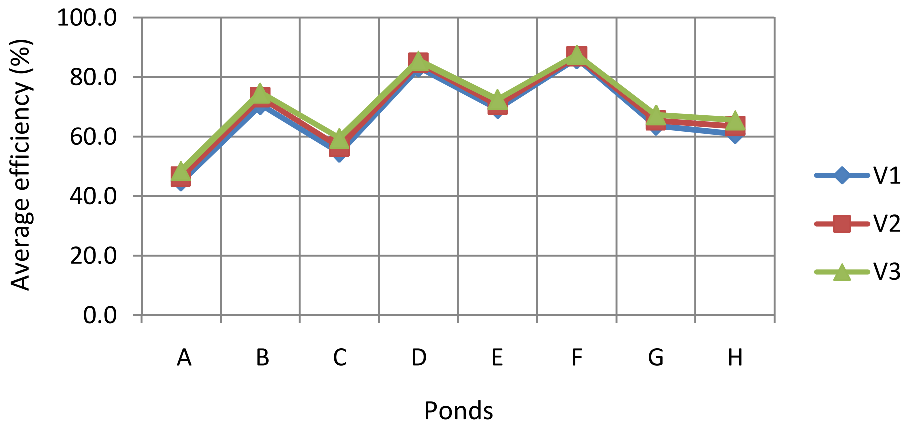

Figure 4.114: Average Efficiency of Biochemical Oxygen Demand Removal for different Velocities (Set 2)

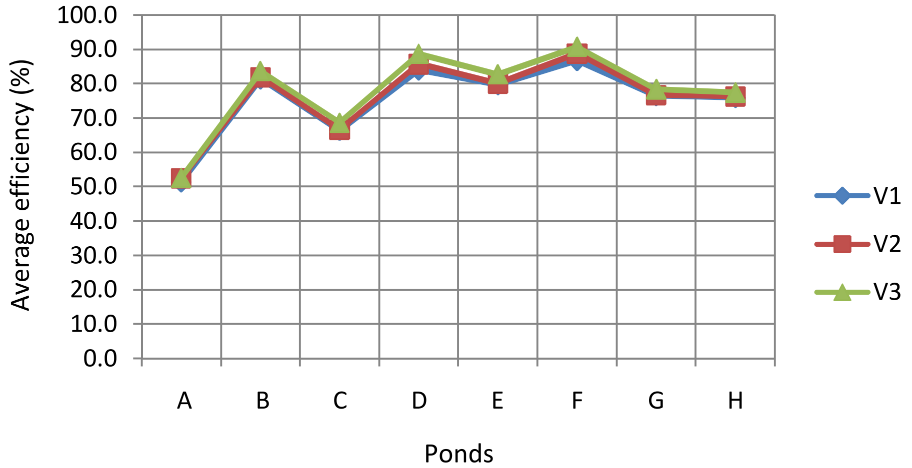

Figure 4.115: Average Efficiency of Coliform Removal for different Velocities (Set 2)

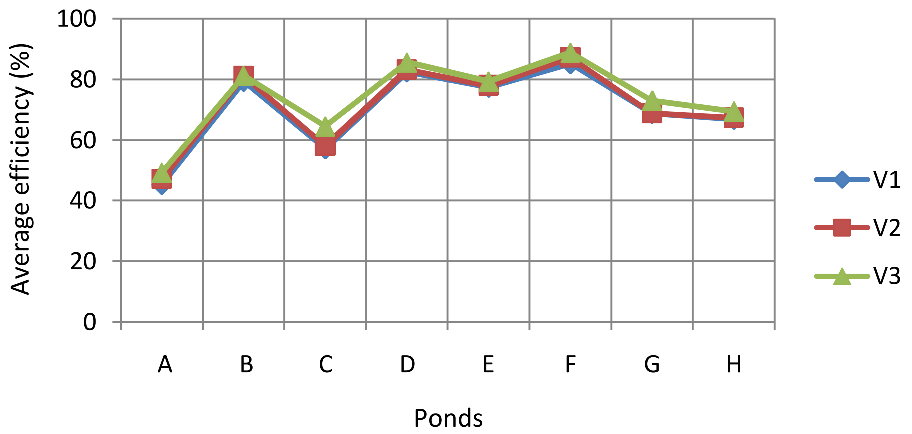

Figure 4.116: Average Efficiency of E-coli Removal for different Velocities (Set 2)

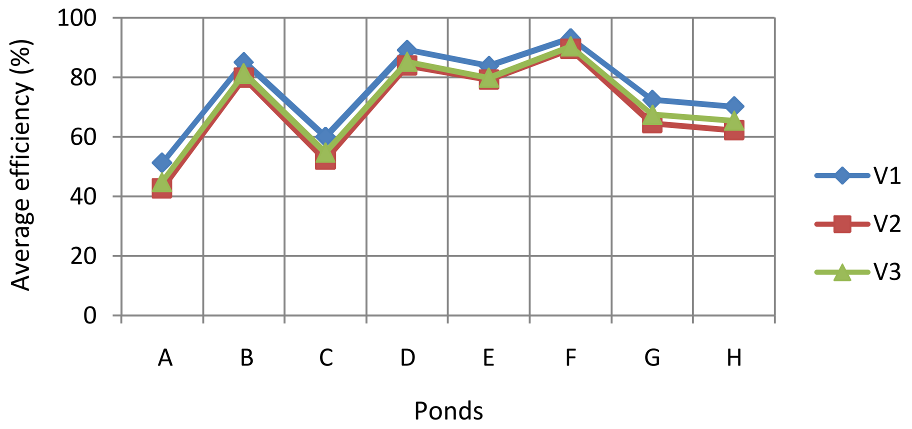

Figure 4.117: Average Efficiency of Suspended Solids Removal for different Velocities (Set 3)

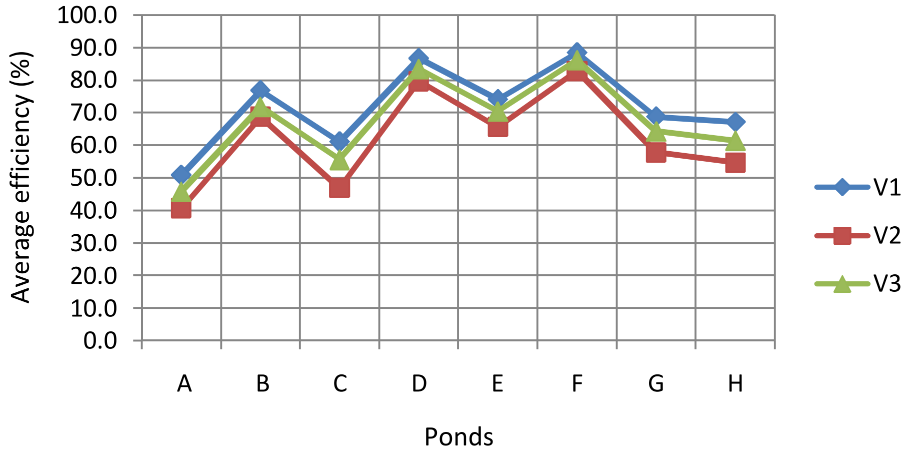

Figure 4.118: Average Efficiency of Biochemical Oxygen Demand Removal for different Velocities (Set 3)

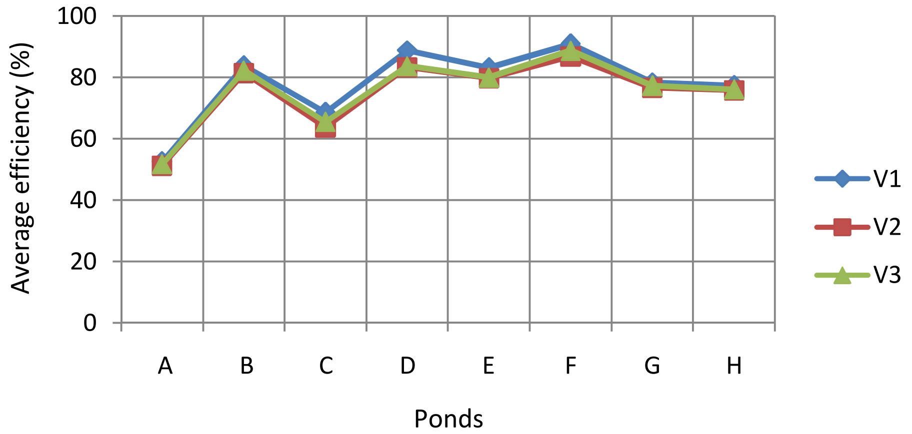

Figure 4.119: Average Efficiency of Coliform Removal for different Velocities (Set 3)

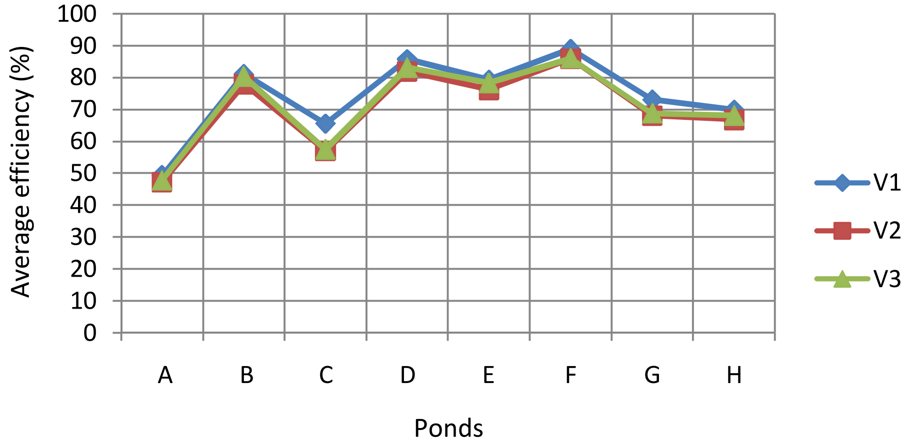

Figure 4.120: Average Efficiency of E-coli Removal for different Velocities (Set 3)

4.3 EFFECT OF SOLAR RADIATION ON TREATMENT EFFICIENCY

Generally, the efficiencies of treatment of the parameters increased with increase in the solar radiation. Amongst ponds B, D, E, F, G and H, pond F, which had the smallest width, had the highest treatment efficiencies of coliform, BOD, E-coli and suspended solids removal as shown in Figures 121 to 156. For the three sets, these corresponding results were corroborated by the higher maximum temperature in Pond D (34.5°C, 36.5°C, 37.5.0°C) than Pond A (32.5°C, 34.0°C, 35.0°C) (Marais, 1974).

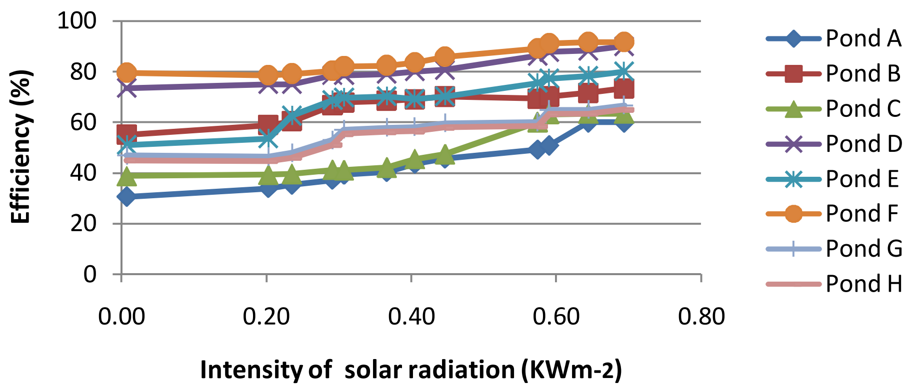

Figure 4.121: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 1, V_1)

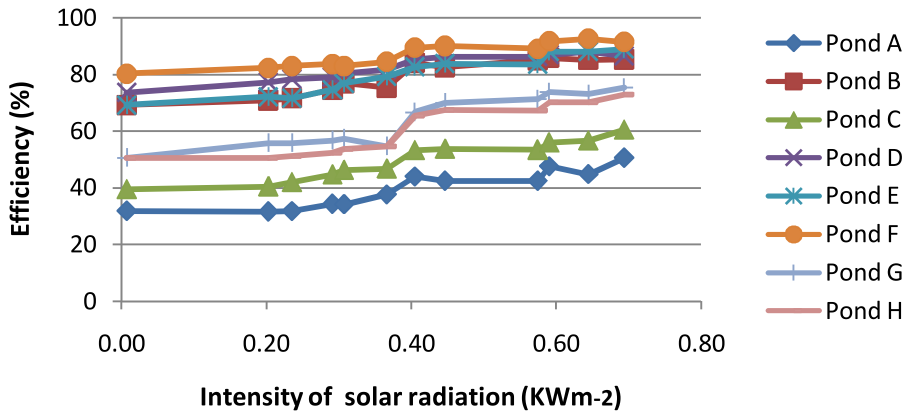

Figure 4.122: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 1, V_1)

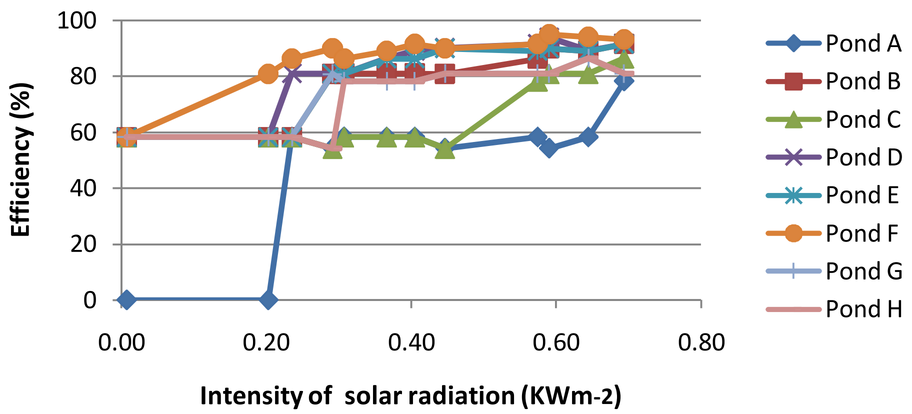

Figure 4.123: Efficiency of Coliform Removal versus Solar Intensity (Set 1, V_1)

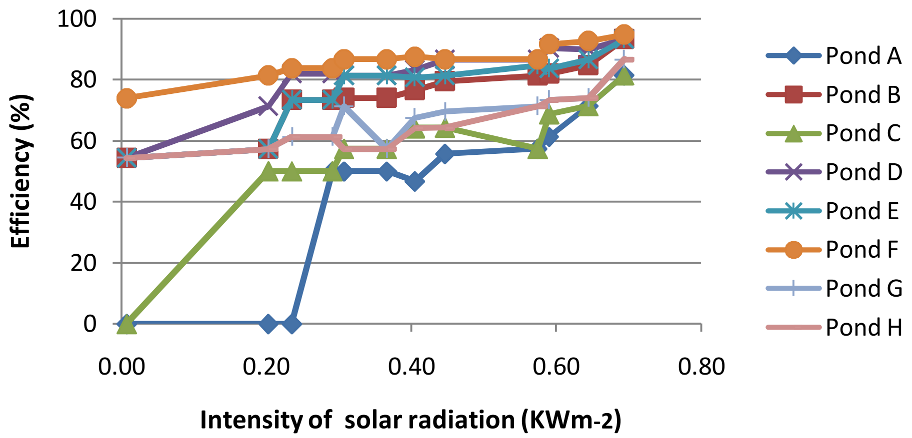

Figure 4.124: Efficiency of E-coli Removal versus Solar Intensity (Set 1, V_1)

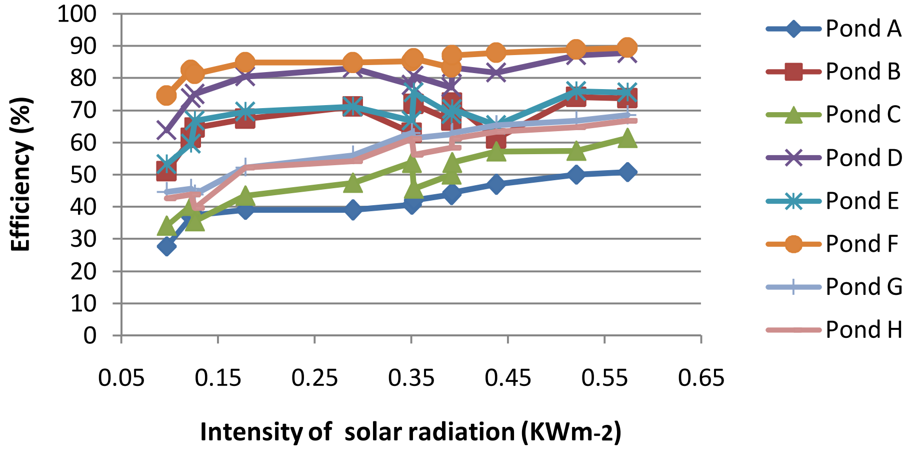

Figure 4.125: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 1, V_2)

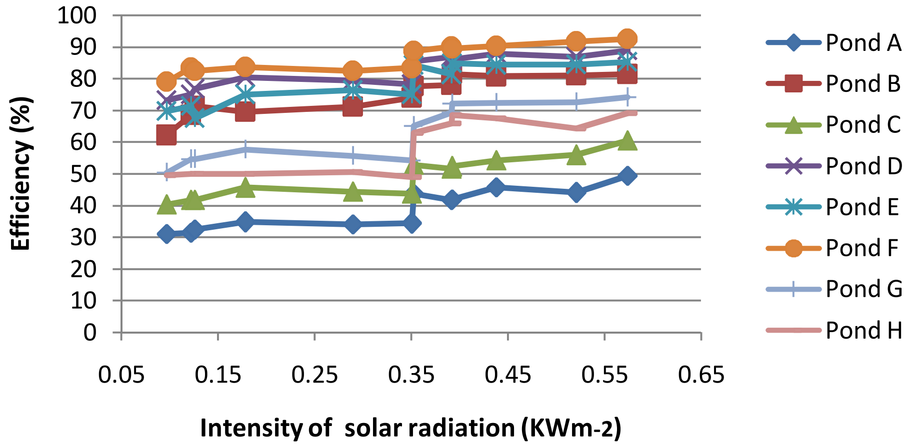

Figure 4.126: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 1, V_2)

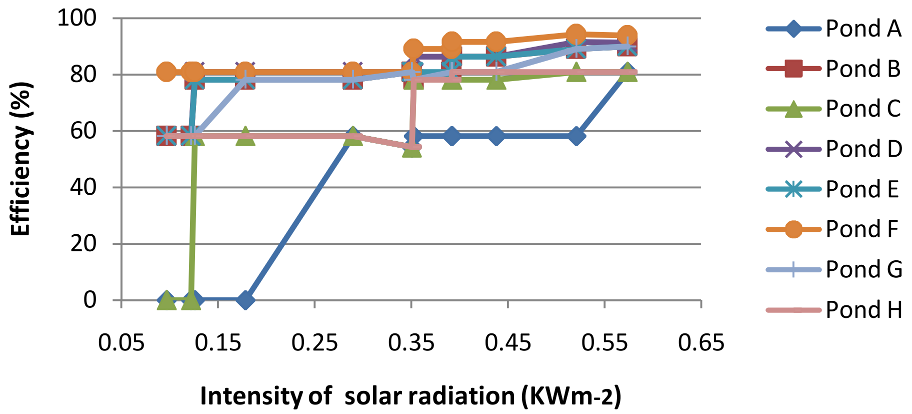

Figure 4.127: Efficiency of Coliform Removal versus Solar Intensity (Set 1, V_2)

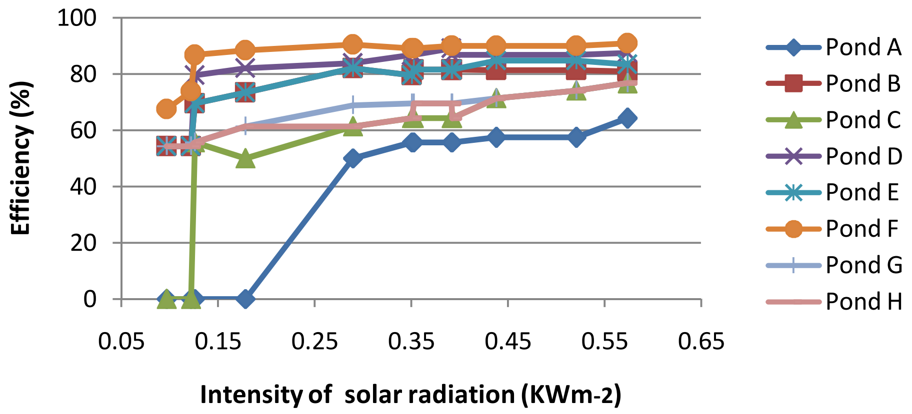

Figure 4.128: Efficiency of E-coli Removal versus Solar Intensity (Set 1, V_2)

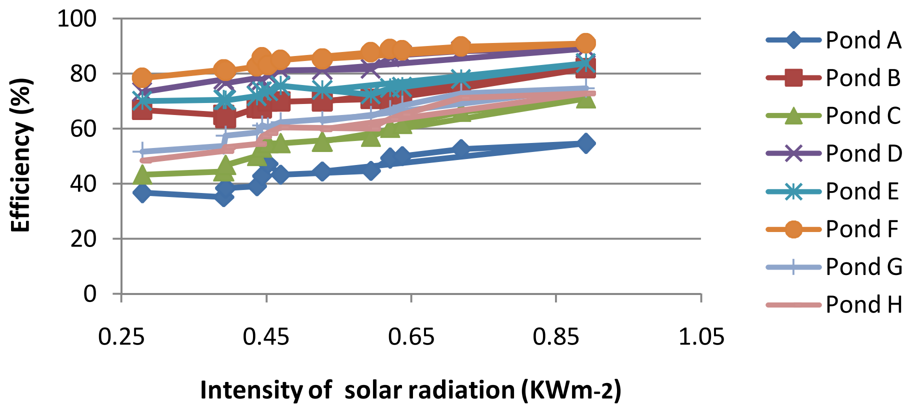

Figure 4.129: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 1, V_3)

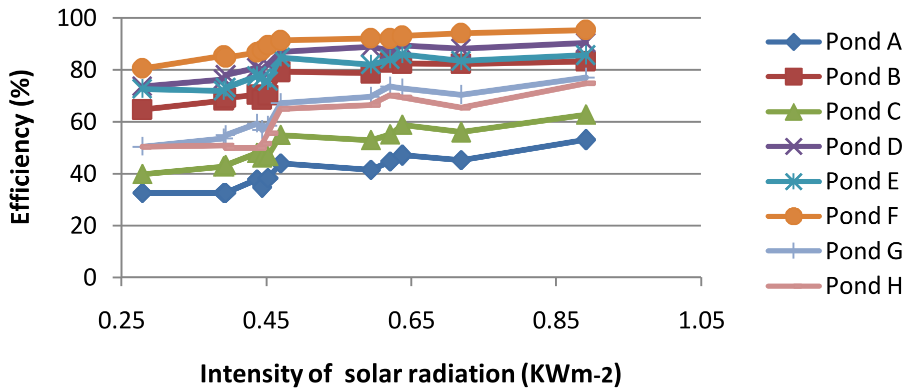

Figure 4.130: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 1, V_3)

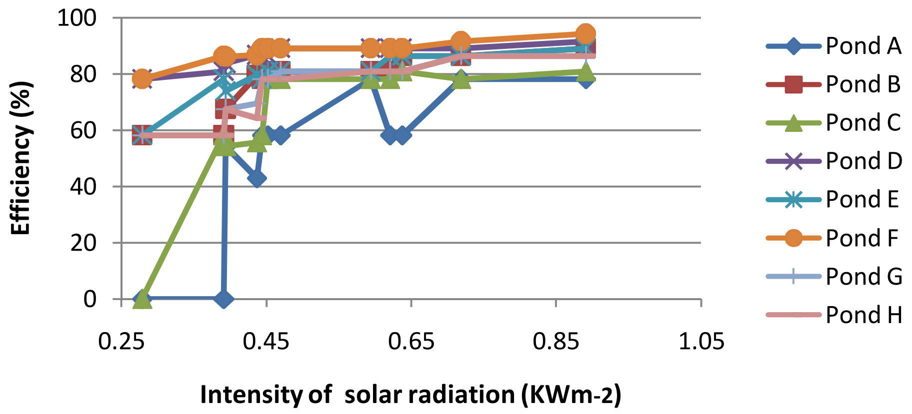

Figure 4.131: Efficiency of Coliform Removal versus Solar Intensity (Set 1, V_3)

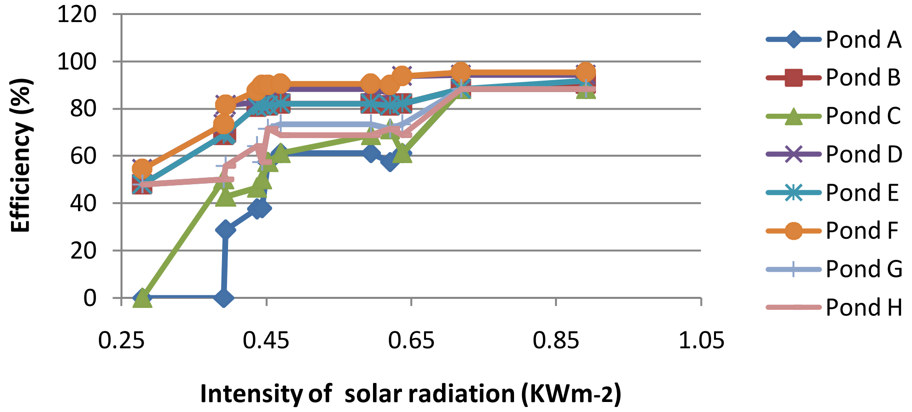

Figure 4.132: Efficiency of E-coli Removal versus Solar Intensity (Set 1, V_3)

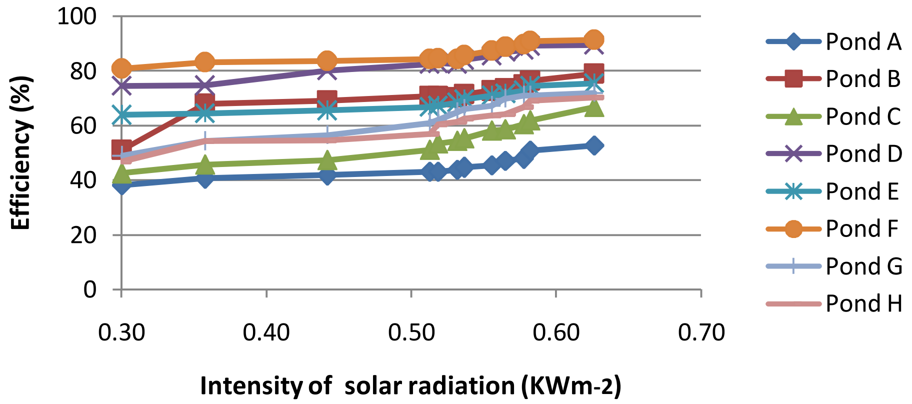

Figure 4.133: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 2, V_1)

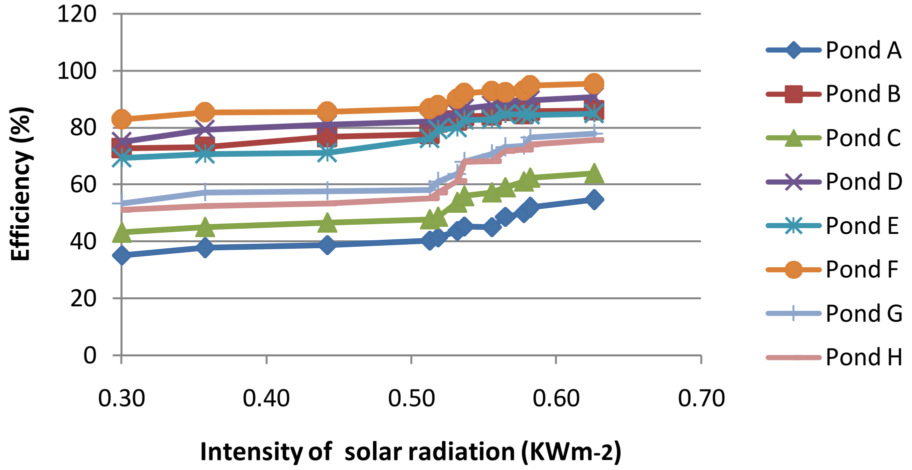

Figure 4.134: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 2, V_1)

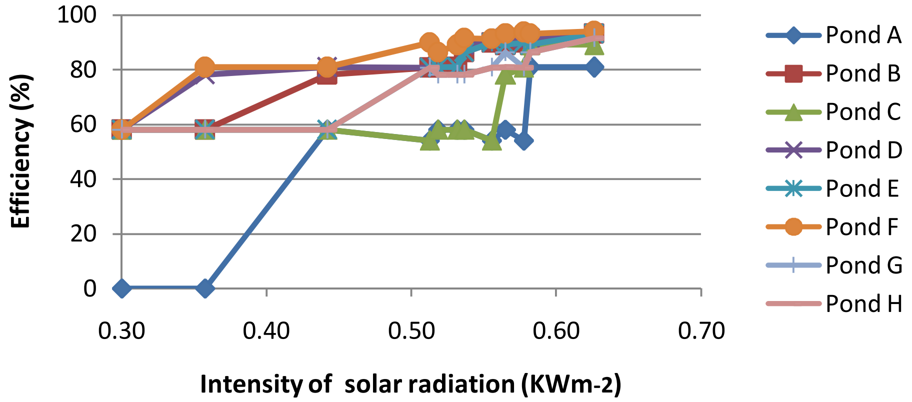

Figure 4.135: Efficiency of Coliform Removal versus Solar Intensity (Set 2, V_1)

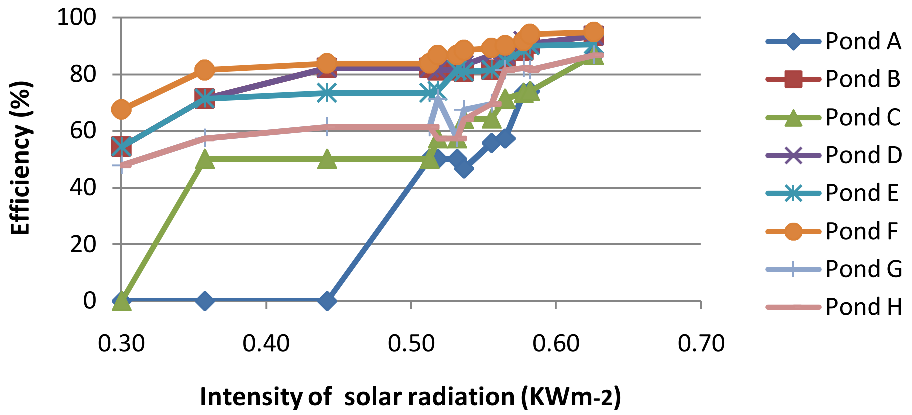

Figure 4.136: Efficiency of E-coli Removal versus Solar Intensity (Set 2, V_1)

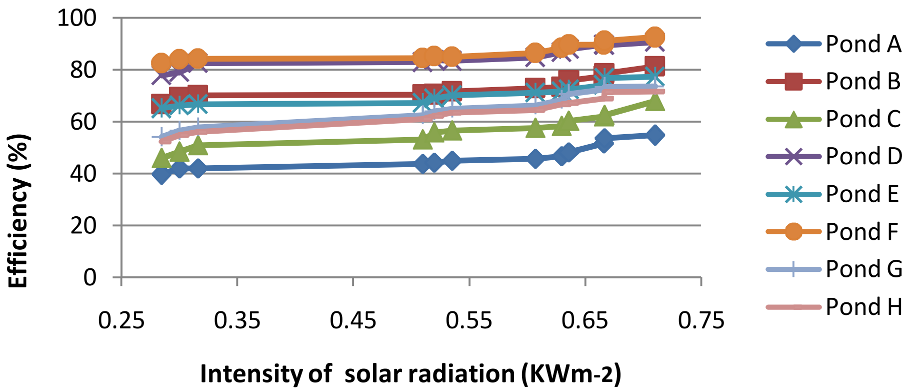

Figure 4.137: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 2, V_2)

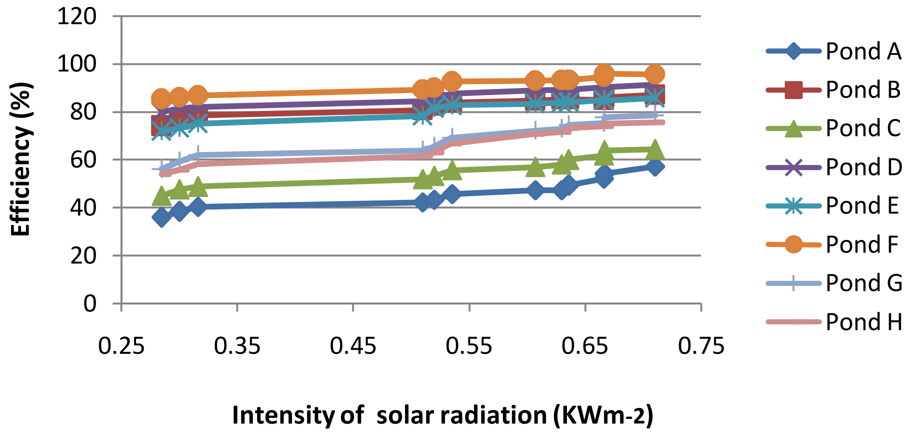

Figure 4.138: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 2, V_2)

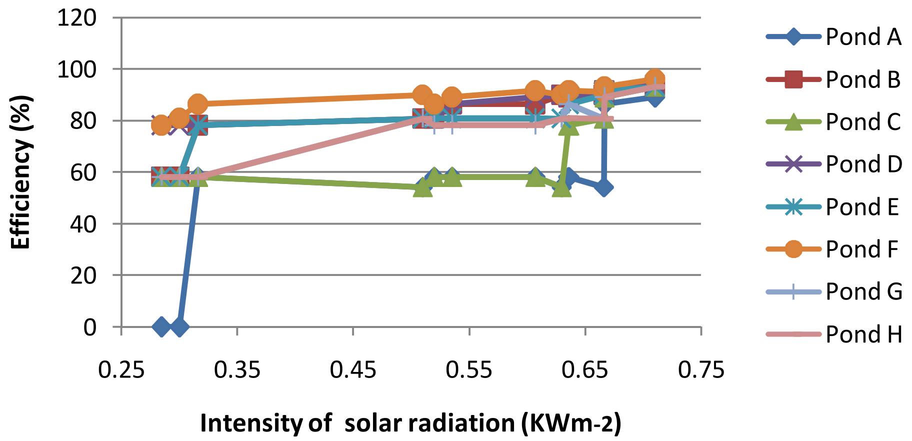

Figure 4.139: Efficiency of Coliform Removal versus Solar Intensity (Set 2, V_2)

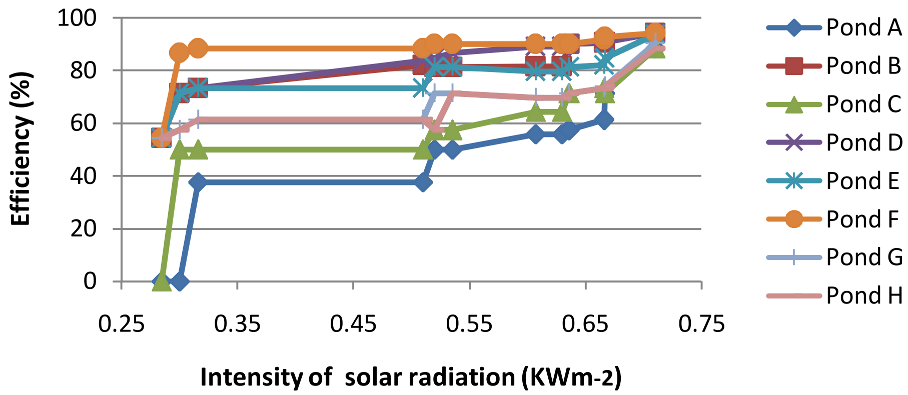

Figure 4.140: Efficiency of E-coli Removal versus Solar Intensity (Set 2, V_2)

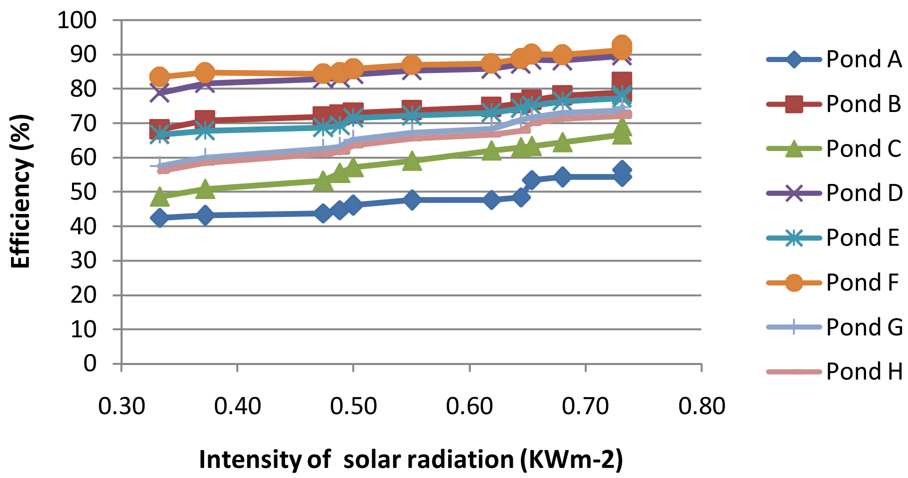

Figure 4.141: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 2, V_3)

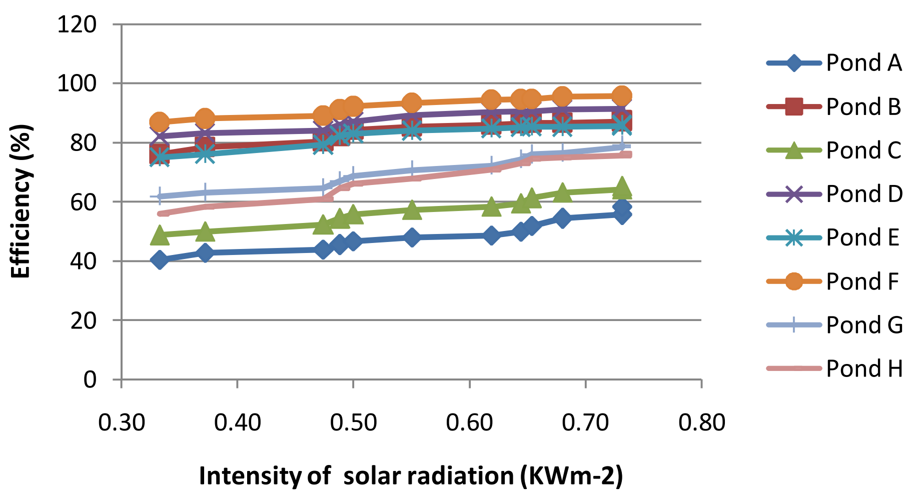

Figure 4.142: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 2, V_3)

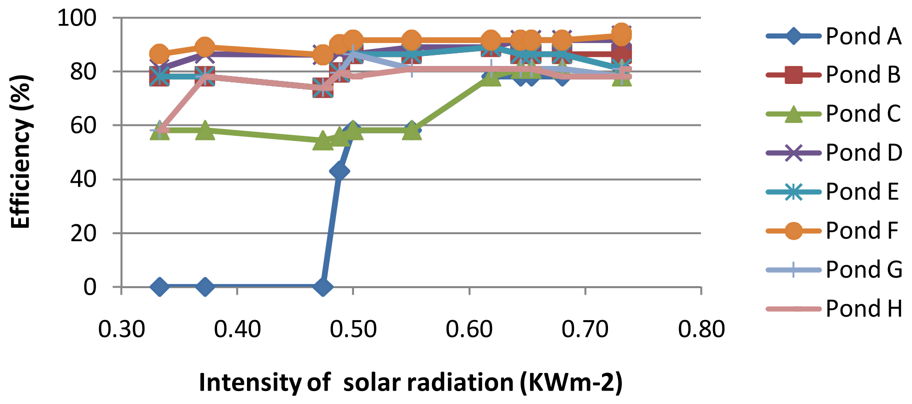

Figure 4.143: Efficiency of Coliform Removal versus Solar Intensity (Set 2, V_3)

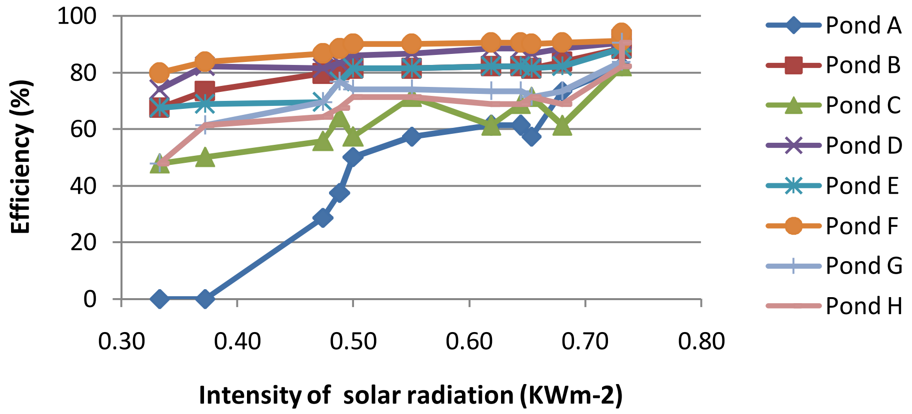

Figure 4.144: Efficiency of E-coli Removal versus Solar Intensity (Set 2, V_3)

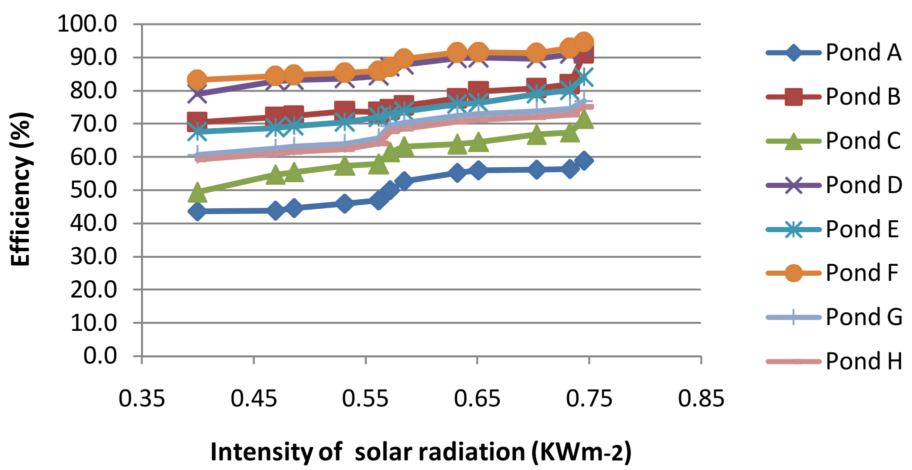

Figure 4.145: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 3, V_1)

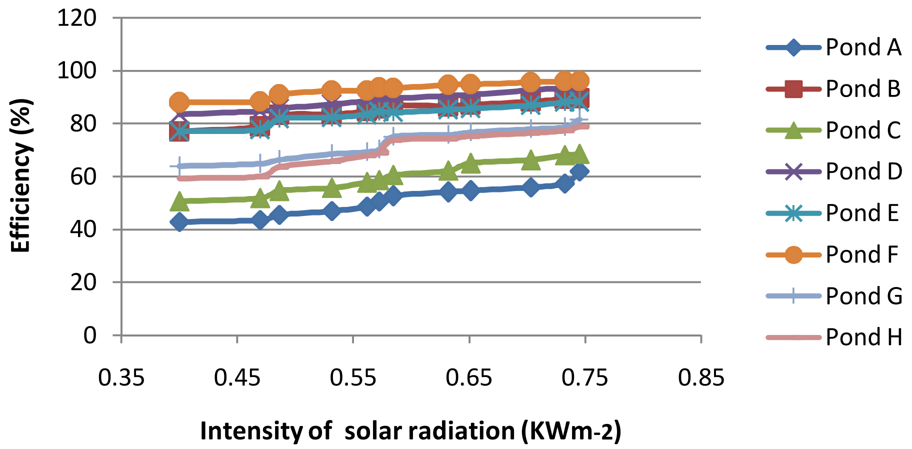

Figure 4.146: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 3, V_1)

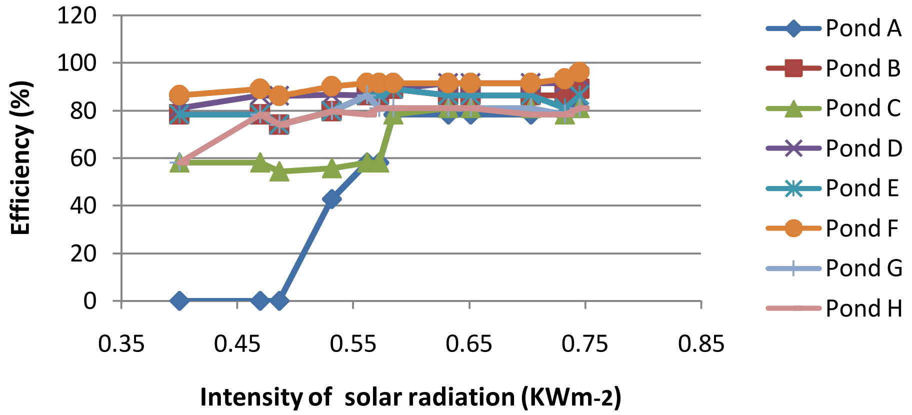

Figure 4.147: Efficiency of Coliform Removal versus Solar Intensity (Set 3, V_1)

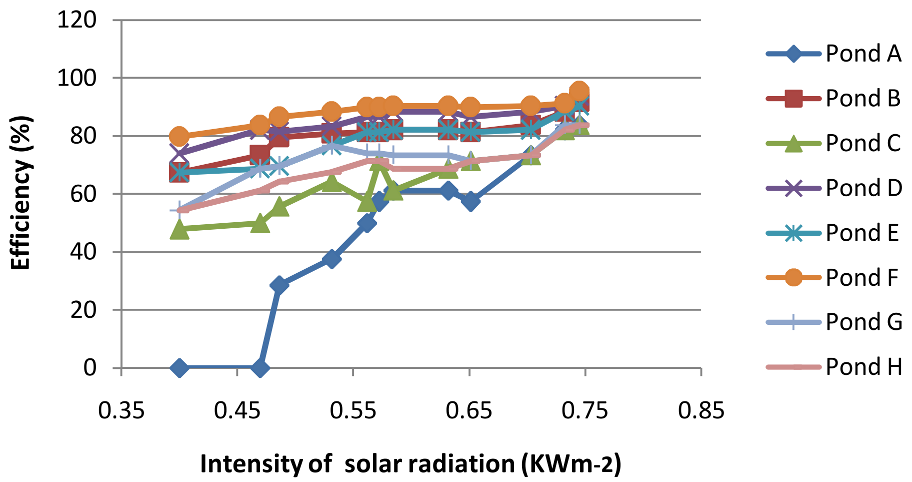

Figure 4.148: Efficiency of E-coli Removal versus Solar Intensity (Set 3, V_1)

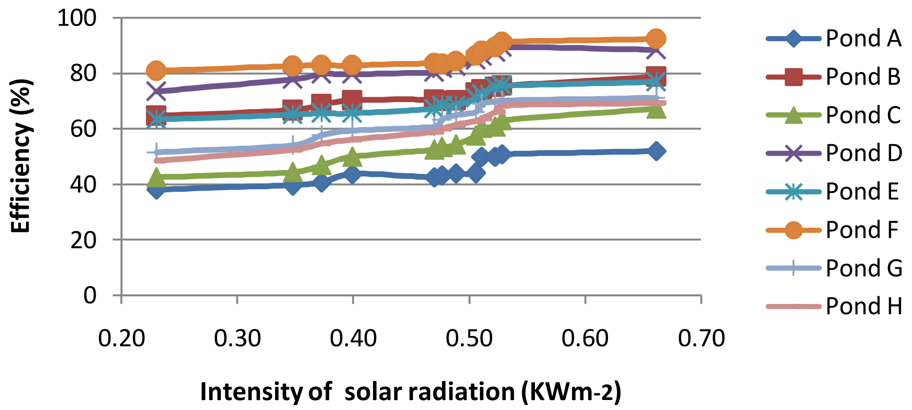

Figure 4.149: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 3, V_2)

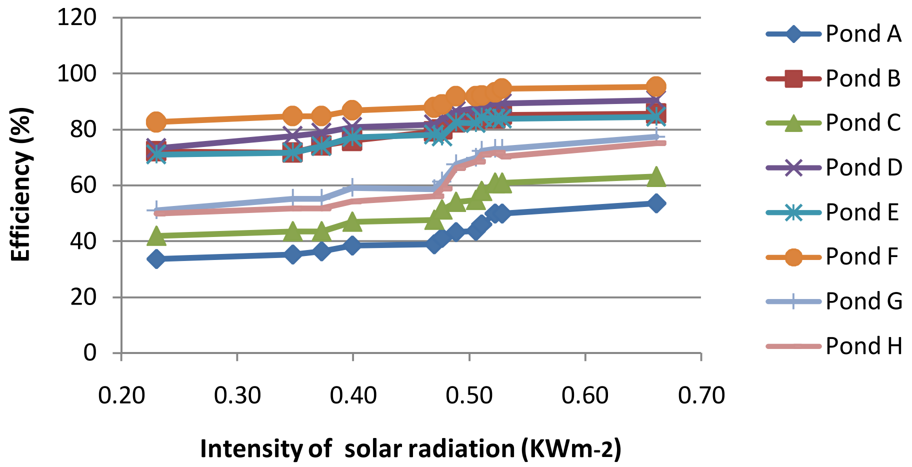

Figure 4.150: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 3, V_2)

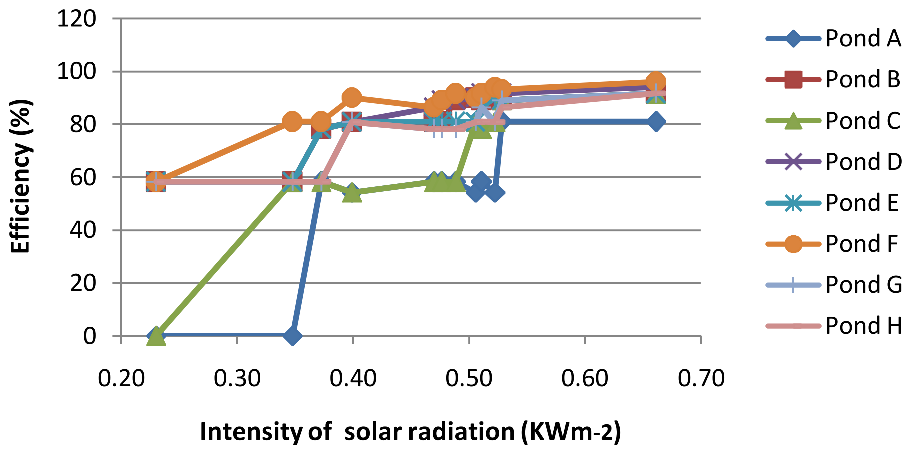

Figure 4.151: Efficiency of Coliform Removal versus Solar Intensity (Set 3, V_2)

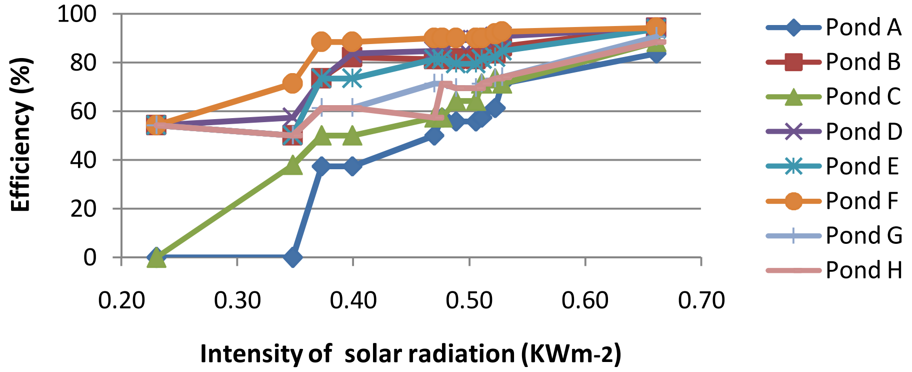

Figure 4.152: Efficiency of E-coli Removal versus Solar Intensity (Set 3, V_2)

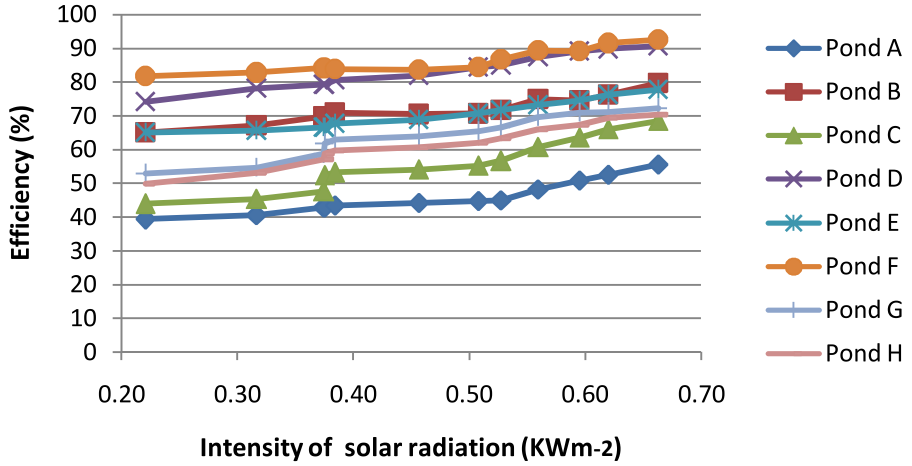

Figure 4.153: Efficiency of Biochemical Oxygen Demand Removal versus Solar Intensity (Set 3, V_3)

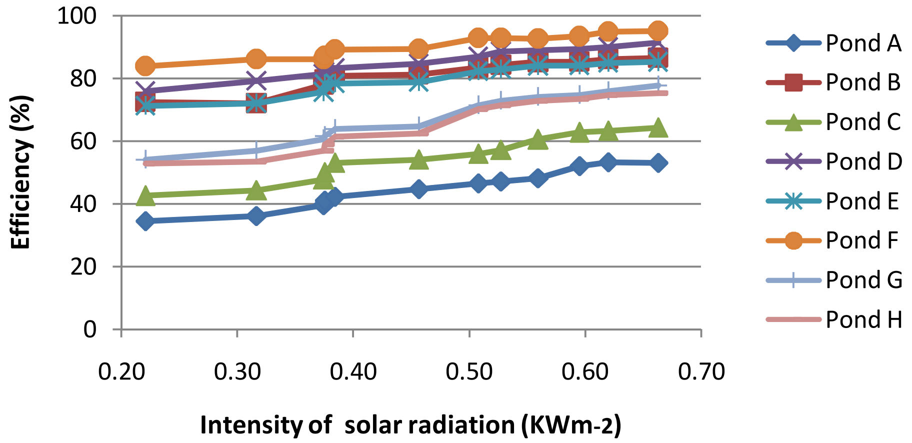

Figure 4.154: Efficiency of Suspended Solids Removal versus Solar Intensity (Set 3, V_3)

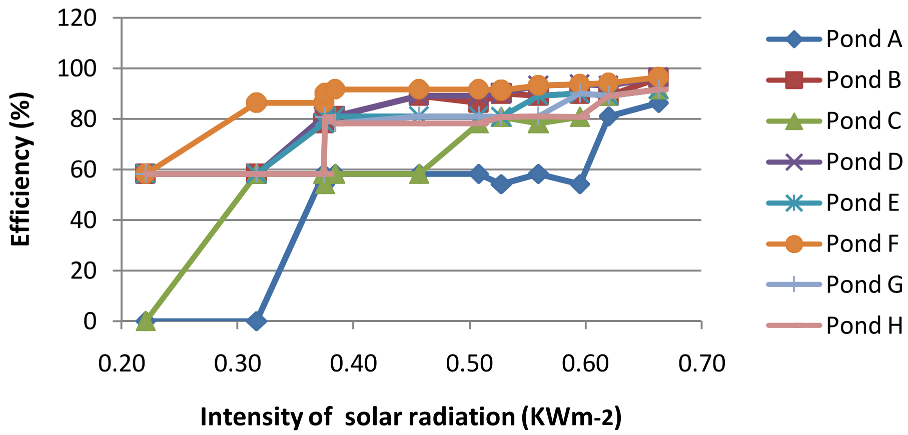

Figure 4.155: Efficiency of Coliform Removal versus Solar Intensity (Set 3, V_3)

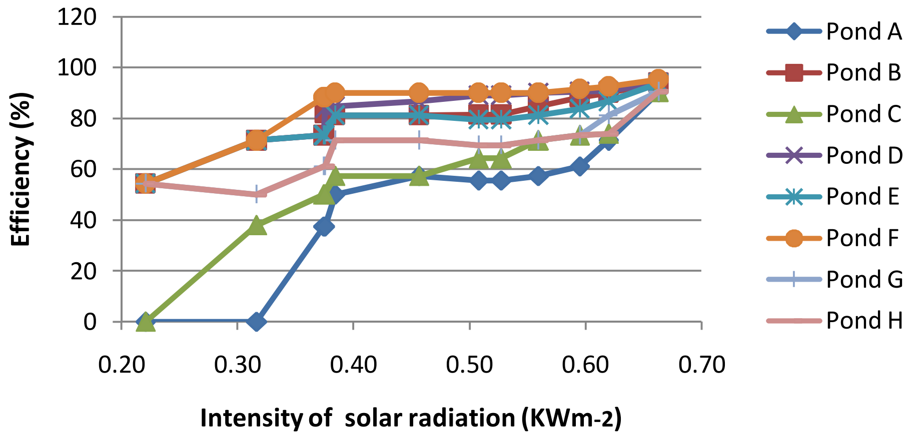

Figure 4.156: Efficiency of E-coli Removal versus Solar Intensity (Set 3, V_3)

4.4 EFFECT OF LOCATION OF POINT OF INITIATION OF HYDRAULIC JUMP

The location of the point of initiation of hydraulic jump resulted to the variation of treatment efficiencies of the ISHJEWSPs with respect to the parameters studied as shown in Figures 4.157 to 4.168. Set 3 had the highest average efficiencies of coliform, BOD, E-coli and suspended solids removal for velocity V_1. This was followed by Set 2 and then Set 1. Set 2 had the highest average efficiencies of coliform, BOD, E-coli and suspended solids removal for velocitiesV_2 and V_3. This was followed by Set 3 and then Set 1, respectively. The research revealed that the average treatment efficiencies of the ISHJEWSPs increased as the location of the point of initiation of hydraulic jump decreased relative to the inlet. This is unconnected with the early introduction of dissolved oxygen to support the symbiotic bacterial activities in the ponds. However, the precedence of the intensity of solar radiation and temperature to the location of hydraulic jump was generally observed as seen in the average efficiencies for V_2 and V_3.

The average efficiencies of coliform removal of the ISHJEWSPs (i.e. ponds D, E, F, G and H) corresponding to Set 1, Set 2, Set 3 for V_1, are 79.4%, 80.5%, 83.7%; for V_2: 78.1%, 81.5%, 80.4% and V_3: 81.0%, 83.6% and 81.1%, respectively. Also, the average efficiencies of E-coli removal of the ISHJEWSPs corresponding to Set 1, Set 2, Set 3 for V_1, are 75.4%, 76.6%, 79.4%; for V_2: 74.2%, 76.9%, 75.8% and V_3: 76.6%, 79.1% and 76.9%, respectively. The average efficiencies of BOD removal of the ISHJEWSPs corresponding to Set 1, Set 2, Set 3 for V_1 are 69.4%, 72.6%, 77.0%; for V_2: 69.0%, 74.2%, 72.2% and V_3: 71.7%, 75.6% and 73.2%, respectively. Also, the average efficiencies of Total Suspended Solids removal of the ISHJEWSPs corresponding to Set 1, Set 2, Set 3 for V_1, are 74.4%, 76.7%, 81.7%; for V_2: 73.5%, 78.9%, 75.8% and V_3: 76.1%, 80.6% and 77.6%, respectively.

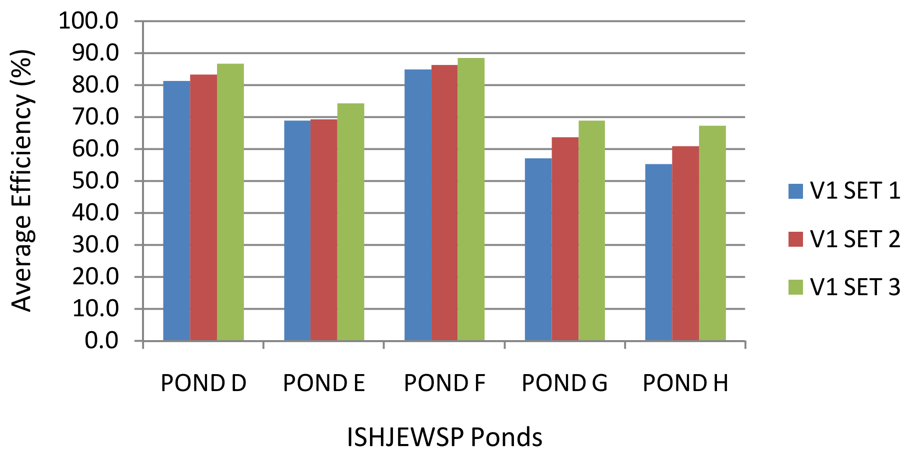

Figure 4.157: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Biochemical Oxygen Demand Removal for Velocity V_1

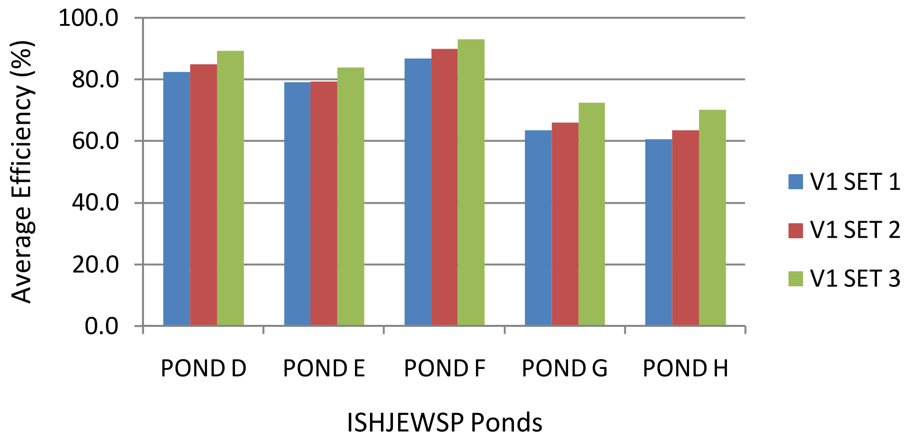

Figure 4.158: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Suspended Solids Removal for Velocity V_1

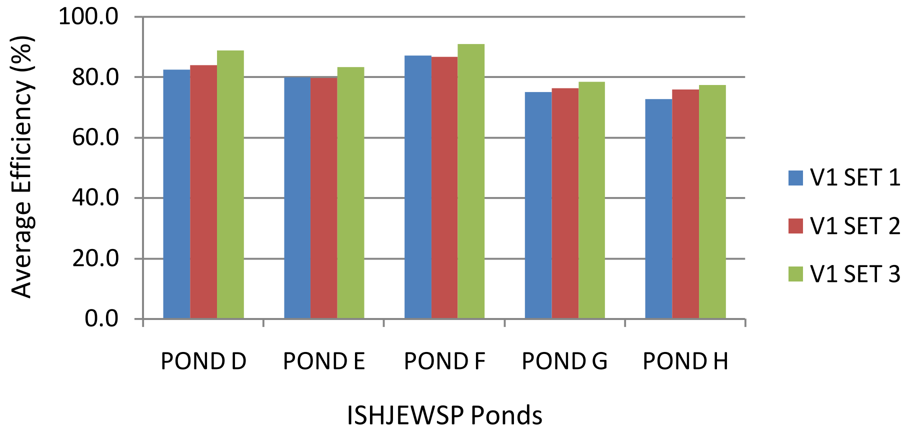

Figure 4.159: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Coliform Removal for Velocity V_1

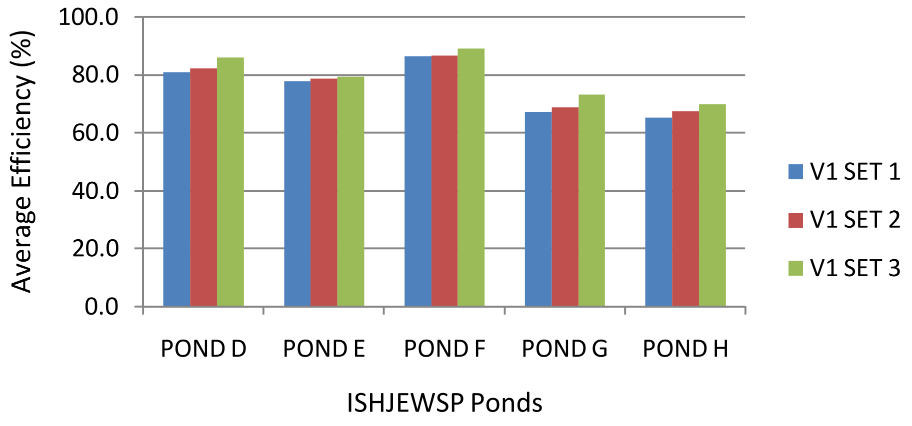

Figure 4.160: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of E-coli Removal for Velocity V_1

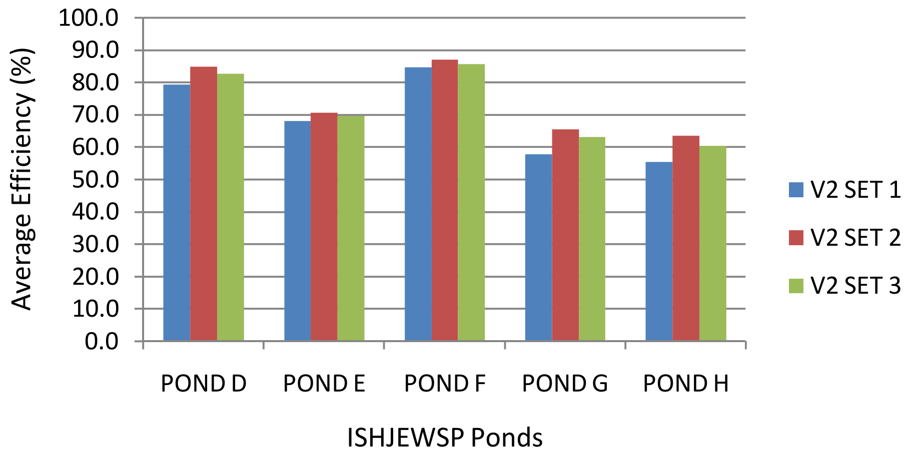

Figure 4.161: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Biochemical Oxygen Demand Removal for Velocity V_2

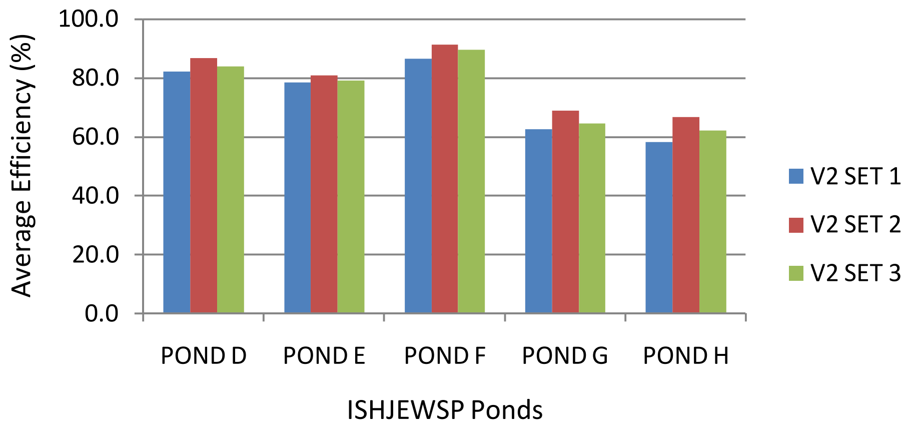

Figure 4.162: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Suspended Solids Removal for Velocity V_2

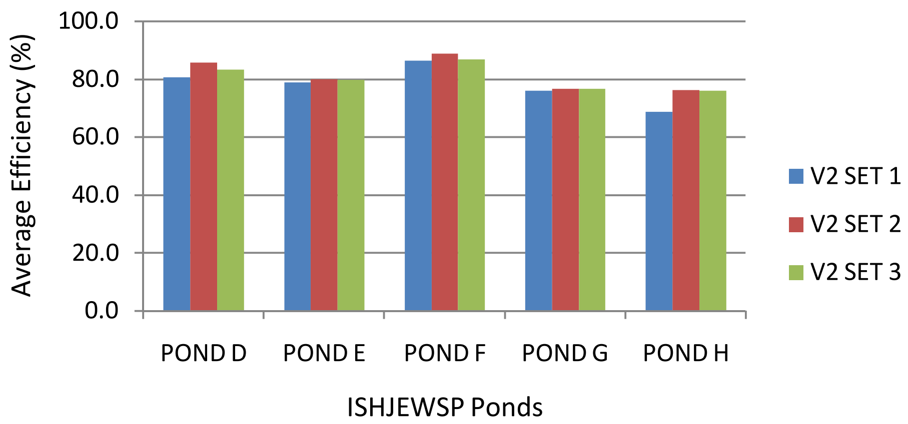

Figure 4.163: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Coliform Removal for Velocity V_2

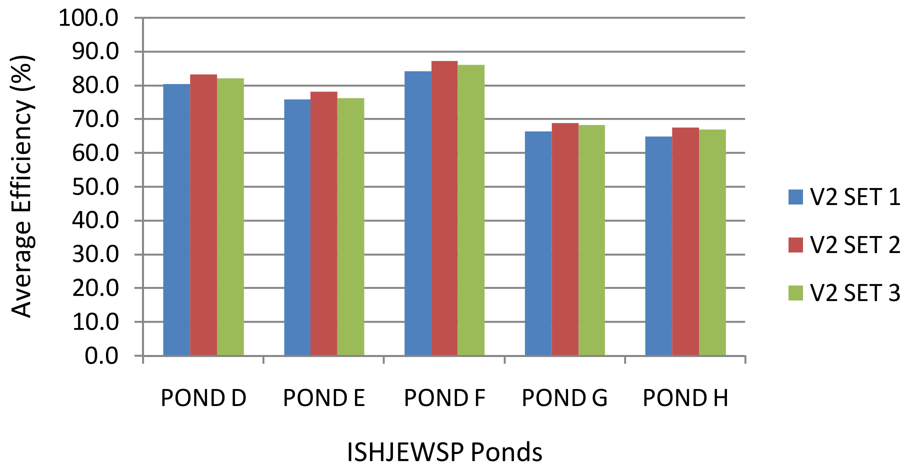

Figure 4.164: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of E-coli Removal for Velocity V_2

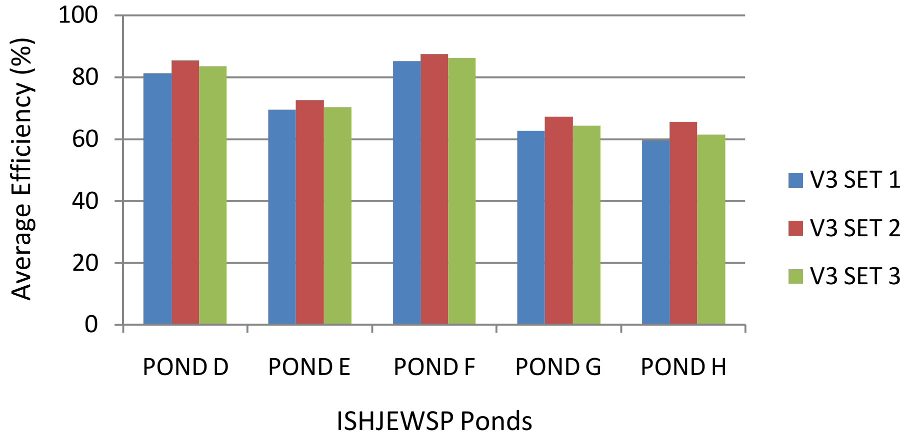

Figure 4.165 Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Biochemical Oxygen Demand Removal for Velocity V_3

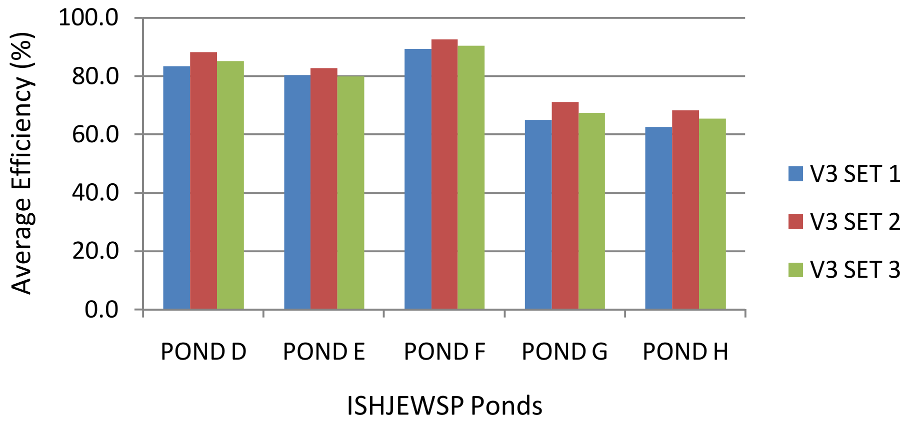

Figure 4.166: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Suspended Solids Removal for Velocity V_3

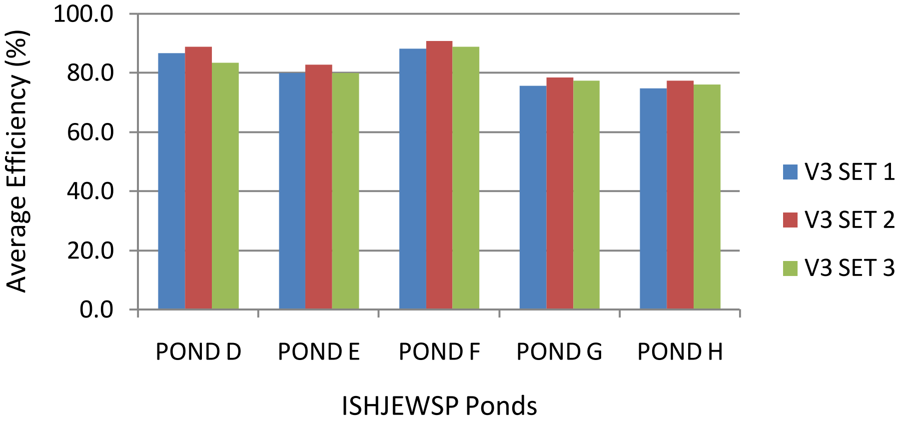

Figure 4.167: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of Coliform Removal for Velocity V_3

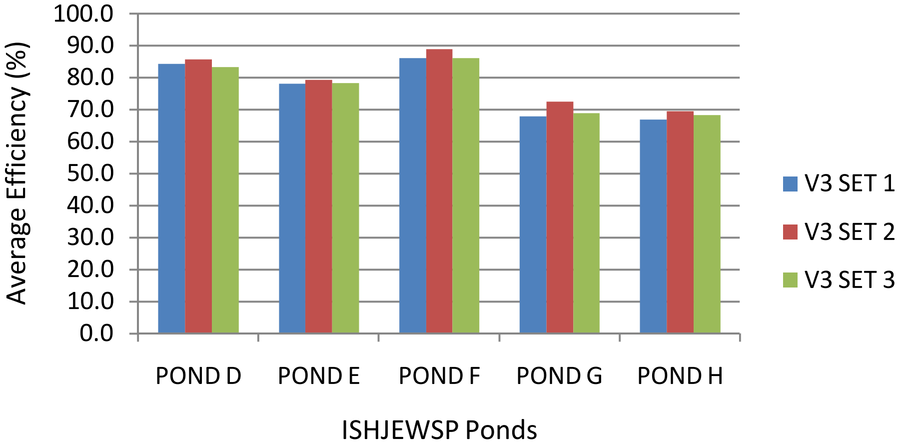

Figure 4.168: Effect of Location of Point of Initiation of Hydraulic Jump on the Average Efficiency of E-coli Removal for Velocity V_3

4.5 EMPIRICAL REGRESSION MODEL FOR THE PREDICTION OF THE BIOCHEMICAL OXYGEN DEMAND IN THE INTEGRATED SOLAR AND HYDRAULIC JUMP ENHANCED WASTE STABILIZATION POND FOR SEWAGE TREATMENT

An empirical regression model was developed for the prediction of the BOD_5 in the ISHJEWSP (Pond D) based on the independent variables of pH, temperature, algal concentration, dissolved oxygen, inlet velocity, distance from inlet to the point of initiation of hydraulic jump, angle of inclination causing jump and intensity of solar radiation (Appendix B). The application of regression analysis using Microsoft EXCEL on the data (Appendix D) revealed that a linear correlation existed between the parameters. The model developed gave a good multiple regression coefficient of 0.938 with a standard error of 5.224 at a significance level of 0.10. Equation (4.1) is obtained as an empirical regression model for the prediction of BOD_5 in the integrated solar and hydraulic jump enhanced WSP for sewage treatment. The summary of output of the regression model is shown in Appendix F.

$$y = -2.82x - 0.49x - 0.09x + 16.68x + 12.69x + 105.52x + 1.17x + 1.40x - 123.45 \quad (4.1)$$

where y_{BOD} represents the BOD in the ISHJEWSP (mg/l); x_{temp} is temperature (°C); x_{algae} is algae concentration (µg chlorophyll a/l); x_{DO} is dissolved oxygen (mg/l); x_v is the inlet velocity (m/s); x_{HJL} is the distance from inlet to the point of initiation of hydraulic jump (m); x[illegible] is the angle representing change in pond bed slope (^{o}); x_I represents the intensity of solar radiation (KW/m^2).

The R square value of the regression model shows that 87.97% of the total variation in the BOD_5 is accounted for by the eight independent variables.

4.6 COMPARISON BETWEEN THE CONVENTIONAL POND (POND A) AND THE ISHJEWSP (POND D)

4.6.1 Model Calibration

The appropriate null hypothesis (H_o) and alternate hypothesis (H_a) for the calibration of the conventional (pond A) and integrated solar and hydraulic jump enhanced waste stabilization ponds (Pond D) are stated thus:

H_o: There is no statistically significant difference between the mean of the measured N_e/N_o of the ISHJEWSP and the mean of the measured N_e/N_o of the conventional WSP.

$\mu_{ISHJEWSP} = \mu_c$

where $\mu_{ISHJEWSP}$ = Population mean of N_e/N_o of the Integrated Solar and Hydraulic Jump Enhanced Waste Stabilization Pond

μ_c = Population mean of N_e/N_o of the conventional Waste

Stabilization Pond

H$_a$: There is statistically significant difference between the mean of the measured N_e/N_o of the ISHJEWSP and the mean of the measured N_e/N_o of the conventional WSP.

$$\mu_{ISHJEWSP} \neq \mu_c$$

Applying the normal small theory of test of hypothesis (Spiegel, 1987), the student t-critical value at 22 degree of freedom and 5% level of significance is 1.72 while the computed t-values were 4.308, 4.299, 4.483, 4.105, 4.121, 3.683, 3.690, 3.865 and 3.752 corresponding to Set 1, Set 2 and Set 3 for velocities V_1, V_2 and V_3, respectively. Therefore, because the calculated t value exceeds the critical t value, the null hypothesis is rejected. Hence, at $\alpha = 5\%$ ($p < 0.05$) it is significant to infer that there is statistically significant difference between the mean of the N_e/N_o of the ISHJEWSP and the mean of the N_e/N_o of the conventional WSP. We infer that the N_e/N_o of the irradiated ISHJEWSPs are lower than those of the conventional pond at aforementioned level of significance.

4.7 EFFECT OF DETENTION TIME ON THE PERFORMANCE OF THE ISHJEWSP

The variations of N_e/N_o with detention time for both the conventional and ISHJEWSP is as shown in Figures 4.169 to 4.177.

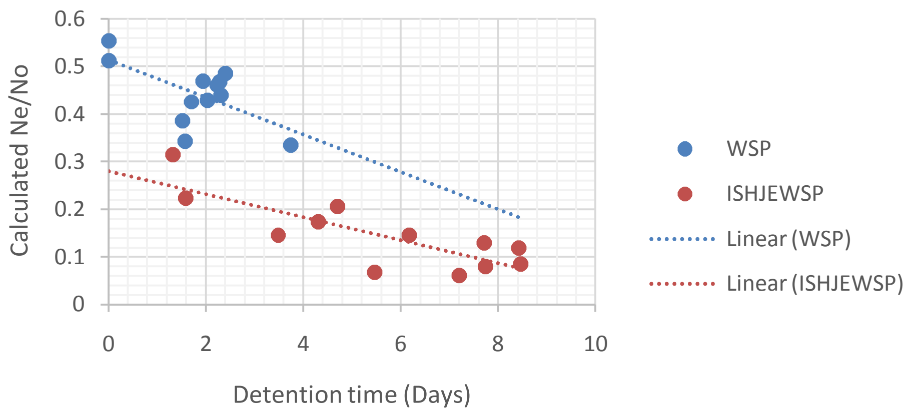

Figure 4.169: Effect of Detention Time on N_e/N_o for Velocity V_1 (Set 1)

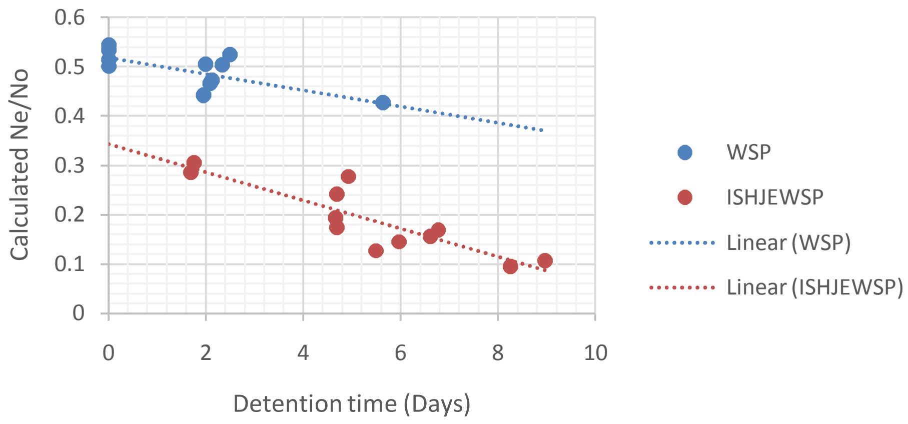

Figure 4.170: Effect of Detention Time on N_e/N_o for Velocity V_2 (Set 1)

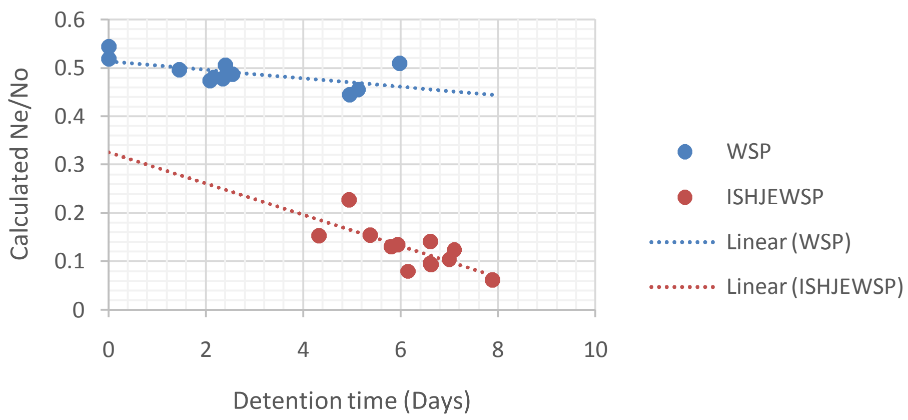

Figure 4.171: Effect of Detention Time on N_e/N_o for Velocity V_3 (Set 1)

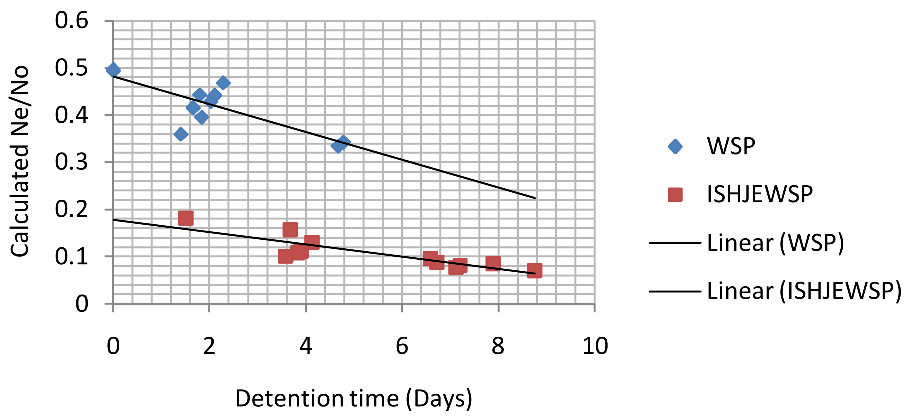

Figure 4.172: Effect of Detention Time on N_e/N_o for Velocity V_1 (Set 2)

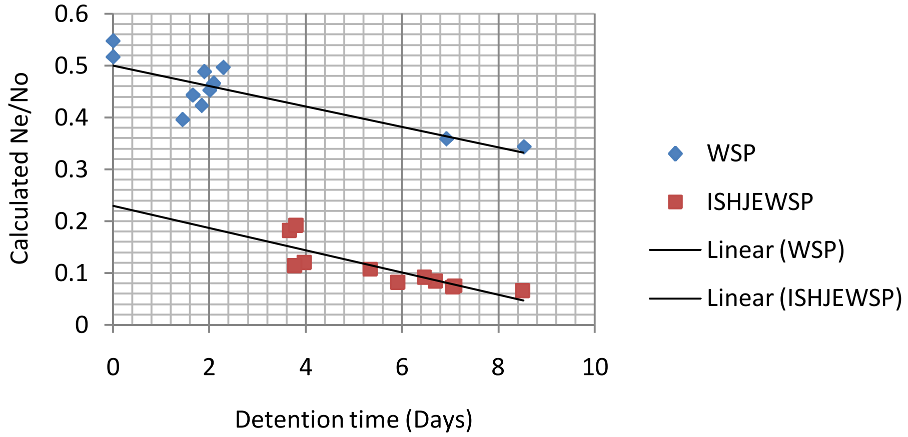

Figure 4.173: Effect of Detention Time on N_e/N_o for Velocity V_2 (Set 2)

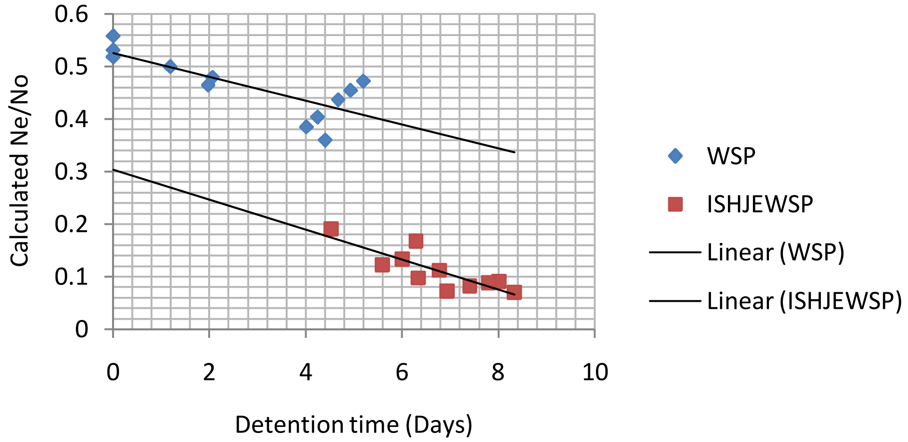

Figure 4.174: Effect of Detention Time on N_e/N_o for Velocity V_3 (Set 2)

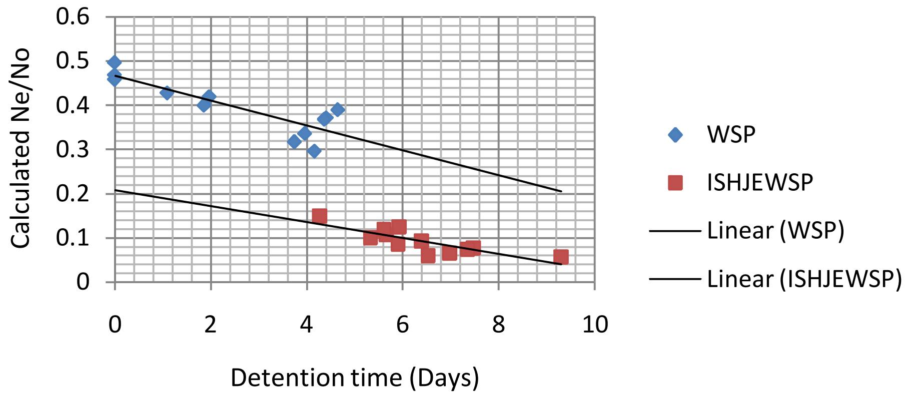

Figure 4.175: Effect of Detention Time on N_e/N_o for Velocity V_1 (Set 3)

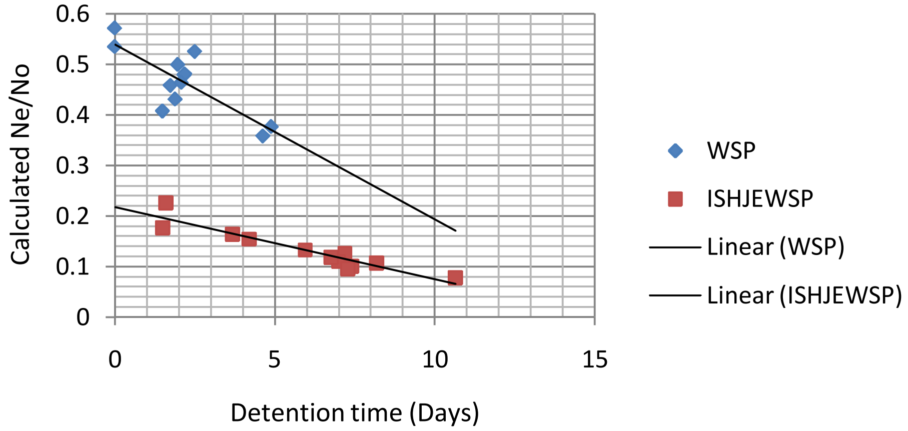

Figure 4.176: Effect of Detention Time on N_e/N_o for Velocity V_2 (Set 3)

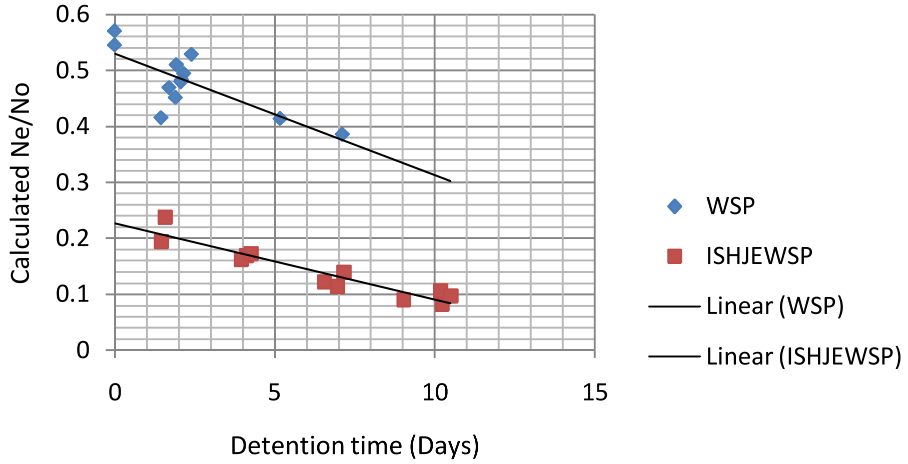

Figure 4.177: Effect of Detention Time on N_e/N_o for Velocity V_3 (Set 3)

Figures 4.169 to 4.177 reveal that the N_e/N_o reduce with increase in detention time (Toet, et al., 2005; Kayombo et al., 2005).

4.8 VERIFICATION OF MODELS

Figures 4.178 to 4.186 show the verification of the conventional model with good average coefficients of regression of R = 0.744 (0.713 to 0.777) between the measured and calculated N_e/N_o with an average standard error of 0.189 (0.168 to 0.224) for set 1. Similarly, average coefficients of regression of R = 0.823 (0.787 to 0.848), average standard error of 0.170 (0.157 to 0.188), R = 0.834 (0.801 to 0.891), average standard error of 0.1613, (0.161 to 0.162) were obtained for set 2 and 3, respectively. Also, for the ISHJEWSP, the average coefficients of regression of R = 0.890 (0.843 to 0.897) between the measured and calculated N_e/N_o with an average standard error of 0.031 (0.015 to 0.056) for set 1. Similarly, average coefficients of regression of R = 0.938 (0.928 to 0.954), standard error of 0.023 (0.011 to 0.038), R = 0.939 (0.925 to 0.965), standard error of 0.033 (0.010 to 0.049) were obtained for set 2 and 3, respectively. In the past, similar correlation coefficients have been obtained by different authors (Agunwamba, 2001b; Polprasert et al., 1983).

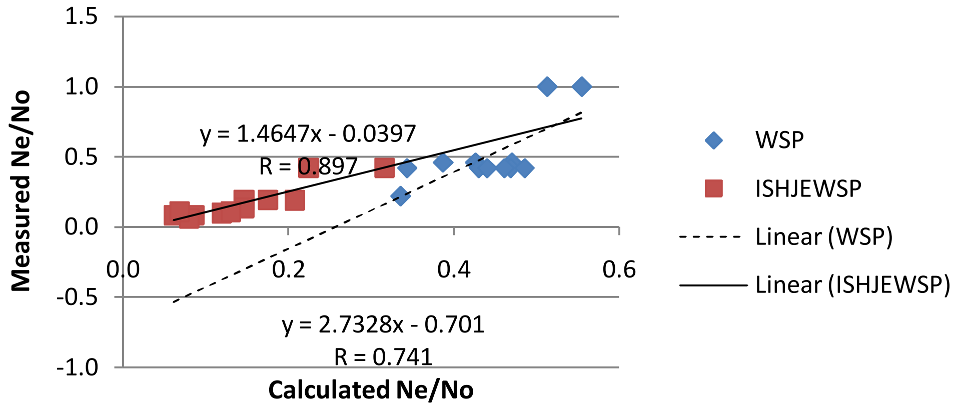

Figure 4.178: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 1, V_1)

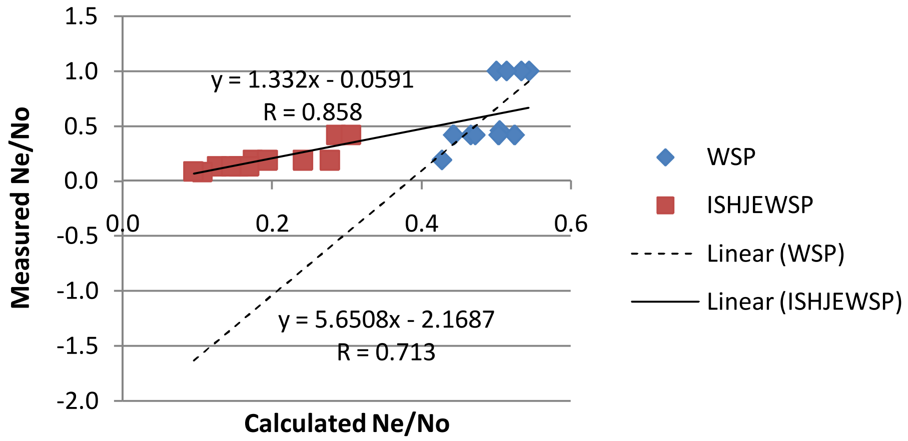

Figure 4.179: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 1, V_2)

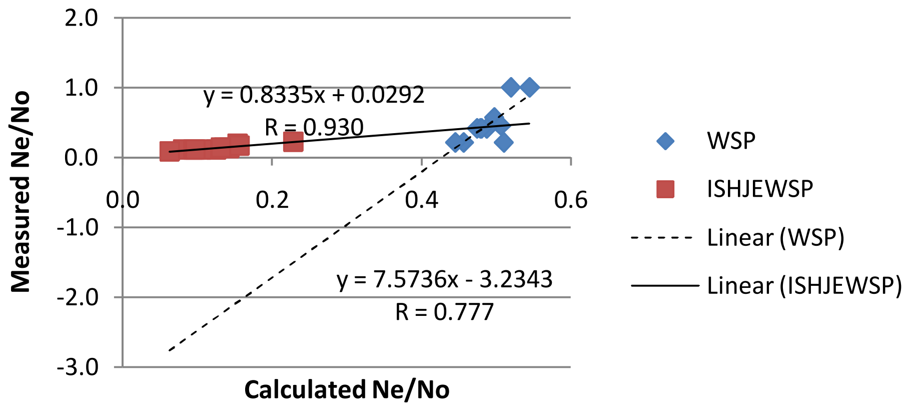

Figure 4.180: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 1, V_3)

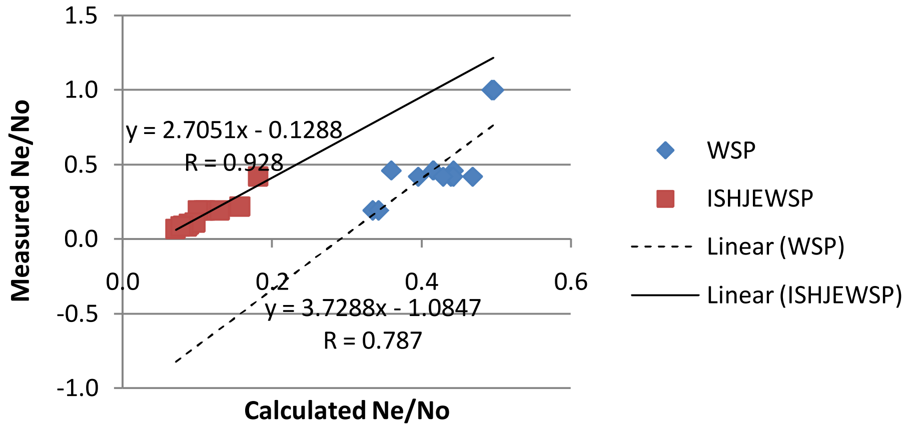

Figure 4.181: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 2, V_1)

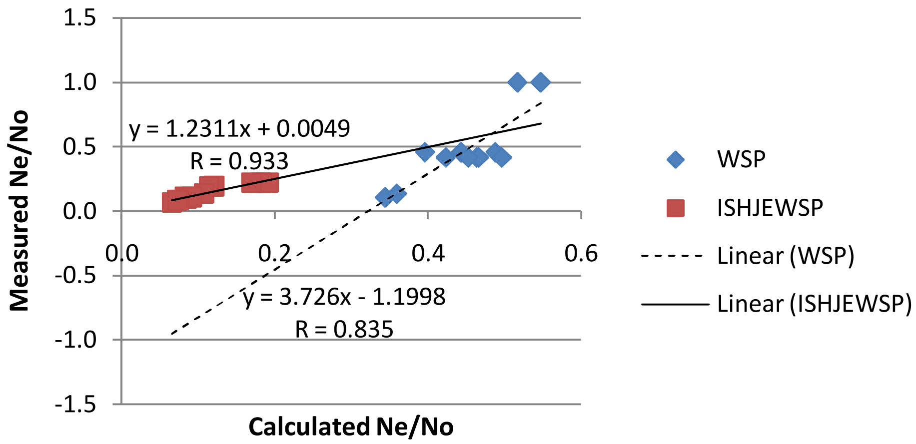

Figure 4.182: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 2, V_2)

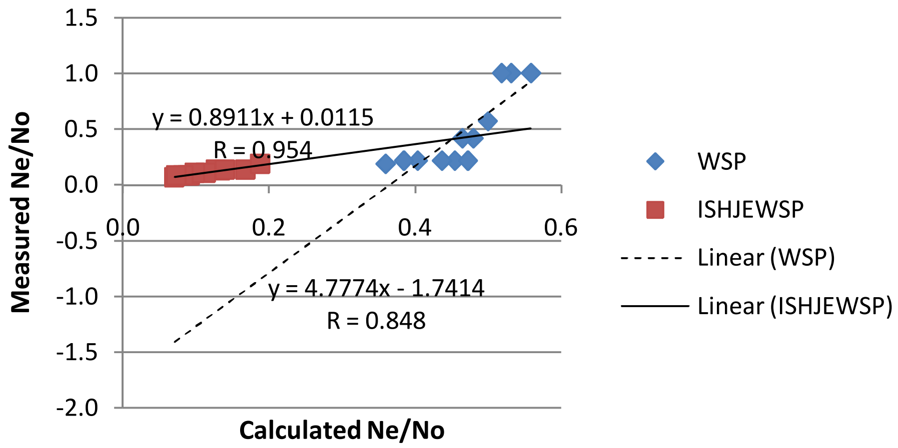

Figure 4.183: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 2, V_3)

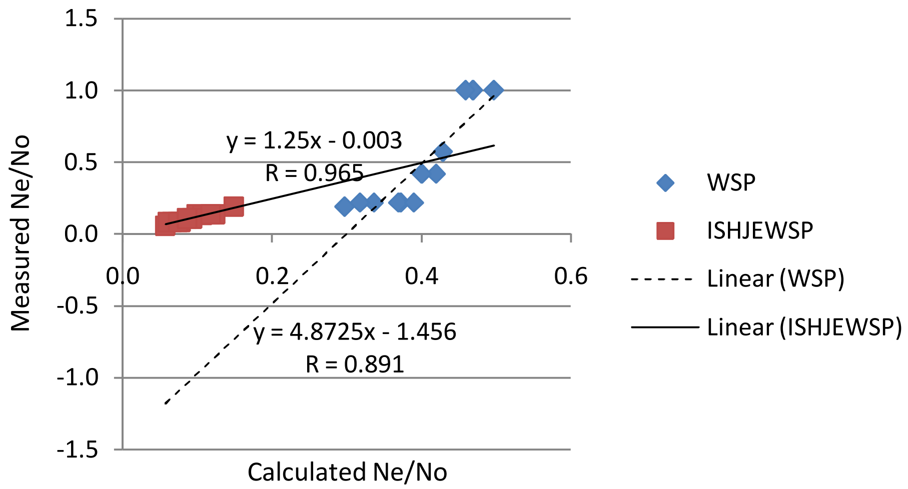

Figure 4.184: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 3, V_1)

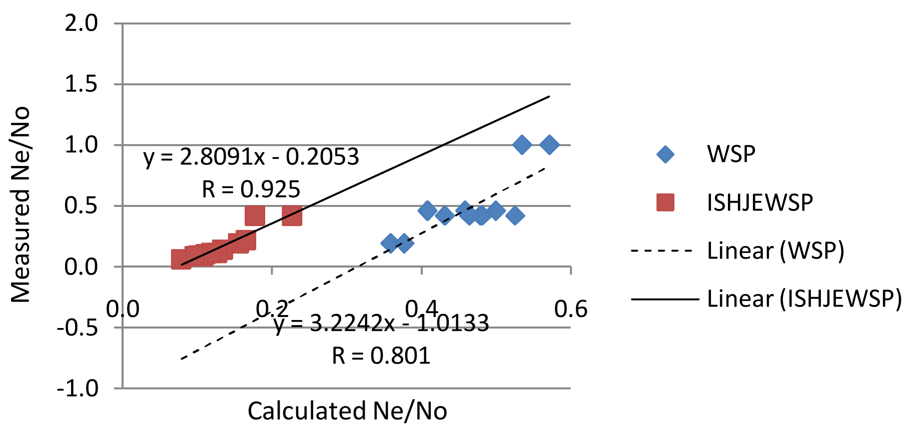

Figure 4.185: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 3, V_2)

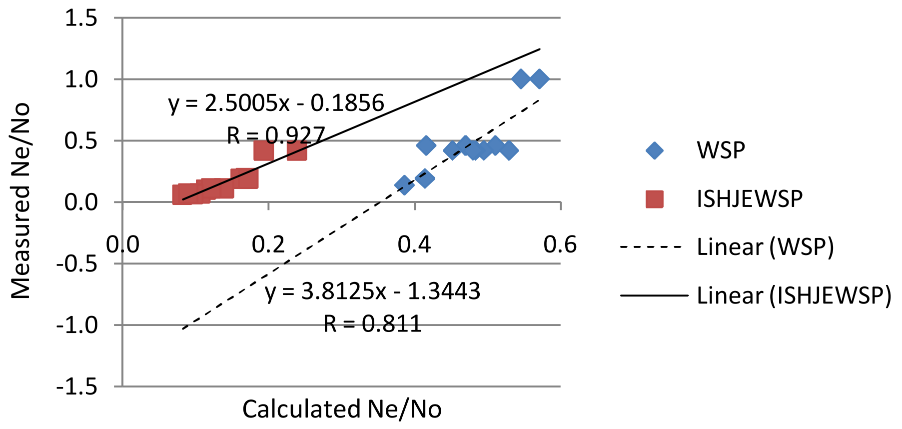

Figure 4.186: Measured versus Calculated N_e/N_o in Conventional and ISHJEWSP (Set 3, V_3)

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Experimental investigations were carried out on eight experimental ponds with sewage effluent from the imhoff tank in the University of Nigeria, Nsukka. One out of the eight ponds was constructed without a change in slope and solar reflector to serve as control experiment. Six out of the eight ponds were constructed to account for the effect of solar radiation and/or hydraulic jump for various velocities. Three sets were studied with varying locations of point initiation of hydraulic jump.

From the experimental results, comparative analysis revealed that, the efficiencies of the ISHJEWSPs with respect to these parameters fluctuated with the inlet velocity, width, location of point of initiation of hydraulic jump and intensity of solar radiation. The highest treatment efficiency was observed in the integrated solar and hydraulic jump enhanced waste stabilization pond shallowest in width at higher velocity and shortest proximity of the location of the point of initiation of the hydraulic jump from the inlet with precedence to higher solar intensity and temperature.

A new model was derived, calibrated and verified for the prediction of the performance of the ISHJEWSP. The faecal bacteria removal was significantly higher in the enhanced pond than in the conventional pond at 0.05 level of significance. The verification of the conventional model gave an average coefficient of regression of R = 0.744 (0.713 to 0.777) between the measured and calculated N_e/N_o with an average standard error of 0.189 (0.168 to 0.224) for set 1. Similarly, average coefficients of regression of R = 0.823 (0.787 to 0.848), average standard error of 0.170 (0.157 to 0.188), R = 0.834 (0.801 to 0.891), average standard error of 0.1613, (0.161 to 0.162) were obtained for set 2 and 3, respectively. Also, the ISHJEWSP gave an average coefficient of regression of R = 0.890 (0.843 to 0.897) between the measured and calculated N_e/N_o with an average standard error of 0.031 (0.015

to 0.056) for set 1. Similarly, average coefficients of regression of R = 0.938 (0.928 to 0.953), standard error of 0.023 (0.011 to 0.038), R = 0.939 (0.925 to 0.965), standard error of 0.033 (0.010 to 0.049) were obtained for set 2 and 3, respectively. In the past, similar correlation coefficients have been obtained by different authors (Agunwamba, 2001b; Polprasert et al., 1983).

The empirical model developed to predict the Biochemical Oxygen Demand in the ISHJEWSP based on the independent variables of pH, temperature, algae concentration, dissolved oxygen, inlet velocity, distance from inlet to the point of initiation of hydraulic jump, angle representing change in pond bed slope and intensity of solar radiation, revealed that a linear correlation existed between the parameters. The model developed gave a good multiple regression coefficient of correlation of 0.938 with a standard error of 5.224 at a significance level of 0.10.

The research further revealed that an ISHJEWSP with Length (L): Width (W): Depth (D) ratio of 1.0:0.3:0.2 is averagely about 1.1 times more efficient than the solar enabled pond (pond B), about 1.3 times efficient than the hydraulic jump (slope) enabled pond (pond C), about 1.7 times efficient than the conventional WSP with the same L: W: D ratio for coliform removal using aluminum foil paper as solar reflector.

5.2 RECOMMENDATIONS

Based on the findings of this research, the following recommendations would be useful in improving the efficiency of waste stabilization ponds in sewage treatment:

1. The use of the integrated solar and hydraulic jump enhanced waste stabilization pond in lieu of the conventional waste stabilization pond should be adopted for large scale municipal sewage treatment.
2. The use of flat plane reflector, using aluminum foil paper appeared to be a low-cost and practical system suited to raising the pond temperature. Test results for

the months studied; show that it is possible to raise the average temperature of the ISHJEWSP over those of the conventional WSP between 2.43°C ï 3.23°C.

3. The precedence of higher solar radiation and temperature to the increase in inlet velocity and location of point of initiation of hydraulic jump imply that the efficiency of the ISHJEWSP is largely dependent on the climatic conditions; implying higher organic load assimilation during periods with high temperature and solar radiation.
4. It was observed that the varying channel width of the ISHJEWSPs had negligible effect on the rise in fluid surface for identical inflow Froude number.
5. Hydraulic jump occurred for the inlet Froude numbers studied (Froude number = 1.1, 1.2 and 1.3). The inlet piping system of waste stabilization ponds should be designed to deliver sewage influent at inflow Froude numbers > 1.
6. The incorporation of hydraulic jump constructed with change in pond bed slope at its inlet resulted to increased pond performance through increased mixing. This resulted to increased dissolved oxygen, thereby resulting to increased rate of microbial activities in the pond.
7. Waste stabilization ponds should be fitted with solar reflectors at varying angles in accordance with the relative position of the sun per week at the outlet (west facing) in order to optimize the reflectance received by the ponds from the solar noon upwards.

However, further study is required on the incorporation of tracker on the solar reflector to enhance minute by minute optimization of solar radiation. Also, further research is required on the study of the effect of different reflector length and width.

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APPENDIX A
CALCULATION OF PARAMETERS

Coliform

The Most Probable Number of coliform for positive tubes is obtained from MPN index per 100 ml from the table of MPN index and 95% confidence limits for various combinations of positive and negative results when three 10-ml portions, three 1-ml portions and three 0.1-ml portions are used.

Biochemical Oxygen Demand (BOD)

BOD at each pond can be calculated using the formula;

$$BOD = \frac{D_1 - D_2}{P}$$

where,

D_1 = Dissolved oxygen of diluted sample in 15 minutes after preparation of (BOD_1).

D_2 = Dissolved oxygen of diluted sample after 5 days incubation (BOD_5).

$$P\ \text{decimal volumetric fraction of sample used}, \quad P = \frac{?}{250} = ?$$

Tracers Studies

Concentration of salt tracer for each pond can be calculated using the formula below

$$mg\ Cl^-\left(\frac{mg}{L}\right) = \frac{(a - b) \times N \times 35450}{ml\ of\ sample}$$

where,
a = ml of Silver nitrate in blank sample titration = varies
b = ml of Silver nitrate in sample titration = varies

N = Normality of Silver nitrate = 0.0141

Dispersion Number

Dispersion Number for each pond can be calculated using the formula below

$$? = \frac{?}{?}\left[\sqrt{8?^{?} + 1} - 1\right]$$

Where σ^2 = normalized variance given by

$$\sigma^2 = \frac{1}{\bar{\theta}^2}\left[\frac{\sum_{i=1}^{n} ci\, t_i^{\,2}}{\sum_{i=1}^{n} ci} - \bar{\theta}^2\right]$$

t_i = time after injection of tracer (seconds); C is tracer response concentration at the exit of the pond (mg/l); n is number of samples; and $\bar{\theta}$ the average flow time (Marecos do Monte and Mara, 1987) given by

$$\bar{\theta} = \left(\begin{array}{c} \dfrac{\sum_{i}^{n} C_i\, t_i}{\sum_{i}^{n} C_i} \\ i = 1 \end{array}\right)$$

Total Suspended Solids (SS)

The total suspended solids for each pond can be calculated using the formula below

$$\text{TSS} = \frac{(\square_{\square} - \square_{\square})\ \square\ \square\square\square\square}{\text{V}}$$

Where W_1 = Weight of clean filter paper in mg

W_2 = Weight of filter paper and residue in mg

V = Weight of sample in millilitres

Algae Concentration

Determination of chlorophyll a, b, and c (trichromatic method): Spectrophotometric procedure

The concentrations of chlorophyll *a, b,* and *c* in the extract were calculated by inserting the corrected optical densities from the following equations:

Ca = 11.85(OD664) - 1.54(OD647) - 0.08(OD630)

where:

Ca, = concentrations of chlorophyll *a*, mg/l

OD664, OD647, and OD630 are corrected optical densities (with a 1-cm light path) at the respective wavelengths.

After determining the concentration of pigment in the extract, the amounts of pigment per unit volume were calculated as shown below:

[illegible]

APPENDIX B
RESEARCH EMPIRICAL DATA

Variation of pond DO with time (Set 1, V_1)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.05.13	2.0	7.7	8.5	7.9	8.9	8.8	9.2	8.4	8.2
Week 1	10.05.13	2.2	7.9	8.9	8.3	9.3	9.1	9.5	8.7	8.6
Week 1	13.05.13	2.7	7.7	9.1	8.7	9.7	9.4	9.8	8.9	8.7
Week 1	15.05.13	2.1	7.8	9.0	8.2	9.2	9.1	9.4	8.9	8.7
Week 2	17.05.13	2.3	7.1	8.9	8.4	9.4	9.4	9.6	8.7	8.5
Week 2	19.05.13	1.7	7.0	8.1	7.1	8.6	8.5	8.9	7.7	7.6
Week 2	21.05.13	1.6	6.6	8.3	7.0	8.5	8.4	8.8	7.9	7.5
Week 3	23.05.13	1.9	7.1	8.7	7.4	8.9	8.8	9.1	8.4	8.1
Week 3	25.05.13	2.8	7.6	9.2	8.9	9.5	9.2	9.9	8.8	8.5
Week 3	28.05.13	2.4	7.7	8.8	8.5	9.6	9.0	9.7	8.7	8.7
Week 3	31.05.13	1.8	6.8	8.6	7.3	9	8.7	9.1	8.3	8.1
Week 4	06.06.13	2.3	7.9	8.9	8.3	9.3	8.9	9.6	8.7	8.5

Variation of pond Temperature with time (Set 1, V_1)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.05.13	25.9	30.5	32.6	30.8	33.2	32.7	33.2	32.2	31.8
Week 1	10.05.13	26.2	29.0	31.7	29.9	32.2	32.0	33.0	31.0	30.5
Week 1	13.05.13	27.4	28.5	29.8	28.8	31.1	29.9	32.7	29.7	29.5
Week 1	15.05.13	26.0	29.1	32.1	30.1	32.7	32.5	33.1	31.6	31.2
Week 2	17.05.13	27.3	28.7	30.8	29.5	31.4	31.1	33.1	30.5	30.4
Week 2	19.05.13	25.6	32.0	33.9	32.5	34.3	34.1	34.6	33.2	33.0
Week 2	21.05.13	25.0	32.5	34.0	32.9	34.5	34.2	34.8	33.2	33.1
Week 3	23.05.13	25.5	31.0	32.9	31.1	33.2	33.1	33.7	32.5	32.3
Week 3	25.05.13	26.2	26.2	28.9	26.6	29.2	29.1	30.7	27.7	27.2
Week 3	28.05.13	27.4	28.6	30.5	29.2	31.3	31.1	33.1	29.8	29.6
Week 3	31.05.13	25.4	31.2	33.4	31.3	33.9	33.5	34.1	32.9	32.8
Week 4	06.06.13	26.4	29.3	31.0	29.7	31.6	31.2	32.2	30.4	30.2

Variation of pond pH with time (Set 1, V_1)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.05.13	6.8	7.7	8.4	7.8	9.1	8.8	9.5	8.1	8.1
Week 1	10.05.13	6.9	7.4	8.2	7.6	8.8	8.6	9.1	8.1	8.0
Week 1	13.05.13	6.4	6.5	7.5	7.2	8.0	7.7	8.4	7.8	7.7

Week 1	15.05.13	7.0	7.6	8.3	7.7	9.1	8.7	9.4	8.1	8.0
Week 2	17.05.13	6.9	7.1	8.1	7.4	8.5	8.5	9.0	8.0	7.9
Week 2	19.05.13	7.3	8.7	9.8	8.7	10.8	10.2	10.8	8.9	8.8
Week 2	21.05.13	7.2	8.8	10.0	8.9	10.9	10.4	10.8	9.1	9.0
Week 3	23.05.13	7.3	7.7	9.4	7.8	10.0	9.8	10.3	8.2	8.1
Week 3	25.05.13	6.3	6.3	8.7	7.5	9.4	9.0	9.4	8.1	8.0
Week 3	28.05.13	6.6	6.7	8.6	7.3	8.0	7.8	8.7	7.9	7.8
Week 3	31.05.13	7.1	8.2	9.5	8.4	10.2	9.9	10.4	8.5	8.4
Week 4	06.06.13	7.1	7.2	9.2	8.0	10.1	9.7	10.4	8.6	8.5

Variation of pond algae concentration with time (Set 1, V_1)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.05.13	100.41	124.11	231.59	125.73	282.74	248.89	323.82	187.51	178.82
Week 1	10.05.13	94.8	100.49	221.36	113.88	248.81	228.35	301.74	165.43	156.66
Week 1	13.05.13	85.48	97.33	143.27	98.95	194.42	182.65	223.65	131.42	121.11
Week 1	15.05.13	97.41	113.88	231.59	125.73	282.74	238.58	311.97	175.66	177.2
Week 2	17.05.13	88.64	95.79	175.58	100.49	226.73	206.35	267.81	151.96	141.65
Week 2	19.05.13	110.8	134.5	270.89	156.58	344.2	311.81	385.2	228.35	196.04
Week 2	21.05.13	102.03	146.35	282.74	166.89	356.05	323.66	397.05	240.2	218.2
Week 3	23.05.13	98.95	134.5	248.81	146.35	300.04	279.5	341.04	218.12	185.81
Week 3	25.05.13	79.87	81.41	131.42	87.1	194.42	172.42	200.11	119.57	109.26
Week 3	28.05.13	81.41	85.48	153.5	100.41	204.65	192.88	245.73	141.73	131.42
Week 3	31.05.13	100.49	134.5	252.13	146.35	303.28	282.82	345.98	211.13	189.05
Week 4	06.06.13	88.64	98.79	187.51	103.57	238.66	216.66	279.74	155.12	146.35

1st Reading collected on 01.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.4421	63.4501	30	8	267	
Pond A	55.2716	55.2762	30	4.6	153	42.5
Pond B	52.0613	52.0627	30	1.4	47	82.5
Pond C	55.1397	55.1434	30	3.7	123	53.7
Pond D	50.0158	50.0169	30	1.1	37	86.2
Pond E	51.0059	51.0072	30	1.3	43	83.7
Pond F	48.0015	48.0023	30	0.8	27	90.0
Pond G	54.1282	54.1306	30	2.4	80	70.0
Pond H	54.2606	54.2632	30	2.6	87	67.5

2nd Reading collected on 10.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.4324	62.4401	30	7.7	257	
Pond A	55.2433	55.2481	30	4.8	160	38
Pond B	52.0304	52.0323	30	1.9	63	75
Pond C	55.1200	55.1241	30	4.1	137	47
Pond D	49.9055	49.9069	30	1.4	47	82
Pond E	50.906	50.9076	30	1.6	53	79
Pond F	47.9020	47.9032	30	1.2	40	84
Pond G	54.0182	54.0217	30	3.5	117	55
Pond H	54.1496	54.1531	30	3.5	117	55

3rd Reading collected on 13.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.4322	63.4401	30	7.9	263	
Pond A	55.2626	55.268	30	5.4	180	31.6
Pond B	52.0404	52.0432	30	2.8	93	64.6
Pond C	55.1298	55.1345	30	4.7	157	40.5
Pond D	50.0051	50.0069	30	1.8	60	77.2
Pond E	51.0050	51.0076	30	2.6	87	67.1
Pond F	48.0018	48.0032	30	1.4	47	82.3
Pond G	54.1084	54.1119	30	3.5	117	55.7
Pond H	54.2482	54.2521	30	3.9	130	50.6

4th Reading collected on 15.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.3326	62.3401	30	7.5	250	
Pond A	55.1109	55.1151	30	4.2	140	44
Pond B	52.0115	52.0127	30	1.2	40	84
Pond C	55.0205	55.024	30	3.5	117	53
Pond D	49.8058	49.8069	30	1.1	37	85
Pond E	50.7059	50.7072	30	1.3	43	83
Pond F	47.8024	47.8032	30	0.8	27	89

Pond G	54.0088	54.0113	30	2.5	83	67
Pond H	54.0507	54.0533	30	2.6	87	65

5th Reading collected on 17.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.0128	60.0195	30	6.7	223	
Pond A	55.1135	55.1179	30	4.4	147	34.3
Pond B	51.5512	51.5529	30	1.7	57	75
Pond C	54.9105	54.9142	30	3.7	123	45
Pond D	48.3042	48.3056	30	1.4	47	79
Pond E	50.0057	50.0074	30	1.7	57	75
Pond F	47.2006	47.2017	30	1.1	37	84
Pond G	53.4085	53.4114	30	2.9	97	57
Pond H	53.9098	53.9130	30	3.2	107	52

6th Reading collected on 19.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.0128	58.0209	30	8.1	270	
Pond A	54.1145	54.1187	30	4.2	140	48.1
Pond B	49.0063	49.0075	30	1.2	40	85.2
Pond C	53.9112	53.9147	30	3.5	117	56.8
Pond D	47.3048	47.3059	30	1.1	37	86.4
Pond E	49.5513	49.5522	30	0.9	30	88.9
Pond F	46.2013	46.202	30	0.7	23	91.4
Pond G	52.4093	52.4114	30	2.1	70	74.1
Pond H	52.9106	52.9130	30	2.4	80	70.4

7th Reading collected on 21.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.0328	61.0409	30	8.1	270	
Pond A	54.0536	54.0576	30	4	133	50.6
Pond B	50.2066	50.2078	30	1.2	40	85.2

Pond C	54.0416	54.0448	30	3.2	107	60.5
Pond D	49.6061	49.6072	30	1.1	37	86.4
Pond E	51.8519	51.8528	30	0.9	30	88.9
Pond F	47.4023	47.403	30	0.7	23	91.4
Pond G	53.7100	53.7120	30	2	67	75.3
Pond H	54.0210	54.0232	30	2.2	73	72.8

8th Reading collected on 23.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.2328	62.2401	30	7.3	243	
Pond A	55.0138	55.0180	30	4.2	140	42.5
Pond B	52.0016	52.0027	30	1.1	37	84.9
Pond C	55.0105	55.0139	30	3.4	113	53.4
Pond D	49.7057	49.7067	30	1	33	86.3
Pond E	50.5064	50.5076	30	1.2	40	83.6
Pond F	47.5025	47.5033	30	0.8	27	89.0
Pond G	53.9080	53.9101	30	2.1	70	71.2
Pond H	54.0305	54.0329	30	2.4	80	67.1

9th Reading collected on 25.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.541	63.5501	30	9.1	303	
Pond A	55.7715	55.7777	30	6.2	207	32
Pond B	52.0791	52.0825	30	3.4	113	63
Pond C	55.6384	55.6439	30	5.5	183	40
Pond D	50.0142	50.0166	30	2.4	80	74
Pond E	51.055	51.0584	30	3.4	113	63
Pond F	50.0035	50.0053	30	1.8	60	80
Pond G	54.1267	54.1312	30	4.5	150	51
Pond H	54.5485	54.5530	30	4.5	150	51

10th Reading collected on 28.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.5413	63.5501	30	8.8	293	
Pond A	55.6721	55.6781	30	6	200	32
Pond B	51.0345	51.037	30	2.5	83	72
Pond C	55.5389	55.544	30	5.1	170	42
Pond D	50.0146	50.0165	30	1.9	63	78
Pond E	52.0698	52.0723	30	2.5	83	72
Pond F	50.0016	50.0031	30	1.5	50	83
Pond G	54.2265	54.2304	30	3.9	130	56
Pond H	54.3488	54.3531	30	4.3	143	51

11th Reading collected on 31.05.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.0228	60.0312	30	8.4	280	
Pond A	55.2139	55.2183	30	4.4	147	47.6
Pond B	51.6517	51.6529	30	1.2	40	85.7
Pond C	55.0111	55.0148	30	3.7	123	56.0
Pond D	48.4057	48.4068	30	1.1	37	86.9
Pond E	50.1064	50.1074	30	1	33	88.1
Pond F	47.3014	47.3021	30	0.7	23	91.7
Pond G	53.5097	53.5119	30	2.2	73	73.8
Pond H	54.0110	54.0135	30	2.5	83	70.2

12th Reading collected on 06.06.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.4419	63.4501	30	8.2	273	
Pond A	55.4718	55.4772	30	5.4	180	34.1
Pond B	52.0601	52.062	30	1.9	63	77
Pond C	55.3401	55.3445	30	4.4	147	46
Pond D	50.015	50.0166	30	1.6	53	80
Pond E	51.0153	51.0172	30	1.9	63	77
Pond F	49.0018	49.0032	30	1.4	47	83

Pond G	54.228	54.2315	30	3.5	117	57
Pond H	54.2493	54.2531	30	3.8	127	54

1st Reading collected on 01.05.13

Biochemical Oxygen Demand (BOD)						
Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.2	285	
Pond A	250	5	7.5	4.4	155	45.6
Pond B	250	5	9.9	8.2	85	70.2
Pond C	250	5	8.9	5.9	150	47.4
Pond D	250	5	10.2	9.1	55	80.7
Pond E	250	5	9.9	8.2	85	70.2
Pond F	250	5	10.5	9.7	40	86.0
Pond G	250	5	9.7	7.4	115	59.6
Pond H	250	5	9.3	6.9	120	57.9

2nd Reading collected on 10.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.4	285	
Pond A	250	5	7.5	4.1	170	40.4
Pond B	250	5	8.7	6.9	90	68.4
Pond C	250	5	8.2	4.9	165	42.1
Pond D	250	5	9.4	8.2	60	78.9
Pond E	250	5	9.3	7.6	85	70.2
Pond F	250	5	10	9.0	50	82.5
Pond G	250	5	8.3	5.9	120	57.9
Pond H	250	5	7.9	5.4	125	56.1

3rd Reading collected on 13.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.7	1.3	270	
Pond A	250	5	7.8	4.2	180	33.3
Pond B	250	5	9.0	6.7	115	57.4

Pond C	250	5	8.2	4.9	165	38.9
Pond D	250	5	9.6	8.3	65	75.9
Pond E	250	5	9.4	6.9	125	53.7
Pond F	250	5	9.8	8.7	55	79.6
Pond G	250	5	8.9	6	145	46.3
Pond H	250	5	8.6	5.6	150	44.4

4th Reading collected on 15.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	1.3	275	
Pond A	250	5	7.5	4.4	155	43.64
Pond B	250	5	9.9	8.2	85	69.09
Pond C	250	5	8.9	5.9	150	45.45
Pond D	250	5	10.2	9.1	55	80.00
Pond E	250	5	9.9	8.2	85	69.09
Pond F	250	5	10.5	9.6	45	83.64
Pond G	250	5	9.7	7.4	115	58.18
Pond H	250	5	9.3	6.9	120	56.36

5th Reading collected on 17.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.4	1.3	255	
Pond A	250	5	6.6	3.4	160	37.3
Pond B	250	5	9.4	7.7	85	66.7
Pond C	250	5	7.7	4.7	150	41.2
Pond D	250	5	9.7	8.6	55	78.4
Pond E	250	5	9.6	8.0	80	68.6
Pond F	250	5	10	9.0	50	80.4
Pond G	250	5	8.9	6.5	120	52.9
Pond H	250	5	8.7	6.2	125	51.0

6th Reading collected on 19.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.9	1.9	300	
Pond A	250	5	6.9	4.5	120	60.00
Pond B	250	5	9.8	8.1	85	71.67
Pond C	250	5	7.2	5.0	110	63.33
Pond D	250	5	10.3	9.6	35	88.33
Pond E	250	5	9.4	8.1	65	78.33
Pond F	250	5	10.7	10.2	25	91.67
Pond G	250	5	8.2	6.1	105	65.00
Pond H	250	5	7.9	5.7	110	63.33

7th Reading collected on 21.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO1	DO5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.0	2.0	300	
Pond A	250	5	7	4.6	120	60.00
Pond B	250	5	9.8	8.2	80	73.33
Pond C	250	5	7.2	5	110	63.33
Pond D	250	5	10.3	9.7	30	90.00
Pond E	250	5	9.4	8.2	60	80.00
Pond F	250	5	10.8	10.3	25	91.67
Pond G	250	5	8.3	6.3	100	66.67
Pond H	250	5	8	5.9	105	65.00

8th Reading collected on 23.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.8	1.3	325	
Pond A	250	5	7.9	4.6	165	49.23
Pond B	250	5	9.6	7.6	100	69.23
Pond C	250	5	8.2	5.6	130	60.00
Pond D	250	5	10.3	9.4	45	86.15
Pond E	250	5	9.9	8.3	80	75.38
Pond F	250	5	10.6	9.9	35	89.23

Pond G	250	5	9.2	6.6	130	60.00
Pond H	250	5	9.0	6.3	135	58.46

9th Reading collected on 25.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.8	0.9	245	
Pond A	250	5	6.1	2.7	170	30.6
Pond B	250	5	7.4	5.2	110	55.1
Pond C	250	5	6.0	3.0	150	38.8
Pond D	250	5	8.7	7.4	65	73.5
Pond E	250	5	8.4	6.0	120	51.0
Pond F	250	5	8.9	7.9	50	79.6
Pond G	250	5	6.7	4.1	130	46.9
Pond H	250	5	6.4	3.7	135	44.9

10th Reading collected on 28.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.7	0.9	240	
Pond A	250	5	6.0	2.9	155	35.42
Pond B	250	5	7.5	5.6	95	60.42
Pond C	250	5	6.9	4.0	145	39.58
Pond D	250	5	9.2	8.0	60	75.00
Pond E	250	5	8.8	7.0	90	62.50
Pond F	250	5	9.7	8.7	50	79.17
Pond G	250	5	7.1	4.6	125	47.92
Pond H	250	5	6.9	4.3	130	45.83

11th Reading collected on 31.05.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.6	1.9	285	
Pond A	250	5	6.8	4.0	140	50.88
Pond B	250	5	9.5	7.8	85	70.18

Pond C	250	5	7.1	5.0	105	63.16
Pond D	250	5	10.3	9.6	35	87.72
Pond E	250	5	9.4	8.1	65	77.19
Pond F	250	5	10.6	10.1	25	91.23
Pond G	250	5	8.1	6.1	100	64.91
Pond H	250	5	7.9	5.8	105	63.16

12th Reading collected on 06.06.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.4	280	
Pond A	250	5	7.5	4.1	170	39.3
Pond B	250	5	8.7	6.9	90	67.9
Pond C	250	5	8.2	4.9	165	41.1
Pond D	250	5	9.4	8.2	60	78.6
Pond E	250	5	9.3	7.6	85	69.6
Pond F	250	5	10	9.0	50	82.1
Pond G	250	5	8.3	5.9	120	57.1
Pond H	250	5	7.9	5.4	125	55.4

1st Reading collected on 01.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 0	240	90
Pond E	3 - 3 - 0	240	90
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

2nd Reading collected on 10.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81

Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 1	150	86
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 13.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	1100	0.0
Pond B	3 - 3 - 1	460	58.2
Pond C	3 - 3 - 1	460	58.2
Pond D	3 - 3 - 1	460	58.2
Pond E	3 - 3 - 1	460	58.2
Pond F	3 - 3 - 0	210	80.9
Pond G	3 - 3 - 1	460	58.2
Pond H	3 - 3 - 1	460	58.2

4th Reading collected on 15.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 2	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

5th Reading collected on 17.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 1	460	81

Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 2	1100	54

6th Reading collected on 19.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58.2
Pond B	3 - 1 - 2	120	89.1
Pond C	3 - 2 - 2	210	80.9
Pond D	3 - 1 - 2	120	89.1
Pond E	3 - 1 - 2	120	89.1
Pond F	3 - 0 - 2	64	94.2
Pond G	3 - 2 - 1	150	86.4
Pond H	3 - 2 - 1	150	86.4

7th Reading collected on 21.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78.2
Pond B	3 - 2 - 0	93	91.5
Pond C	3 - 2 - 1	150	86.4
Pond D	3 - 2 - 0	93	91.5
Pond E	3 - 2 - 0	93	91.5
Pond F	3 - 1 - 1	75	93.2
Pond G	3 - 2 - 2	210	80.9
Pond H	3 - 2 - 2	210	80.9

8th Reading collected on 23.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58.2
Pond B	3 - 2 - 1	150	86.4
Pond C	3 - 3 - 0	240	78.2
Pond D	3 - 2 - 0	93	91.5
Pond E	3 - 1 - 2	120	89

Pond F	3 - 2 - 0	93	91.5
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

9th Reading collected on 25.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 2	460	58
Pond C	3 - 3 - 2	460	58
Pond D	3 - 3 - 2	460	58
Pond E	3 - 3 - 2	460	58
Pond F	3 - 3 - 2	460	58
Pond G	3 - 3 - 2	460	58
Pond H	3 - 3 - 2	460	58

10th Reading collected on 28.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58.2
Pond B	3 - 3 - 1	460	58.2
Pond C	3 - 3 - 1	460	58.2
Pond D	3 - 2 - 2	210	80.9
Pond E	3 - 3 - 1	460	58.2
Pond F	3 - 2 - 1	150	86.4
Pond G	3 - 3 - 1	460	58.2
Pond H	3 - 3 - 1	460	58.2

11th Reading collected on 31.05.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54.2
Pond B	3 - 3 - 0	240	90.0
Pond C	3 - 3 - 1	460	80.8
Pond D	3 - 2 - 1	210	91.3
Pond E	3 - 3 - 0	240	90.0
Pond F	3 - 1 - 2	150	93.8
Pond G	3 - 3 - 1	460	80.8

Pond H	3 - 3 - 1	460	80.8

12th Reading collected on 06.06.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

1st Reading collected on 01.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	55.7
Pond B	3 - 1 - 0	43	79.5
Pond C	3 - 1 - 1	75	64.3
Pond D	2 - 2 - 1	28	86.7
Pond E	3 - 1 - 0	39	81.4
Pond F	2 - 2 - 1	28	86.7
Pond G	3 - 0 - 2	64	69.5
Pond H	3 - 1 - 1	75	64.3

2nd Reading collected on 10.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50.0
Pond B	2 - 2 - 1	39	74.0
Pond C	3 - 0 - 2	64	57.3
Pond D	2 - 2 - 1	28	81.3
Pond E	2 - 2 - 1	28	81.3
Pond F	2 - 1 - 1	20	86.7
Pond G	3 - 0 - 2	64	57.3
Pond H	3 - 0 - 2	64	57.3

3rd Reading collected on 13.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 2 - 1	150	0.0
Pond B	3 - 1 - 0	64	57.3
Pond C	3 - 1 - 1	75	50.0
Pond D	3 - 1 - 0	43	71.3
Pond E	3 - 1 - 0	64	57.3
Pond F	2 - 2 - 1	28	81.3
Pond G	3 - 0 - 2	64	57.3
Pond H	3 - 0 - 2	64	57.3

4th Reading collected on 15.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 0 - 2	64	47
Pond B	2 - 2 - 1	28	77
Pond C	3 - 1 - 0	43	64.2
Pond D	2 - 1 - 1	20	83
Pond E	3 - 0 - 0	23	81
Pond F	2 - 1 - 0	15	88
Pond G	3 - 0 - 1	39	67.5
Pond H	3 - 1 - 0	43	64.2

5th Reading collected on 17.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	120	50.0
Pond B	3 - 0 - 2	64	73.3
Pond C	3 - 1 - 2	120	50.0
Pond D	3 - 1 - 0	43	82.1
Pond E	3 - 0 - 2	64	73.3
Pond F	3 - 1 - 0	39	83.8
Pond G	3 - 2 - 0	93	61.3
Pond H	3 - 2 - 0	93	61.3

6th Reading collected on 19.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	

Pond A	3 - 1 - 0	43	71.3
Pond B	3 - 0 - 0	23	84.7
Pond C	3 - 1 - 0	43	71.3
Pond D	2 - 1 - 0	15	90.0
Pond E	2 - 1 - 1	20	86.7
Pond F	1 - 2 - 0	11	92.7
Pond G	3 - 0 - 1	39	74.0
Pond H	3 - 0 - 1	39	74.0

7th Reading collected on 21.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	210	
Pond A	3 - 0 - 2	39	81.43
Pond B	2 - 0 - 1	14	93.33
Pond C	3 - 0 - 2	39	81.43
Pond D	2 - 0 - 1	14	93.33
Pond E	2 - 0 - 1	14	93.33
Pond F	1 - 2 - 0	11	94.76
Pond G	2 - 2 - 1	28	86.67
Pond H	2 - 2 - 1	28	86.67

8th Reading collected on 23.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 1 - 1	20	87
Pond E	3 - 0 - 0	23	85
Pond F	2 - 1 - 1	20	87
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

9th Reading collected on 25.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	460	
Pond A	3 - 3 - 2	460	0.0
Pond B	3 - 2 - 2	210	54.3
Pond C	3 - 3 - 2	460	0.0
Pond D	3 - 2 - 2	210	54.3

Pond E	3 - 2 - 2	210	54.3
Pond F	3 - 1 - 2	120	73.9
Pond G	3 - 2 - 2	210	54.3
Pond H	3 - 2 - 2	210	54.3

10th Reading collected on 28.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 3 - 0	240	0.0
Pond B	3 - 0 - 2	64	73.3
Pond C	3 - 1 - 2	120	50.0
Pond D	3 - 1 - 0	43	82.1
Pond E	3 - 0 - 2	64	73.3
Pond F	3 - 1 - 0	39	83.8
Pond G	3 - 1 - 2	93	61.3
Pond H	3 - 1 - 2	93	61.3

11th Reading collected on 31.05.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 1	75	69
Pond D	3 - 0 - 0	23	90
Pond E	3 - 0 - 1	39	84
Pond F	3 - 0 - 0	20	92
Pond G	3 - 0 - 2	64	73
Pond H	3 - 0 - 2	64	73

12th Reading collected on 06.06.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	3 - 0 - 2	39	74
Pond C	3 - 0 - 2	64	57
Pond D	2 - 2 - 1	28	81
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 1	20	87
Pond G	3 - 1 - 0	43	71.3
Pond H	3 - 0 - 2	64	57

Variation of pond parameters with time (Set 1, V2)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.08.13	2.2	7.9	9.2	7.9	9.3	9.3	9.5	8.6	8.4
Week 1	05.08.13	2.0	7.6	8.7	8.1	9.1	8.9	9.3	8.4	8.2
Week 1	07.08.13	1.9	7.5	8.6	7.9	9.0	8.8	9.2	8.4	8.1
Week 1	09.08.13	1.6	6.9	8.3	7.2	8.7	8.6	8.8	8.1	7.8
Week 2	12.08.13	2.6	8.3	9.4	8.7	9.8	9.6	9.9	9.2	9.0
Week 2	14.08.13	2.4	8.1	9.3	8.4	9.6	9.4	9.6	9.1	8.9
Week 2	16.08.13	2.3	8.0	9.0	8.3	9.4	9.2	9.6	8.9	8.9
Week 3	18.08.13	2.4	8.1	9.2	8.3	9.5	9.3	9.7	9.0	8.7
Week 3	20.08.13	1.7	7.3	8.4	7.5	8.8	8.5	9.0	8.3	7.9
Week 3	22.09.13	1.8	7.5	8.6	7.7	8.8	8.9	9.1	8.5	8.3
Week 3	24.09.13	2.1	7.7	8.9	7.7	9.3	9.1	9.4	8.5	8.4
Week 4	27.09.13	1.8	7.1	8.6	7.4	8.7	8.6	9.0	8.2	8.2

Variation of pond Temperature with time (Set 1, V_2)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.08.13	26.0	26.5	27.9	26.9	28.4	28.1	29.0	27.5	27.2
Week 1	05.08.13	26.3	26.8	27.8	27.0	29.0	28.2	30.1	27.7	27.3
Week 1	07.08.13	26.3	28.5	29.5	29.0	30.2	29.8	30.7	29.7	29.5
Week 1	09.08.13	25.9	31.3	32.7	31.7	34.3	33.3	34.5	32.3	32.0
Week 2	12.08.13	25.0	25.1	27.3	26.3	28.0	27.7	28.3	27.0	26.4
Week 2	14.08.13	25.1	25.2	27.0	26.5	28.2	28.0	28.5	27.0	26.8
Week 2	16.08.13	26.1	26.6	27.9	26.9	28.3	28.0	28.9	27.3	27.1
Week 3	18.08.13	26.1	26.3	27.9	26.7	28.2	27.8	28.6	27.1	27.0
Week 3	20.08.13	26.1	29.1	31.3	30.0	32.7	31.8	33.8	31.6	31.3
Week 3	22.09.13	26.1	29.4	31.2	29.9	32.1	31.6	33.0	30.8	30.4
Week 3	24.09.13	26.1	26.7	27.8	27.0	28.3	28.2	29.3	27.7	27.2
Week 4	27.09.13	26.2	28.5	30.8	29.0	31.5	31.1	32.0	30.5	30.4

Variation of pond pH with time (Set 1, V_2)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.08.13	7.0	7.1	7.7	7.3	8.3	8.1	8.4	7.3	7.3
Week 1	05.08.13	7.0	7.3	7.9	7.4	8.5	8.3	8.8	7.5	7.4
Week 1	07.08.13	6.9	7.4	8.0	7.5	8.5	8.3	9.1	7.6	7.6
Week 1	09.08.13	6.2	7.9	8.9	8.1	9.6	9.4	9.9	8.5	8.3
Week 2	12.08.13	6.4	6.4	7.3	6.6	7.9	7.7	8.0	7.0	7.0
Week 2	14.08.13	6.7	6.7	7.4	6.9	8.0	7.9	8.2	7.0	7.0

Week 2	16.08.13	7.0	7.0	7.6	7.1	8.2	8.0	8.4	7.2	7.2
Week 3	18.08.13	6.9	6.9	7.5	7.0	8.1	7.9	8.3	7.1	7.1
Week 3	20.08.13	6.5	7.8	8.7	8.0	9.5	9.3	9.7	8.3	8.1
Week 3	22.09.13	6.7	7.7	8.5	7.9	9.4	9.2	9.6	8.1	8.0
Week 3	24.09.13	7.1	7.2	7.8	7.3	8.4	8.2	8.6	7.4	7.4
Week 4	27.09.13	6.9	7.5	8.2	7.7	8.9	8.7	9.3	7.8	7.8

Variation of pond algae concentration with time (Set 1, V_2)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.08.13	88.6	95.8	175.6	100.5	226.7	206.4	267.8	152.0	141.7
Week 1	05.08.13	97.3	100.5	209.5	113.9	248.8	219.6	301.7	165.4	156.7
Week 1	07.08.13	97.3	113.9	219.7	125.7	270.9	226.7	312.0	175.7	177.2
Week 1	09.08.13	109.3	144.7	281.1	156.6	344.2	322.0	395.4	238.6	206.3
Week 2	12.08.13	76.8	78.3	119.6	87.1	182.6	162.2	189.9	119.6	109.3
Week 2	14.08.13	78.3	79.9	131.4	87.1	182.6	172.4	200.1	129.8	119.5
Week 2	16.08.13	81.4	85.5	153.5	98.9	204.7	192.9	245.7	141.7	131.4
Week 3	18.08.13	75.2	76.7	143.3	97.4	194.4	182.7	223.7	131.4	121.1
Week 3	20.08.13	99.0	136.0	253.7	147.9	304.8	284.4	347.5	212.7	189.1
Week 3	22.09.13	99.0	134.5	248.8	146.4	300.0	279.5	341.0	206.3	185.8
Week 3	24.09.13	90.2	98.8	187.5	103.6	238.7	216.7	279.7	155.1	146.4
Week 4	27.09.13	97.4	124.1	231.6	125.7	282.7	248.9	323.8	187.5	178.8

1st Reading collected on 02.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.4392	64.4489	30	9.7	323	
Pond A	57.7817	57.7881	30	6.4	213	34
Pond B	54.0889	54.0917	30	2.8	93	71
Pond C	56.6491	56.6545	30	5.4	180	44
Pond D	51.0249	51.0269	30	2	67	79
Pond E	54.0653	54.0676	30	2.3	77	76
Pond F	51.0143	51.0160	30	1.7	57	82
Pond G	55.2369	55.2412	30	4.3	143	56
Pond H	56.5579	56.5627	30	4.8	160	51

2nd Reading collected on 05.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.5094	62.5183	30	8.9	297	
Pond A	56.7863	56.7913	30	5	167	44
Pond B	55.1958	55.1978	30	2	67	78
Pond C	56.6586	56.6628	30	4.2	140	53
Pond D	54.8156	54.8169	30	1.3	43	85
Pond E	55.0475	55.0489	30	1.4	47	84
Pond F	52.4677	52.4687	30	1	33	89
Pond G	55.6341	55.6372	30	3.1	103	65
Pond H	56.3478	56.3511	30	3.3	110	63

3rd Reading collected on 07.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.3088	61.3179	30	9.1	303	
Pond A	56.2860	56.2913	30	5.3	177	42
Pond B	55.0758	55.0778	30	2	67	78
Pond C	56.1584	56.1628	30	4.4	147	52
Pond D	54.2157	54.2169	30	1.2	40	87
Pond E	55.0172	55.0189	30	1.7	57	81
Pond F	52.1678	52.1687	30	0.9	30	90
Pond G	55.2344	55.2372	30	2.8	93	69
Pond H	56.0480	56.0511	30	3.1	103	66

4th Reading collected on 09.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.1098	61.1179	30	8.1	270	
Pond A	56.0872	56.0913	30	4.1	137	49
Pond B	55.0763	55.0778	30	1.5	50	81
Pond C	56.0596	56.0628	30	3.2	107	60
Pond D	53.2160	53.2169	30	0.9	30	89
Pond E	55.0167	55.0179	30	1.2	40	85
Pond F	51.1651	51.1657	30	0.6	20	93

Pond G	55.2351	55.2372	30	2.1	70	74
Pond H	55.9386	55.9411	30	2.5	83	69

5th Reading collected on 12.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	65.5382	65.5458	30	7.6	253	
Pond A	57.7707	57.7759	30	5.2	173	32
Pond B	54.0782	54.0811	30	2.9	97	62
Pond C	56.6379	56.6424	30	4.5	150	41
Pond D	51.0137	51.0157	30	2	67	74
Pond E	54.054	54.0563	30	2.3	77	70
Pond F	51.0036	51.0052	30	1.6	53	79
Pond G	55.2265	55.2303	30	3.8	127	50
Pond H	56.5473	56.5511	30	3.8	127	50

6th Reading collected on 14.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.5393	64.5473	30	8	267	
Pond A	58.7707	58.7762	30	5.5	183	31
Pond B	54.0542	54.0567	30	2.5	83	69
Pond C	56.6382	56.6429	30	4.7	157	41
Pond D	51.0142	51.0162	30	2	67	75
Pond E	54.0496	54.0519	30	2.3	77	71
Pond F	51.0043	51.0056	30	1.3	43	84
Pond G	55.2269	55.2306	30	3.7	123	54
Pond H	57.5481	57.5521	30	4	133	50

7th Reading collected on 16.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.4286	64.4378	30	9.2	307	
Pond A	59.7821	59.7881	30	6	200	35
Pond B	54.0893	54.0921	30	2.8	93	70

Pond C	56.6495	56.6545	30	5	167	46
Pond D	52.0251	52.0269	30	1.8	60	80
Pond E	54.0667	54.0690	30	2.3	77	75
Pond F	51.0145	51.0160	30	1.5	50	84
Pond G	55.2373	55.2412	30	3.9	130	58
Pond H	56.5587	56.5633	30	4.6	153	50

8th Reading collected on 18.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.5393	64.5483	30	9	300	
Pond A	58.5708	58.5769	30	6.1	203	32
Pond B	54.0496	54.0522	30	2.6	87	71
Pond C	56.6382	56.6435	30	5.3	177	41
Pond D	51.0144	51.0165	30	2.1	70	77
Pond E	54.0541	54.0570	30	2.9	97	68
Pond F	51.0042	51.0058	30	1.6	53	82
Pond G	55.2267	55.2308	30	4.1	137	54
Pond H	57.5477	57.5521	30	4.4	147	51

9th Reading collected on 20.08.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.3095	61.3179	30	8.4	280	
Pond A	56.2866	56.2913	30	4.7	157	44
Pond B	55.0862	55.0878	30	1.6	53	81
Pond C	56.1590	56.1627	30	3.7	123	56
Pond D	54.2158	54.2169	30	1.1	37	87
Pond E	55.0171	55.0184	30	1.3	43	85
Pond F	52.1650	52.1657	30	0.7	23	92
Pond G	55.3346	55.3369	30	2.3	77	73
Pond H	56.0481	56.0511	30	3	100	64

10th Reading collected on 22.09.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.2096	61.2179	30	8.3	277	
Pond A	56.1868	56.1913	30	4.5	150	46
Pond B	55.0763	55.0779	30	1.6	53	81
Pond C	56.0593	56.0631	30	3.8	127	54
Pond D	54.2159	54.2169	30	1	33	88
Pond E	55.0167	55.0180	30	1.3	43	84
Pond F	52.1649	52.1657	30	0.8	27	90
Pond G	55.2349	55.2372	30	2.3	77	72
Pond H	56.0384	56.0411	30	2.7	90	67

11th Reading collected on 24.09.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.5383	64.5466	30	8.3	277	
Pond A	59.7918	59.7972	30	5.4	180	35
Pond B	54.0892	54.0914	30	2.2	73	73
Pond C	56.6491	56.6538	30	4.7	157	43
Pond D	52.0278	52.0296	30	1.8	60	78
Pond E	54.0672	54.0692	30	2	67	76
Pond F	51.0134	51.0148	30	1.4	47	83
Pond G	55.2677	55.2715	30	3.8	127	54
Pond H	56.5278	56.5321	30	4.3	143	48

12th Reading collected on 27.09.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.5093	61.5179	30	8.6	287	
Pond A	56.5863	56.5913	30	5	167	42
Pond B	55.0962	55.0978	30	1.6	53	81
Pond C	56.3587	56.3628	30	4.1	137	52
Pond D	54.4157	54.4169	30	1.2	40	86
Pond E	55.0276	55.0289	30	1.3	43	85
Pond F	52.3678	52.3687	30	0.9	30	90

Pond G	55.4348	55.4372	30	2.4	80	72
Pond H	56.1484	56.1511	30	2.7	90	69

1st Reading collected on 02.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.3	295	
Pond A	250	5	6.7	3.1	180	39
Pond B	250	5	9.7	8.0	85	71
Pond C	250	5	8.3	5.2	155	47
Pond D	250	5	9.9	8.9	50	83
Pond E	250	5	9.7	8.0	85	71
Pond F	250	5	10.1	9.2	45	85
Pond G	250	5	9.1	6.5	130	56
Pond H	250	5	8.8	6.1	135	54

2nd Reading collected on 05.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.4	285	
Pond A	250	5	7.5	4.2	165	42
Pond B	250	5	9.1	7.5	80	72
Pond C	250	5	8.2	5.1	155	46
Pond D	250	5	9.9	8.8	55	81
Pond E	250	5	9.6	8.2	70	75
Pond F	250	5	10.3	9.5	40	86
Pond G	250	5	8.9	6.7	110	61
Pond H	250	5	8.7	6.2	125	56

3rd Reading collected on 07.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.7	0.9	240	
Pond A	250	5	6.0	3.3	135	44
Pond B	250	5	7.6	6	80	67

Pond C	250	5	6.1	3.7	120	50
Pond D	250	5	9.2	8.1	55	77
Pond E	250	5	8.7	7.2	75	69
Pond F	250	5	10.1	9.3	40	83
Pond G	250	5	6.7	4.9	90	63
Pond H	250	5	6.7	4.7	100	58

4th Reading collected on 09.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.2	285	
Pond A	250	5	7.2	4.4	140	51
Pond B	250	5	9.8	8.3	75	74
Pond C	250	5	8.9	6.7	110	61
Pond D	250	5	9.9	9.2	35	88
Pond E	250	5	9.7	8.3	70	75
Pond F	250	5	10.5	9.9	30	89
Pond G	250	5	9.2	7.4	90	68
Pond H	250	5	9.1	7.2	95	67

5th Reading collected on 12.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.8	2	190	
Pond A	250	5	6.1	3.4	135	29
Pond B	250	5	7.4	5.5	95	50
Pond C	250	5	6.0	3.5	125	34
Pond D	250	5	8.8	7.4	70	63
Pond E	250	5	7.7	5.9	90	53
Pond F	250	5	9.1	8.1	50	74
Pond G	250	5	6.7	4.6	105	45
Pond H	250	5	6.6	4.4	110	42

6th Reading collected on 14.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.6	265	
Pond A	250	5	7.9	4.5	170	36
Pond B	250	5	9.1	7	105	60
Pond C	250	5	8.9	5.7	160	40
Pond D	250	5	9.7	8.3	70	74
Pond E	250	5	8.9	6.7	110	58
Pond F	250	5	10.2	9.3	45	83
Pond G	250	5	8.7	5.8	145	45
Pond H	250	5	8.7	5.7	150	43

7th Reading collected on 16.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.7	1.1	230	
Pond A	250	5	7.1	4.3	140	39
Pond B	250	5	9.9	8.4	75	67
Pond C	250	5	7.1	4.5	130	43
Pond D	250	5	10.1	9.2	45	80
Pond E	250	5	9.9	8.5	70	70
Pond F	250	5	10.3	9.6	35	85
Pond G	250	5	7.9	5.7	110	52
Pond H	250	5	7.7	5.5	110	52

8th Reading collected on 18.08.13

Biochemical Oxygen Demand (BOD)						
Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.7	0.9	240	
Pond A	250	5	4.9	1.9	150	38
Pond B	250	5	7.7	6.0	85	65
Pond C	250	5	5.6	2.5	155	35
Pond D	250	5	8.9	7.7	60	75
Pond E	250	5	7.6	6	80	67
Pond F	250	5	9.1	8.2	45	81

Pond G	250	5	7.0	4.3	135	44
Pond H	250	5	6.9	4.0	145	40

9th Reading collected on 20.08.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.5	270	
Pond A	250	5	7.7	5.0	135	50
Pond B	250	5	9.8	8.4	70	74
Pond C	250	5	8.3	6.0	115	57
Pond D	250	5	10.3	9.6	35	87
Pond E	250	5	10.0	8.7	65	76
Pond F	250	5	10.9	10.3	30	89
Pond G	250	5	9.1	7.3	90	67
Pond H	250	5	8.9	7	95	65

10th Reading collected on 22.09.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.4	1.5	245	
Pond A	250	5	7.2	4.6	130	47
Pond B	250	5	9.1	7.2	95	61
Pond C	250	5	7.9	5.8	105	57
Pond D	250	5	10	9.1	45	82
Pond E	250	5	9.5	7.8	85	65
Pond F	250	5	10.5	9.9	30	88
Pond G	250	5	8.8	7.1	85	65
Pond H	250	5	8.7	6.9	90	63

11th Reading collected on 24.09.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.5	270	
Pond A	250	5	7.7	4.5	160	41
Pond B	250	5	8.6	6.6	100	63
Pond C	250	5	8.3	5.8	125	54
Pond D	250	5	9.5	8.3	60	78

Pond E	250	5	9.4	7.6	90	67
Pond F	250	5	9.9	9.1	40	85
Pond G	250	5	8.1	6.1	100	63
Pond H	250	5	7.9	5.8	105	61

12th Reading collected on 27.09.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.7	270	
Pond A	250	5	6.8	3.8	150	44
Pond B	250	5	9.7	8.2	75	72
Pond C	250	5	8.1	5.6	125	54
Pond D	250	5	9.8	8.9	45	83
Pond E	250	5	9.7	8.1	80	70
Pond F	250	5	9.6	8.9	35	87
Pond G	250	5	8.9	6.9	100	63
Pond H	250	5	8.0	5.9	105	61

1st Reading collected on 02.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 2	210	81
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 1	460	58

2nd Reading collected on 05.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	150	86

Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 07.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 2 - 2	210	81
Pond H	3 - 3 - 0	240	78

4th Reading collected on 09.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 1	460	81
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 3 - 0	210	91
Pond E	3 - 3 - 0	240	90
Pond F	3 - 2 - 2	150	94
Pond G	3 - 3 - 0	240	90
Pond H	3 - 3 - 1	460	81

5th Reading collected on 12.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 3	1100	0
Pond B	3 - 3 - 2	460	58
Pond C	3 - 3 - 3	1100	0
Pond D	3 - 3 - 2	460	58
Pond E	3 - 3 - 2	460	58
Pond F	3 - 3 - 1	210	81
Pond G	3 - 3 - 2	460	58

Pond H	3 - 3 - 2	460	58

6th Reading collected on 14.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 1	460	58
Pond C	3 - 3 - 2	1100	0
Pond D	3 - 3 - 1	460	58
Pond E	3 - 3 - 1	460	58
Pond F	3 - 2 - 2	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

7th Reading collected on 16.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 2	210	81
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 1	460	58

8th Reading collected on 18.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 2	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

9th Reading collected on 20.08.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 1 - 2	120	89
Pond F	3 - 0 - 2	64	94
Pond G	3 - 1 - 2	120	89
Pond H	3 - 2 - 2	210	81

10th Reading collected on 22.09.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

11th Reading collected on 24.09.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 1	460	81
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 1	460	81
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 2	1100	54

12th Reading collected on 27.09.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

1st Reading collected on 02.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 1 - 2	120	50
Pond B	3 - 1 - 0	43	82
Pond C	3 - 2 - 0	93	61
Pond D	3 - 0 - 1	39	84
Pond E	3 - 1 - 0	43	82
Pond F	2 - 2 - 1	28	88
Pond G	3 - 1 - 1	75	69
Pond H	3 - 2 - 0	93	61

2nd Reading collected on 05.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 0 - 1	39	81
Pond C	3 - 1 - 1	75	64
Pond D	2 - 2 - 1	28	87
Pond E	3 - 0 - 1	39	81
Pond F	3 - 0 - 0	23	89
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

3rd Reading collected on 07.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 0 - 1	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 0 - 1	39	81
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

4th Reading collected on 09.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 1 - 0	43	64
Pond B	3 - 0 - 0	23	81
Pond C	2 - 2 - 1	28	77
Pond D	2 - 1 - 0	15	88
Pond E	2 - 1 - 1	20	83
Pond F	2 - 1 - 0	15	88
Pond G	2 - 2 - 1	28	77
Pond H	2 - 2 - 1	28	77

5th Reading collected on 12.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	460	
Pond A	3 - 3 - 2	460	0
Pond B	3 - 2 - 2	210	54
Pond C	3 - 3 - 2	460	0
Pond D	3 - 2 - 1	210	54
Pond E	3 - 2 - 1	210	54
Pond F	3 - 2 - 1	150	67
Pond G	3 - 2 - 2	210	54
Pond H	3 - 2 - 2	210	54

6th Reading collected on 14.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 3 - 1	460	0.0
Pond B	3 - 2 - 2	210	54.3
Pond C	3 - 3 - 1	460	0.0
Pond D	3 - 1 - 2	210	54.3
Pond E	3 - 2 - 2	210	54.3
Pond F	3 - 1 - 2	120	73.9
Pond G	3 - 2 - 2	210	54.3
Pond H	3 - 2 - 2	210	54.3

7th Reading collected on 16.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 3 - 0	240	0
Pond B	3 - 0 - 2	64	73
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 1	43	82
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 2 - 0	93	61
Pond H	3 - 2 - 0	93	61

8th Reading collected on 18.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 2	210	0
Pond B	3 - 0 - 2	64	70
Pond C	3 - 2 - 0	93	56
Pond D	3 - 0 - 1	43	80
Pond E	3 - 0 - 2	64	70
Pond F	2 - 2 - 1	28	87
Pond G	3 - 2 - 0	93	56
Pond H	3 - 2 - 0	93	56

9th Reading collected on 20.08.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 1	39	74
Pond D	2 - 1 - 1	20	87
Pond E	3 - 0 - 0	23	85
Pond F	2 - 1 - 1	20	87
Pond G	3 - 0 - 1	39	74
Pond H	3 - 0 - 1	39	74

10th Reading collected on 22.09.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 1	20	87
Pond E	3 - 0 - 0	23	85
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

11th Reading collected on 24.09.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	43	80
Pond C	3 - 1 - 1	75	64
Pond D	2 - 2 - 1	28	87
Pond E	3 - 1 - 0	43	80
Pond F	3 - 0 - 0	23	89
Pond G	3 - 0 - 2	64	70
Pond H	3 - 1 - 1	75	64

12th Reading collected on 27.09.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 0 - 1	39	81
Pond C	3 - 1 - 1	75	64
Pond D	2 - 2 - 1	28	87
Pond E	3 - 0 - 1	39	81
Pond F	2 - 2 - 1	28	87
Pond G	3 - 0 - 2	64	70
Pond H	3 - 1 - 1	75	64

Variation of pond DO with time (Set 1, V_3)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.10.13	2.6	8.4	9.3	8.7	9.7	9.5	10.1	9.2	9
Week 1	03.10.13	2.2	7.8	8.9	8.1	9.2	9.2	9.4	8.5	8.3
Week 1	05.10.13	1.7	7.6	8.6	8.0	9	8.7	9.1	8.4	8.3
Week 1	07.10.13	2.2	7.9	9.2	8.2	9.4	9.3	9.5	8.6	8.5
Week 2	10.10.13	1.9	8.3	8.9	8.7	9.1	9.1	9.3	9	8.9
Week 2	12.10.13	2.4	7.9	9.2	8.2	9.4	9.4	9.9	8.7	8.5
Week 2	15.10.13	2.1	8.3	9.2	8.6	9.5	9.3	9.7	9	8.9
Week 3	21.10.13	2.4	8.4	9.3	8.7	9.5	9.4	9.7	9	9
Week 3	25.10.13	1.6	7.5	8	7.8	8.7	8.3	8.9	8.2	8.1
Week 3	27.10.13	2	7.7	9	8.1	9.4	9.2	9.5	8.6	8.4
Week 3	29.10.13	1.9	8.3	9	8.6	9.5	9.1	9.8	9.1	8.9
Week 4	31.10.13	2.2	8.4	9.2	8.8	9.7	9.4	9.9	9.2	9.1

Variation of pond Temperature with time (Set 1, V_3)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.10.13	26.4	28.5	31.3	29.2	31.9	31.2	31.8	30.4	30.2
Week 1	03.10.13	26.9	29.0	31.8	29.5	32.3	31.7	33.2	30.4	30.3
Week 1	05.10.13	26.1	31.0	33.2	31.2	33.6	32.9	34.7	32.1	31.7
Week 1	07.10.13	26.9	29.8	32.0	30.0	33.1	32.4	33.0	31.4	31.0
Week 2	10.10.13	26.6	31.6	33.2	31.7	33.9	32.9	34.2	32.2	31.5
Week 2	12.10.13	26.4	28.9	31.6	29.7	32.1	31.9	33.1	31.5	31.0
Week 2	15.10.13	26.7	30.8	32.4	31.1	33.8	33.3	33.6	32.4	32.3
Week 3	21.10.13	27.1	28.7	31.5	31.3	32.6	32.1	32.9	31.5	31.4
Week 3	25.10.13	25.9	31.0	33.6	31.2	34.0	32.8	34.9	32.1	31.9
Week 3	27.10.13	26.7	30.7	32.5	31.1	33.3	32.8	33.9	31.6	31.5

Week 3	29.10.13	26.2	30.1	33.4	30.3	34.0	32.9	34.5	32.1	31.8
Week 4	31.10.13	26.7	29.8	32.3	30.2	33.8	32.4	33.2	31.2	31.2

Variation of pond pH with time (Set 1, V_3)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.10.13	6.8	6.9	7.2	7.0	7.2	7.2	8.4	7.1	7.0
Week 1	03.10.13	6.9	7.1	8.1	7.3	9.0	8.2	9.1	7.8	7.7
Week 1	05.10.13	6.8	7.7	9.8	8.3	10.2	10.0	10.6	9.0	8.9
Week 1	07.10.13	6.9	7.2	8.2	7.4	9.4	8.4	9.5	7.9	7.8
Week 2	10.10.13	7.0	7.4	9.3	7.7	9.8	9.6	10.2	8.6	8.5
Week 2	12.10.13	6.9	7.0	8.5	7.3	8.9	8.6	9.0	7.7	7.5
Week 2	15.10.13	7.0	7.4	8.9	7.6	9.6	9.1	9.7	8.3	8.1
Week 3	21.10.13	7.1	7.2	8.4	7.3	9.1	8.5	9.2	7.6	7.5
Week 3	25.10.13	6.6	7.7	10.0	8.4	10.3	10.2	10.8	9.1	9.0
Week 3	27.10.13	7.0	7.2	9.1	7.5	9.7	9.4	9.8	8.5	8.4
Week 3	29.10.13	6.9	7.6	9.5	8.0	9.8	9.6	10.3	8.8	8.7
Week 4	31.10.13	7.0	7.2	8.7	7.5	9.5	8.8	9.5	8.1	8.0

Variation of pond algae concentration with time (Set 1, V_3)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.10.13	93.93	120.95	192.88	122.57	204.65	153.5	233.88	141.73	131.42
Week 1	03.10.13	88.64	112.26	238.66	115.42	260.66	209.51	301.74	165.43	156.66
Week 1	05.10.13	98.87	156.66	323.74	178.74	366.36	293.05	386.9	250.51	219.74
Week 1	07.10.13	90.18	115.42	248.89	113.88	270.89	219.74	311.97	175.66	166.97
Week 2	10.10.13	97.41	147.89	293.05	158.2	313.51	262.36	356.21	219.82	199.28
Week 2	12.10.13	88.48	112.26	228.43	113.8	238.58	187.43	279.66	155.12	146.35
Week 2	15.10.13	97.33	124.19	270.97	136.04	292.97	241.82	335.67	197.74	189.05
Week 3	21.10.13	97.41	132.88	204.73	134.42	226.73	175.58	267.81	151.96	141.65
Week 3	25.10.13	98.95	166.89	344.2	188.97	376.59	303.28	417.59	260.74	229.97
Week 3	27.10.13	98.95	136.04	282.82	146.35	303.28	252.13	345.98	209.59	189.05
Week 3	29.10.13	98.95	156.5	303.28	158.2	347.44	272.59	366.44	230.05	209.51
Week 4	31.10.13	93.26	113.88	260.74	125.73	282.74	231.59	323.82	187.51	178.82

1st Reading collected on 01.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	65.8388	65.8469	30	8.1	270	
Pond A	57.2705	57.2760	30	5.5	183	32.10
Pond B	54.7795	54.7817	30	2.2	73	72.84
Pond C	56.1374	56.1423	30	4.9	163	39.51
Pond D	51.21391	51.2161	30	2.19	73	72.96
Pond E	54.7545	54.7567	30	2.2	73	72.84
Pond F	51.5539	51.5555	30	1.6	53	80.25
Pond G	55.3258	55.3298	30	4	133	50.62
Pond H	56.5475	56.5515	30	4	133	50.62

2nd Reading collected on 03.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.6281	64.6379	30	9.8	327	
Pond A	59.882	59.8879	30	5.9	197	39.80
Pond B	54.2900	54.2924	30	2.4	80	75.51
Pond C	56.7494	56.7543	30	4.9	163	50.00
Pond D	52.225	52.2269	30	1.9	63	80.61
Pond E	54.1954	54.1976	30	2.2	73	77.55
Pond F	51.0048	51.0061	30	1.3	43	86.73
Pond G	55.3372	55.3412	30	4	133	59.18
Pond H	56.6586	56.6631	30	4.5	150	54.08

3rd Reading collected on 05.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.4095	61.4179	30	8.4	280	
Pond A	56.3867	56.3913	30	4.6	153	45
Pond B	55.0965	55.0978	30	1.3	43	85
Pond C	56.1691	56.1728	30	3.7	123	56
Pond D	54.3159	54.3169	30	1	33	88
Pond E	55.1172	55.1185	30	1.3	43	85
Pond F	52.1752	52.1757	30	0.5	17	94

Pond G	55.3447	55.3472	30	2.5	83	70
Pond H	56.1483	56.1511	30	2.8	93	67

4th Reading collected on 07.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.1392	64.1487	30	9.5	317	
Pond A	57.8819	57.8874	30	5.5	183	42.11
Pond B	54.3899	54.3921	30	2.2	73	76.84
Pond C	56.4494	56.4540	30	4.6	153	51.58
Pond D	51.175	51.1769	30	1.9	63	80.00
Pond E	54.1855	54.1876	30	2.1	70	77.89
Pond F	51.1245	51.1257	30	1.2	40	87.37
Pond G	55.9369	55.941	30	4.1	137	56.84
Pond H	56.6585	56.6628	30	4.3	143	54.74

5th Reading collected on 10.10.13

Suspended solid (SS)						
Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.5192	61.5279	30	8.7	290	
Pond A	56.7865	56.7913	30	4.8	160	45
Pond B	55.2964	55.2978	30	1.4	47	84
Pond C	56.6589	56.6628	30	3.9	130	55
Pond D	54.5158	54.5169	30	1.1	37	87
Pond E	55.1276	55.1289	30	1.3	43	85
Pond F	52.3779	52.3786	30	0.7	23	92
Pond G	55.5149	55.5172	30	2.3	77	74
Pond H	56.3486	56.3511	30	2.5	83	71

6th Reading collected on 12.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.6401	64.6505	30	10.4	347	
Pond A	58.8811	58.8875	30	6.4	213	38.5
Pond B	54.4499	54.4527	30	2.8	93	73.1

Pond C	56.9386	56.9441	30	5.5	183	47.1
Pond D	51.2146	51.2169	30	2.3	77	77.9
Pond E	54.1548	54.1576	30	2.8	93	73.1
Pond F	51.1032	51.1048	30	1.6	53	84.6
Pond G	55.2569	55.2616	30	4.7	157	54.8
Pond H	57.7481	57.7531	30	5	167	51.9

7th Reading collected on 15.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.3095	62.3186	30	9.1	303	
Pond A	56.9863	56.9914	30	5.1	170	44
Pond B	55.2962	55.2978	30	1.6	53	82
Pond C	56.7587	56.7628	30	4.1	137	55
Pond D	54.3157	54.3169	30	1.2	40	87
Pond E	55.0276	55.0289	30	1.3	43	86
Pond F	52.2679	52.2687	30	0.8	27	91
Pond G	55.4342	55.4368	30	2.6	87	71
Pond H	56.6479	56.6507	30	2.8	93	69

8th Reading collected on 21.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.7421	64.7509	30	8.8	293	
Pond A	58.7707	58.7761	30	5.4	180	38.6
Pond B	54.2543	54.2569	30	2.6	87	70.5
Pond C	56.6382	56.6433	30	5.1	170	42.0
Pond D	51.7143	51.7164	30	2.1	70	76.1
Pond E	54.2496	54.2521	30	2.5	83	71.6
Pond F	51.0815	51.0828	30	1.3	43	85.2
Pond G	55.7267	55.7308	30	4.1	137	53.4
Pond H	57.2481	57.2524	30	4.3	143	51.1

9th Reading collected on 25.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.1101	62.1184	30	8.3	277	
Pond A	56.3872	56.3911	30	3.9	130	53.01
Pond B	55.2775	55.2787	30	1.2	40	85.54
Pond C	56.1598	56.1629	30	3.1	103	62.65
Pond D	53.4159	53.4168	30	0.9	30	89.16
Pond E	55.1168	55.1179	30	1.1	37	86.75
Pond F	51.2653	51.2658	30	0.5	17	93.98
Pond G	55.4351	55.4370	30	1.9	63	77.11
Pond H	55.8487	55.8507	30	2	67	75.90

10th Reading collected on 27.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.5088	61.5177	30	8.9	297	
Pond A	56.1861	56.1911	30	5	167	43.8
Pond B	55.2763	55.2778	30	1.5	50	83.1
Pond C	56.0584	56.0624	30	4	133	55.1
Pond D	54.3157	54.3167	30	1	33	88.8
Pond E	55.0073	55.0088	30	1.5	50	83.1
Pond F	52.0680	52.0687	30	0.7	23	92.1
Pond G	55.1345	55.1369	30	2.4	80	73.0
Pond H	56.2482	56.2508	30	2.6	87	70.8

11th Reading collected on 29.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.3094	61.3179	30	8.5	283	
Pond A	56.1868	56.1913	30	4.5	150	47
Pond B	55.0765	55.0778	30	1.3	43	85
Pond C	56.0593	56.0628	30	3.5	117	59
Pond D	54.2170	54.2179	30	0.9	30	89
Pond E	55.1168	55.1179	30	1.1	37	87
Pond F	52.1750	52.1756	30	0.6	20	93

Pond G	55.2359	55.2382	30	2.3	77	73
Pond H	56.1386	56.1411	30	2.5	83	71

12th Reading collected on 31.10.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.3384	64.3478	30	9.4	313	
Pond A	59.6923	59.6976	30	5.3	177	43.62
Pond B	54.1900	54.1921	30	2.1	70	77.66
Pond C	56.7495	56.7539	30	4.4	147	53.19
Pond D	52.6282	52.6299	30	1.7	57	81.91
Pond E	54.1676	54.1696	30	2	67	78.72
Pond F	51.2135	51.2145	30	1	33	89.36
Pond G	55.2682	55.2714	30	3.2	107	65.96
Pond H	56.42793	56.4313	30	3.37	112	64.15

1st Reading collected on 01.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.7	0.7	300	
Pond A	250	5	6.5	2.7	190	37
Pond B	250	5	8.8	6.5	115	62
Pond C	250	5	7.9	4.5	170	43
Pond D	250	5	9.1	7.5	80	73
Pond E	250	5	8.9	6.7	110	63
Pond F	250	5	9.2	7.9	65	78
Pond G	250	5	8.8	5.9	145	52
Pond H	250	5	8.5	5.4	155	48

2nd Reading collected on 03.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.9	4.3	230	
Pond A	250	5	7.6	4.8	140	39
Pond B	250	5	9.3	7.8	75	67

Pond C	250	5	8.4	6.1	115	50
Pond D	250	5	9.8	8.8	50	78
Pond E	250	5	9.6	8.1	75	67
Pond F	250	5	10	9.2	40	83
Pond G	250	5	8.8	6.9	95	59
Pond H	250	5	8.6	6.5	105	54

3rd Reading collected on 05.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.8	1.9	295	
Pond A	250	5	6.8	4.0	140	53
Pond B	250	5	9.4	7.9	75	75
Pond C	250	5	7.1	5.1	100	66
Pond D	250	5	9.3	8.6	35	88
Pond E	250	5	9.6	8.2	70	76
Pond F	250	5	9.7	9.1	30	90
Pond G	250	5	7.9	6.3	80	73
Pond H	250	5	7.7	6	85	71

4th Reading collected on 07.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	9.1	4.2	245	
Pond A	250	5	7.7	4.9	140	43
Pond B	250	5	8.8	7.2	80	67
Pond C	250	5	7.7	5.4	115	53
Pond D	250	5	9.2	8.1	55	78
Pond E	250	5	9.0	7.4	80	67
Pond F	250	5	9.4	8.7	35	86
Pond G	250	5	8.0	6.1	95	61
Pond H	250	5	7.9	5.8	105	57

5th Reading collected on 10.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.7	1.4	315	
Pond A	250	5	7.9	4.7	160	49
Pond B	250	5	9.5	7.6	95	70
Pond C	250	5	8.5	6.0	125	60
Pond D	250	5	10.3	9.4	45	86
Pond E	250	5	9.8	7.9	95	70
Pond F	250	5	10.5	9.8	35	89
Pond G	250	5	8.7	6.6	105	67
Pond H	250	5	9.1	6.8	115	63

6th Reading collected on 12.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.7	4.0	235	
Pond A	250	5	6.2	3.3	145	38
Pond B	250	5	7.7	6.0	85	64
Pond C	250	5	6.3	3.8	125	47
Pond D	250	5	9.4	8.3	55	77
Pond E	250	5	8.5	7.1	70	70
Pond F	250	5	9.5	8.6	45	81
Pond G	250	5	6.8	4.8	100	57
Pond H	250	5	6.6	4.4	110	53

7th Reading collected on 15.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.5	1.2	265	
Pond A	250	5	7.8	4.8	150	43
Pond B	250	5	9.3	7.6	85	68
Pond C	250	5	8.3	5.9	120	55
Pond D	250	5	9.5	8.5	50	81
Pond E	250	5	9.5	7.8	85	68
Pond F	250	5	9.7	8.9	40	85

Pond G	250	5	8.9	6.9	100	62
Pond H	250	5	8.6	6.5	105	60

8th Reading collected on 21.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.9	3.5	270	
Pond A	250	5	7.7	4.2	175	35
Pond B	250	5	8.9	6.9	100	63
Pond C	250	5	7.8	4.8	150	44
Pond D	250	5	9.3	8.1	60	78
Pond E	250	5	9.1	7.1	100	63
Pond F	250	5	9.5	8.5	50	81
Pond G	250	5	8.6	6.1	125	54
Pond H	250	5	8.1	5.5	130	52

9th Reading collected on 25.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.4	275	
Pond A	250	5	6.8	4.3	125	55
Pond B	250	5	8.3	7.3	50	82
Pond C	250	5	6.2	4.6	80	71
Pond D	250	5	8.8	8.2	30	89
Pond E	250	5	8.6	7.7	45	84
Pond F	250	5	9.9	9.4	25	91
Pond G	250	5	7.1	5.7	70	75
Pond H	250	5	6.9	5.4	75	73

10th Reading collected on 27.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.7	1.2	325	
Pond A	250	5	7.5	3.9	180	45
Pond B	250	5	9.8	7.8	100	69

Pond C	250	5	8.9	6.1	140	57
Pond D	250	5	10.1	8.9	60	82
Pond E	250	5	9.9	7.9	100	69
Pond F	250	5	10.2	9.4	40	88
Pond G	250	5	9.8	7.5	115	65
Pond H	250	5	9.5	6.9	130	60

11th Reading collected on 29.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.9	1.9	300	
Pond A	250	5	6.9	3.9	150	50
Pond B	250	5	9.5	7.8	85	72
Pond C	250	5	7.3	5.0	115	62
Pond D	250	5	10.3	9.5	40	87
Pond E	250	5	9.3	7.7	80	73
Pond F	250	5	10.7	10.0	35	88
Pond G	250	5	8.2	6.3	95	68
Pond H	250	5	7.7	5.6	105	65

12th Reading collected on 31.10.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.7	3.4	265	
Pond A	250	5	7.5	4.7	140	47
Pond B	250	5	9.2	7.5	85	68
Pond C	250	5	8.2	5.8	120	55
Pond D	250	5	9.4	8.3	55	79
Pond E	250	5	9.9	8.2	85	68
Pond F	250	5	10.1	9.2	45	83
Pond G	250	5	8.7	6.6	105	60
Pond H	250	5	8.0	5.8	110	58

1st Reading collected on 01.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0.0

Pond B	3 - 3 - 1	460	58.2
Pond C	3 - 3 - 2	1100	0.0
Pond D	3 - 3 - 0	240	78.2
Pond E	3 - 3 - 1	460	58.2
Pond F	3 - 3 - 0	240	78.2
Pond G	3 - 3 - 1	460	58.2
Pond H	3 - 3 - 1	460	58.2

2nd Reading collected on 03.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 1 - 2	120	42.9
Pond B	3 - 1 - 0	43	79.5
Pond C	3 - 0 - 2	93	55.7
Pond D	3 - 0 - 1	28	86.7
Pond E	3 - 1 - 0	43	79.5
Pond F	2 - 2 - 1	28	86.7
Pond G	3 - 0 - 2	64	69.5
Pond H	3 - 1 - 1	75	64.3

3rd Reading collected on 05.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78.2
Pond B	3 - 2 - 1	150	86.4
Pond C	3 - 3 - 0	240	78.2
Pond D	3 - 1 - 2	120	89.1
Pond E	3 - 2 - 1	150	86.4
Pond F	3 - 2 - 0	93	91.5
Pond G	3 - 2 - 1	150	86.4
Pond H	3 - 2 - 1	150	86.4

4th Reading collected on 07.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 3 - 0	240	78

Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

5th Reading collected on 10.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 - 1 - 2	120	89
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

6th Reading collected on 12.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 2 - 2	210	54.3
Pond B	3 - 2 - 1	150	67.4
Pond C	3 - 2 - 2	210	54.3
Pond D	3 - 1 - 1	75	83.7
Pond E	3 - 1 - 2	120	73.9
Pond F	3 - 0 - 2	64	86.1
Pond G	3 - 2 - 1	150	67.4
Pond H	3 - 2 - 1	150	67.4

7th Reading collected on 15.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78.2
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

8th Reading collected on 21.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 1	460	58
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

9th Reading collected on 25.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 1 - 2	120	89
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 1 - 2	120	89
Pond F	3 - 0 - 2	64	94
Pond G	3 - 2 - 1	150	86
Pond H	3 - 2 - 1	150	86

10th Reading collected on 27.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 2 - 2	210	81
Pond H	3 - 3 - 0	240	78

11th Reading collected on 29.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58

Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 - 1 - 2	120	89
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

12th Reading collected on 31.10.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

1st Reading collected on 01.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 3 - 1	460	0
Pond B	3 - 3 - 0	240	48
Pond C	3 - 3 - 1	460	0
Pond D	3 - 1 - 2	210	54
Pond E	3 - 3 - 0	240	48
Pond F	3 - 1 - 2	210	54
Pond G	3 - 3 - 0	240	48
Pond H	3 - 3 - 0	240	48

2nd Reading collected on 03.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 1 - 1	75	38
Pond B	3 - 0 - 0	23	81
Pond C	3 - 0 - 2	64	47
Pond D	3 - 0 - 0	21	83
Pond E	3 - 0 - 0	23	81
Pond F	2 - 1 - 0	15	88

Pond G	3 - 1 - 0	43	64
Pond H	3 - 1 - 0	43	64

3rd Reading collected on 05.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	2 - 2 - 1	28	88
Pond B	2 - 2 - 1	28	88
Pond C	2 - 2 - 1	28	88
Pond D	2 - 0 - 1	14	94
Pond E	2 - 2 - 1	28	88
Pond F	1 - 2 - 0	11	95
Pond G	2 - 2 - 1	28	88
Pond H	2 - 2 - 1	28	88

4th Reading collected on 07.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 2 - 0	93	38
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	75	50
Pond D	2 - 2 - 0	21	86
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 0 - 2	64	57
Pond H	3 - 0 - 2	64	57

5th Reading collected on 10.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	43	71
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

6th Reading collected on 12.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 1	150	28.6
Pond B	3 - 0 - 2	64	69.5
Pond C	3 - 1 - 2	120	42.9
Pond D	3 - 0 - 1	39	81.4
Pond E	3 - 0 - 2	64	69.5
Pond F	3 - 0 - 1	39	81.4
Pond G	3 - 2 - 0	93	55.7
Pond H	3 - 2 - 0	93	55.7

7th Reading collected on 15.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 2 - 0	93	61
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

8th Reading collected on 21.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 3 - 0	240	0
Pond B	3 - 1 - 1	75	69
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 2	64	73
Pond E	3 - 1 - 1	75	69
Pond F	3 - 0 - 2	64	73
Pond G	3 - 1 - 2	120	50
Pond H	3 - 1 - 2	120	50

9th Reading collected on 25.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	240	
Pond A	2 - 2 - 1	28	88
Pond B	3 - 0 - 0	23	90

Pond C	2 - 2 - 1	28	88
Pond D	2 - 0 - 1	14	94
Pond E	2 - 1 - 1	20	92
Pond F	1 - 2 - 0	11	95
Pond G	2 - 2 - 1	28	88
Pond H	2 - 2 - 1	28	88

10th Reading collected on 27.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 1	75	69
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

11th Reading collected on 29.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 2 - 0	93	61
Pond D	2 - 1 - 0	15	94
Pond E	3 - 1 - 0	43	82
Pond F	2 - 1 - 0	15	94
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

12th Reading collected on 31.10.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

TRACERS STUDIES - POND A (Set 1 - V_1)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.5	18.5	0	0.0141	0	50	0	0	0	0
15	18.5	17	1.5	0.0141	72.97	50	1.46	15	21.89	699.2958
20	18.5	16.3	2.2	0.0141	107.02	50	2.14	20	42.81	3922.226
25	18.5	17	1.5	0.0141	72.97	50	1.46	25	36.48	1942.488
30	18.5	17.2	1.3	0.0141	63.24	50	1.26	30	37.94	1820.863
35	18.5	17.4	1.1	0.0141	53.51	50	1.07	35	37.46	1501.477
40	18.5	17.5	1	0.0141	48.65	50	0.97	40	38.92	1473.413
50	18.5	17.6	0.9	0.0141	43.78	50	0.88	50	43.78	1678.31
60	18.5	17.7	0.8	0.0141	38.92	50	0.78	60	46.70	1697.372
70	18.5	18.5	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.5	18.5	0	0.0141	0.00	50	0.00	90	0.00	0
							10.02087	**435**	**305.97705**	**14735.45**

TRACERS STUDIES - POND A (Set 1 - V_2)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.3	18.3	0	0.0141	0	50	0	0	0	0
15	18.3	17.1	1.2	0.0141	58.37	50	1.17	15	17.51	358.0394
20	18.3	16.3	2	0.0141	97.29	50	1.95	20	38.92	2946.827
25	18.3	16.4	1.9	0.0141	92.43	50	1.85	25	46.21	3947.712
30	18.3	16.9	1.4	0.0141	68.10	50	1.36	30	40.86	2274.213
35	18.3	17.1	1.2	0.0141	58.37	50	1.17	35	40.86	1949.326
40	18.3	17.4	0.9	0.0141	43.78	50	0.88	40	35.02	1074.118
50	18.3	17.6	0.7	0.0141	34.05	50	0.68	50	34.05	789.6575
60	18.3	18	0.3	0.0141	14.59	50	0.29	60	17.51	89.50986
70	18.3	18.3	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.3	18.3	0	0.0141	0.00	50	0.00	90	0.00	0
							9.33984	**435**	**270.95265**	**13429.4**

TRACERS STUDIES - POND A (Set 1 - V_3)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.6	18.6	0	0.0141	0	50	0.00	0	0	0
15	18.6	15.7	2.9	0.0141	141.07	50	2.82	15	42.32	5053.37
20	18.6	16.9	1.7	0.0141	82.70	50	1.65	20	33.08	1809.72
25	18.6	17.2	1.4	0.0141	68.10	50	1.36	25	34.05	1579.315
30	18.6	17.4	1.2	0.0141	58.37	50	1.17	30	35.02	1432.158
35	18.6	17.8	0.8	0.0141	38.92	50	0.78	35	27.24	577.578
40	18.6	17.9	0.7	0.0141	34.05	50	0.68	40	27.24	505.3808
50	18.6	18.1	0.5	0.0141	24.32	50	0.49	50	24.32	287.776

60	18.6	18.3	0.3	0.0141	14.59	50	0.29	60	17.51	89.50986
70	18.6	18.6	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.6	18.6	0	0.0141	0.00	50	0.00	90	0.00	0
							9.24255	**435**	**240.79275**	**11334.81**

TRACERS STUDIES - POND D (Set 1 - V_1)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.7	18.7	0	0.0141	0	50	0	0	0	0
15	18.7	16.4	2.3	0.0141	111.88	50	2.24	15	33.57	2520.987
20	18.7	17.6	1.1	0.0141	53.51	50	1.07	20	21.40	490.2783
25	18.7	16.6	2.1	0.0141	102.15	50	2.04	25	51.08	5330.188
30	18.7	17.6	1.1	0.0141	53.51	50	1.07	30	32.11	1103.126
35	18.7	18.1	0.6	0.0141	29.19	50	0.58	35	20.43	243.6657
40	18.7	17.6	1.1	0.0141	53.51	50	1.07	40	42.81	1961.113
50	18.7	17.8	0.9	0.0141	43.78	50	0.88	50	43.78	1678.31
60	18.7	18.2	0.5	0.0141	24.32	50	0.49	60	29.19	414.3975
70	18.7	18.7	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.7	18.7	0	0.0141	0.00	50	0.00	90	0.00	0
							9.43713	**435**	**274.3578**	**13742.07**

TRACERS STUDIES - POND D (Set 1 - V_1)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.1	18.1	0	0.0141	0	50	0	0	0	0
15	18.1	15.8	2.3	0.0141	111.88	50	2.24	15	33.57	2520.987
20	18.1	17.2	0.9	0.0141	43.78	50	0.88	20	17.51	268.5296
25	18.1	16.1	2	0.0141	97.29	50	1.95	25	48.65	4604.417
30	18.1	16.9	1.2	0.0141	58.37	50	1.17	30	35.02	1432.158
35	18.1	17.4	0.7	0.0141	34.05	50	0.68	35	23.84	386.9322
40	18.1	17.1	1	0.0141	48.65	50	0.97	40	38.92	1473.413
50	18.1	17.4	0.7	0.0141	34.05	50	0.68	50	34.05	789.6575
60	18.1	18.1	0	0.0141	0.00	50	0.00	60	0.00	0
70	18.1	18.1	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.1	18.1	0	0.0141	0.00	50	0.00	90	0.00	0
							8.56152	**435**	**231.5502**	**11476.09**

TRACERS STUDIES - POND A (Set 1 - V_3)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.3	18.3	0	0.0141	0	50	0	0	0	0
15	18.3	15.9	2.4	0.0141	116.75	50	2.33	15	35.02	2864.316
20	18.3	17.4	0.9	0.0141	43.78	50	0.88	20	17.51	268.5296

25	18.3	16.3	2	0.0141	97.29	50	1.95	25	48.65	4604.417
30	18.3	17.4	0.9	0.0141	43.78	50	0.88	30	26.27	604.1916
35	18.3	18.1	0.2	0.0141	9.73	50	0.19	35	6.81	9.024657
40	18.3	17.6	0.7	0.0141	34.05	50	0.68	40	27.24	505.3808
50	18.3	17.8	0.5	0.0141	24.32	50	0.49	50	24.32	287.776
60	18.3	18.3	0	0.0141	0.00	50	0.00	60	0.00	0
70	18.3	18.3	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.3	18.3	0	0.0141	0.00	50	0.00	90	0.00	0
							7.39404	**435**	**185.8239**	**9143.635**

Average Efficiencies BOD removal

	V_1		
	SET 1	SET 2	SET 3
D	81.1	83.2	86.7
E	68.8	69.3	74.1
F	84.7	86.2	88.4
G	57.0	63.7	68.8
H	55.2	60.9	67.1

Average Efficiencies of SS removal

	V_1		
	SET 1	SET 2	SET 3
POND D	82.4	84.9	89.1
POND E	79.0	79.2	83.7
POND F	86.6	89.9	93.0
POND G	63.5	65.9	72.3
POND H	60.5	63.4	70.1

Average Efficiencies of Coliform removal

	V1		
	SET 1	SET 2	SET 3
D	82.3	83.9	88.7
E	79.9	79.6	83.2
F	87.1	86.7	90.8
G	75.0	76.3	78.3
H	72.8	75.9	77.4

Average Efficiencies of E-coli removal

	V1		
	SET 1	SET 2	SET 3
POND D	80.7	82.1	85.8
POND E	77.6	78.6	79.3
POND F	86.3	86.4	88.9
POND G	67.1	68.7	73.0
POND H	65.2	67.3	69.8

Average Efficiencies BOD removal

	V2		
	SET 1	SET 2	SET 3
POND D	79.2	84.8	82.6
POND E	68.0	70.6	69.5
POND F	84.6	86.9	85.6
POND G	57.7	65.3	63.1
POND H	55.2	63.4	60.2

Average Efficiencies of SS removal

	V2		
	SET 1	SET 2	SET 3
POND D	82.1	86.7	83.9
POND E	78.4	80.8	79.2
POND F	86.4	91.3	89.5
POND G	62.6	68.9	64.5
POND H	58.2	66.6	62.1

Average Efficiencies of Coliform removal

	V2		
	SET 1	SET 2	SET 3
POND D	80.7	85.7	83.2
POND E	78.8	80.0	79.7
POND F	86.2	88.7	86.8
POND G	76.0	76.7	76.5
POND H	68.8	76.2	75.9

Average Efficiencies of E-coli removal

	V2		
	SET 1	SET 2	SET 3
POND D	80.3	83.1	81.9
POND E	75.8	78.0	76.2
POND F	84.1	87.2	85.9
POND G	66.2	68.7	68.1
POND H	64.7	67.4	66.8

Average Efficiencies BOD removal

	V3		
	SET 1	SET 2	SET 3
POND D	81.3	85.4	83.5
POND E	69.4	72.5	70.4
POND F	85.2	87.4	86.2
POND G	62.7	67.3	64.3
POND H	59.7	65.5	61.5

Average Efficiencies of SS removal

	V3		
	SET 1	SET 2	SET 3
POND D	83.3	88.2	85.1
POND E	80.3	82.7	79.8
POND F	89.2	92.6	90.3
POND G	64.9	71.1	67.4
POND H	62.6	68.3	65.3

Average Efficiencies of Coliform removal

	V3		
	SET 1	SET 2	SET 3
POND D	86.6	88.7	83.5
POND E	79.9	82.7	79.9
POND F	88.1	90.7	88.7
POND G	75.5	78.3	77.3
POND H	74.8	77.4	76.1

Average Efficiencies of E-Coli removal

	V3		
	SET 1	SET 2	SET 3
POND D	84.1	85.6	83.1
POND E	78.1	79.3	78.3
POND F	86.0	88.7	86.0
POND G	67.9	72.4	68.7
POND H	66.7	69.5	68.1

Height of Jump (SET 1)

	V_1	V_2	V_3
	(mm)		
Pond A	2.05	3.45	5.10
Pond B	2.05	3.45	5.15
Pond C	2.00	3.40	5.10
Pond D	2.00	3.40	5.10
Pond E	2.00	3.40	5.10
Pond F	2.00	3.40	5.10
Pond G	2.00	3.40	5.10
Pond H	2.00	3.40	5.10

Height of Jump (SET 2)

	V_1	V_2	V_3
	(mm)		
Pond A	2.35	3.85	5.40

Pond B	2.35	3.85	5.40
Pond C	2.30	3.80	5.40
Pond D	2.30	3.80	5.40
Pond E	2.30	3.80	5.40
Pond F	2.30	3.80	5.40
Pond G	2.30	3.80	5.40
Pond H	2.30	3.80	5.40

Height of Jump (SET 3)

	V_1	V_2	V_3
	(mm)		
Pond A	2.65	4.05	5.60
Pond B	2.65	4.05	5.60
Pond C	2.60	4.00	5.60
Pond D	2.60	4.00	5.60
Pond E	2.60	4.00	5.60
Pond F	2.60	4.00	5.60
Pond G	2.60	4.00	5.60
Pond H	2.60	4.00	5.60

Data of different parameters for multiple regression analysis (Set 1, v1)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
65	8	31.1	194.42	9.7	0.39	0.5	23.5	0.2028
55	8.5	31.4	226.73	9.4	0.39	0.5	23.5	0.2913
60	10.1	31.6	238.66	9.3	0.39	0.5	23.5	0.3073
30	10.9	34.5	356.05	8.5	0.39	0.5	23.5	0.6939
65	9.4	29.9	194.42	9.5	0.39	0.5	23.5	0.00724
60	8.8	32.2	248.81	9.3	0.39	0.5	23.5	0.3664
55	9.1	33.2	282.74	8.9	0.39	0.5	23.5	0.4467
45	10	33.2	300.04	8.9	0.39	0.5	23.5	0.5744
55	9.1	32.7	282.74	9.2	0.39	0.5	23.5	0.4049
35	10.2	33.9	303.28	9.0	0.39	0.5	23.5	0.5903
35	10.8	34.3	344.2	8.6	0.39	0.5	23.5	0.6446
60	8	31.3	204.65	9.6	0.39	0.5	23.5	0.2353

Data of different parameters for multiple regression analysis (Set 1, v2)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
70	8	28.2	182.57	9.6	0.42	0.5	23.5	0.1221
45	9.4	32.1	300.04	8.8	0.42	0.5	23.5	0.4379
45	8.2	28.3	204.65	9.4	0.42	0.5	23.5	0.1783
55	8.5	30.2	270.89	9	0.42	0.5	23.5	0.3916
70	7.9	28	182.57	9.8	0.42	0.5	23.5	0.0966

60	8.4	28.3	238.66	9.3	0.42	0.5	23.5	0.3507
60	8.1	28.2	194.42	9.5	0.42	0.5	23.5	0.1259
50	8.3	28.4	226.73	9.3	0.42	0.5	23.5	0.2896
55	8.5	29	248.81	9.1	0.42	0.5	23.5	0.3524
35	9.5	32.7	304.82	8.8	0.42	0.5	23.5	0.521
45	8.9	31.5	282.74	8.7	0.42	0.5	23.5	0.3925
35	9.6	34.3	344.2	8.7	0.42	0.5	23.5	0.5739

Data of different parameters for multiple regression analysis (Set 1, v3)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
50	9.6	33.8	292.97	9.5	0.46	0.5	23.5	0.4699
55	9.4	33.1	270.89	9.4	0.46	0.5	23.5	0.4441
60	9.1	32.6	226.73	9.5	0.46	0.5	23.5	0.3915
35	10.2	33.6	366.36	9	0.46	0.5	23.5	0.7185
60	9.7	33.3	303.28	9.4	0.46	0.5	23.5	0.5941
50	9	32.3	260.66	9.2	0.46	0.5	23.5	0.4373
55	8.9	32.1	238.58	9.4	0.46	0.5	23.5	0.3942
40	9.8	34	347.44	9.5	0.46	0.5	23.5	0.6376
80	7.2	31.9	204.65	9.7	0.46	0.5	23.5	0.2789
55	9.5	33.8	282.74	9.7	0.46	0.5	23.5	0.4525
30	10.3	34	376.59	8.7	0.46	0.5	23.5	0.891
45	9.8	33.9	313.51	9.1	0.46	0.5	23.5	0.6211

Data of different parameters for multiple regression analysis (Set 2, v1)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
65	8.5	32.1	273	9.9	0.39	0.4	30	0.3576
45	8.9	32.4	292	9.6	0.39	0.4	30	0.5128
50	9.1	32.6	293	9.5	0.39	0.4	30	0.5186
30	10.8	35.9	378	8.7	0.39	0.4	30	0.6262
60	8.3	30.2	217	10.0	0.39	0.4	30	0.3003
50	9.5	33.2	322	9.5	0.39	0.4	30	0.5318
40	10.1	34.2	327	9.2	0.39	0.4	30	0.5556
35	10.2	34.2	337	9.1	0.39	0.4	30	0.5651
45	9.7	33.7	325	9.4	0.39	0.4	30	0.5366
30	10.4	34.9	347	9.1	0.39	0.4	30	0.5776
30	10.7	35.3	356	8.8	0.39	0.4	30	0.5822
55	8.7	32.3	284	9.7	0.39	0.4	30	0.4421

Data of different parameters for multiple regression analysis (Set 3, v1)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
75	8.7	31.7	394.92	10.6	0.39	0.3	41.8	0.3999
30	10.3	35.7	502	9.8	0.39	0.3	41.8	0.632
50	9.4	34.2	471.15	10.1	0.39	0.3	41.8	0.562
30	10.7	36.3	534.31	9.7	0.39	0.3	41.8	0.7031
55	8.8	33.6	405.15	10.4	0.39	0.3	41.8	0.4695
50	9.2	33.9	449.15	10.2	0.39	0.3	41.8	0.5317
40	9.7	34.7	481.46	10	0.39	0.3	41.8	0.5722
20	11.2	37.5	575.39	9.3	0.39	0.3	41.8	0.7454
55	9	33.8	427.23	10.3	0.39	0.3	41.8	0.4862
25	11	37	566.7	9.5	0.39	0.3	41.8	0.7327
30	10.4	35.8	512.23	9.8	0.39	0.3	41.8	0.6513
35	10.1	35.3	491.69	10	0.39	0.3	41.8	0.5845

Data of different parameters for multiple regression analysis (Set 3, v2)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
70	8.4	31.4	204.65	9.9	0.42	0.3	41.8	0.348
65	8.8	31.7	238.58	9.6	0.42	0.3	41.8	0.399
60	9.1	31.9	248.81	9.5	0.42	0.3	41.8	0.470
30	10.7	35.3	364.74	8.8	0.42	0.3	41.8	0.661
90	8.5	29.5	194.42	10	0.42	0.3	41.8	0.230
55	9.4	32.5	282.74	9.4	0.42	0.3	41.8	0.477
45	10	33.5	333.97	9.2	0.42	0.3	41.8	0.506
40	10.1	33.6	303.28	9.2	0.42	0.3	41.8	0.511
50	9.7	33.0	282.74	9.4	0.42	0.3	41.8	0.489
35	10.4	34.1	344.2	9.1	0.42	0.3	41.8	0.523
30	10.6	34.9	356.05	8.9	0.42	0.3	41.8	0.529
65	8.6	31.6	226.73	9.7	0.42	0.3	41.8	0.373

Data of different parameters for multiple regression analysis (Set 3, v3)

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet (m)	Angle of inclination	solar radiation
70	8.5	31.6	282.9	10	0.46	0.3	41.8	0.3166
65	8.9	31.9	289.97	9.8	0.46	0.3	41.8	0.3753
60	9.1	32.2	303.28	9.7	0.46	0.3	41.8	0.3842
25	10.9	36.4	390.06	8.8	0.46	0.3	41.8	0.663
80	8.4	29.7	258.88	10.2	0.46	0.3	41.8	0.2208
55	9.4	32.7	332.43	9.6	0.46	0.3	41.8	0.4564
45	10	34.5	338.75	9.4	0.46	0.3	41.8	0.5275
35	10.1	34.8	359.21	9.4	0.46	0.3	41.8	0.5596
45	9.8	33.3	337.13	9.6	0.46	0.3	41.8	0.5081
30	10.4	35.3	369.6	9.3	0.46	0.3	41.8	0.5954

30	10.7	36.1	379.83	9.0	0.46	0.3	41.8	0.6202
65	8.7	31.8	284.36	9.9	0.46	0.3	41.8	0.3746

Variation of pond parameters with time (Set 2, V1)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.11.13	2.0	7.5	9.0	7.8	9.2	8.9	9.5	8.6	8.4
Week 1	05.11.13	2.3	8.0	9.3	8.3	9.5	9.2	9.8	8.9	8.8
Week 1	07.11.13	2.2	7.8	9.3	8.1	9.5	9.2	9.7	8.9	8.7
Week 2	09.11.13	2.1	7.7	9.3	8.0	9.4	9.1	9.6	8.8	8.6
Week 2	12.11.13	1.6	7.0	8.6	7.2	8.7	8.5	9.0	7.9	7.7
Week 2	14.11.13	1.8	7.1	8.9	7.5	9.1	8.8	9.3	8.5	8.3
Week 3	16.11.13	2.8	8.2	9.8	8.7	10.0	9.5	10.2	9.3	9.2
Week 3	18.11.13	2.5	8.2	9.5	8.5	9.7	9.4	9.9	9.0	8.9
Week 3	21.11.13	1.7	7.0	8.7	7.3	8.8	8.6	9.1	8.0	7.8
Week 4	23.11.13	1.9	7.3	9.0	7.6	9.1	8.9	9.4	8.5	8.3
Week 4	25.11.13	2.8	8.1	9.6	8.5	9.9	9.6	10.0	9.2	9.1
Week 4	27.11.13	2.4	8.2	9.6	8.4	9.6	9.4	9.8	9.1	8.9

Variation of pond parameters with time (Set 2, V1)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.11.13	25.4	31.5	33.7	31.8	34.2	33.6	34.2	33.2	32.8
Week 1	05.11.13	24.9	30.3	32.2	30.7	32.6	32.0	33.2	31.4	31.2
Week 1	07.11.13	25.4	30.0	33.0	30.9	33.2	32.7	34.0	32.0	31.8
Week 1	09.11.13	25.4	30.1	33.5	31.1	33.7	33.1	34.1	32.6	32.2
Week 2	12.11.13	25.2	33.5	35.0	33.9	35.9	34.2	36.7	34.2	34.1
Week 2	14.11.13	25.3	32.2	34.4	32.3	34.9	34.4	35.1	33.9	33.8
Week 2	16.11.13	24.9	27.2	30.1	27.6	30.2	29.9	31.7	28.7	28.2
Week 3	18.11.13	25.7	29.6	32.1	30.2	32.3	31.5	34.1	30.8	30.6
Week 3	21.11.13	25.1	33.0	35.1	33.5	35.3	34.9	35.6	34.2	34.0
Week 3	23.11.13	25.7	32.0	34.1	32.1	34.2	33.9	34.7	33.5	33.3
Week 3	25.11.13	25.5	29.5	30.9	29.8	32.1	30.8	33.7	30.7	30.5
Week 4	27.11.13	25.6	29.7	32.1	30.5	32.4	31.8	34.1	31.5	31.4

Variation of pond parameters with time (Set 2, V1)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.11.13	7.3	7.7	9.7	7.9	10.1	9.2	10.4	8.4	8.2
Week 1	05.11.13	7.5	7.6	8.8	7.8	9.1	8.4	9.4	7.8	7.7
Week 1	07.11.13	7.5	7.5	9.0	7.8	9.5	8.6	9.9	8.0	7.9
Week 1	09.11.13	7.4	7.7	9.3	7.9	9.7	8.9	10.2	8.2	8.0
Week 2	12.11.13	6.5	8.9	10.4	8.9	10.8	10.2	11.2	9.3	9.1
Week 2	14.11.13	6.7	8.4	10.1	8.6	10.4	9.7	10.7	8.9	8.8

Week 2	16.11.13	6.4	6.5	7.9	7.0	8.3	7.7	8.5	7.5	7.4
Week 3	18.11.13	7.0	7.0	8.3	7.4	8.7	8.2	8.8	7.7	7.6
Week 3	21.11.13	6.5	8.8	10.3	8.8	10.7	10.0	11.0	9.1	9.0
Week 3	23.11.13	7.0	7.9	9.9	8.0	10.2	9.6	10.5	8.7	8.5
Week 3	25.11.13	6.5	6.7	8.1	7.2	8.5	7.9	8.7	7.6	7.4
Week 4	27.11.13	7.3	7.3	8.6	7.6	8.9	8.3	9.1	7.8	7.6

Variation of pond algae concentration with time (Set 2, V_1)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (μg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.11.13	90	148	262	155	327	286	358	221	211
Week 1	05.11.13	100	134	242	148	293	271	334	198	191
Week 1	07.11.13	90	137	254	148	322	271	343	208	198
Week 1	09.11.13	90	138	259	150	325	283	356	220	210
Week 2	12.11.13	90	179	305	191	378	346	419	262	232
Week 2	14.11.13	92	158	273	160	347	305	370	233	221
Week 2	16.11.13	96	121	165	123	217	205	246	164	155
Week 3	18.11.13	100	131	221	146	284	259	302	177	169
Week 3	21.11.13	89	158	283	169	356	314	377	240	221
Week 3	23.11.13	89	157	264	157	337	293	368	232	214
Week 3	25.11.13	99	130	210	145	273	249	290	174	164
Week 4	27.11.13	102	133	230	148	292	269	321	186	179

1st Reading collected on 02.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.4519	63.4601	30	8.2	273	
Pond A	55.2719	55.2764	30	4.5	150	45
Pond B	51.0613	51.0626	30	1.3	43	84
Pond C	55.1399	55.1434	30	3.5	117	57
Pond D	50.0159	50.0169	30	1	33	88
Pond E	52.0059	52.0073	30	1.4	47	83
Pond F	48.0015	48.0021	30	0.6	20	93
Pond G	54.1283	54.1307	30	2.4	80	71
Pond H	54.2606	54.2632	30	2.6	87	68

2nd Reading collected on 05.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.4419	63.4501	30	8.2	273	
Pond A	55.4731	55.4779	30	4.8	160	41
Pond B	51.0605	51.062	30	1.5	50	82
Pond C	55.3403	55.3445	30	4.2	140	49
Pond D	50.015	50.0164	30	1.4	47	83
Pond E	53.0155	53.0172	30	1.7	57	79
Pond F	48.0022	48.0032	30	1	33	88
Pond G	54.2282	54.2314	30	3.2	107	61
Pond H	54.2494	54.2529	30	3.5	117	57

3rd Reading collected on 07.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.5321	62.5401	30	8	267	
Pond A	55.1439	55.1484	30	4.5	150	44
Pond B	52.0409	52.0423	30	1.4	47	83
Pond C	55.0200	55.0237	30	3.7	123	54
Pond D	49.8057	49.8069	30	1.2	40	85
Pond E	50.806	50.8076	30	1.6	53	80
Pond F	47.7026	47.7034	30	0.8	27	90
Pond G	54.0189	54.0218	30	2.9	97	64
Pond H	54.1398	54.1429	30	3.1	103	61

4th Reading collected on 09.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.3326	62.3401	30	7.5	250	
Pond A	55.111	55.1151	30	4.1	137	45
Pond B	50.0115	50.0127	30	1.2	40	84
Pond C	55.0209	55.0242	30	3.3	110	56
Pond D	49.8061	49.8071	30	1	33	87
Pond E	51.7058	51.7071	30	1.3	43	83
Pond F	47.8027	47.8033	30	0.6	20	92
Pond G	54.0089	54.0113	30	2.4	80	68
Pond H	54.041	54.0434	30	2.4	80	68

5th Reading collected on 12.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.1101	61.1187	30	8.6	287	
Pond A	56.3672	56.3711	30	3.9	130	55
Pond B	55.1167	55.1179	30	1.2	40	86
Pond C	56.1598	56.1629	30	3.1	103	64
Pond D	53.4159	53.4167	30	0.8	27	91
Pond E	55.2773	55.2786	30	1.3	43	85
Pond F	51.2653	51.2657	30	0.4	13	95
Pond G	55.4351	55.4370	30	1.9	63	78
Pond H	55.8486	55.8507	30	2.1	70	76

6th Reading collected on 14.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.0224	60.0296	30	7.2	240	
Pond A	55.2139	55.2175	30	3.6	120	50
Pond B	51.6515	51.6526	30	1.1	37	85
Pond C	55.0114	55.0142	30	2.8	93	61
Pond D	48.4057	48.4064	30	0.7	23	90
Pond E	50.1063	50.1074	30	1.1	37	85
Pond F	47.3014	47.3019	30	0.5	17	93
Pond G	53.5097	53.5116	30	1.9	63	74
Pond H	54.0110	54.0130	30	2	67	72

7th Reading collected on 16.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.5408	64.5496	30	8.8	293	
Pond A	56.1317	56.1374	30	5.7	190	35
Pond B	52.1793	52.1817	30	2.4	80	73
Pond C	55.6386	55.6436	30	5	167	43
Pond D	50.3143	50.3165	30	2.2	73	75

Pond E	51.455	51.4577	30	2.7	90	69
Pond F	50.7036	50.7051	30	1.5	50	83
Pond G	54.3269	54.3310	30	4.1	137	53
Pond H	54.6485	54.6528	30	4.3	143	51

8th Reading collected on 18.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.9413	63.9503	30	9	300	
Pond A	55.6526	55.6581	30	5.5	183	39
Pond B	51.0249	51.027	30	2.1	70	77
Pond C	55.5292	55.534	30	4.8	160	47
Pond D	50.0048	50.0065	30	1.7	57	81
Pond E	52.0597	52.0623	30	2.6	87	71
Pond F	50.0021	50.0034	30	1.3	43	86
Pond G	54.2166	54.2204	30	3.8	127	58
Pond H	54.4489	54.4531	30	4.2	140	53

9th Reading collected on 21.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.0128	60.0205	30	7.7	257	
Pond A	54.1145	54.1182	30	3.7	123	52
Pond B	49.0063	49.0074	30	1.1	37	86
Pond C	53.9112	53.9141	30	2.9	97	62
Pond D	47.3048	47.3056	30	0.8	27	90
Pond E	49.5513	49.5525	30	1.2	40	84
Pond F	46.2013	46.2017	30	0.4	13	95
Pond G	52.4093	52.4111	30	1.8	60	77
Pond H	52.9106	52.9126	30	2	67	74

10th Reading collected on 23.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.0328	62.0406	30	7.8	260	
Pond A	54.0139	54.0179	30	4	133	49
Pond B	50.0016	50.0027	30	1.1	37	86
Pond C	55.0108	55.0140	30	3.2	107	59
Pond D	49.7057	49.7066	30	0.9	30	88
Pond E	51.5064	51.5076	30	1.2	40	85
Pond F	47.5027	47.5033	30	0.6	20	92
Pond G	53.9080	53.9101	30	2.1	70	73
Pond H	54.0305	54.0327	30	2.2	73	72

11th Reading collected on 25.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.2321	63.2403	30	8.2	273	
Pond A	55.1629	55.168	30	5.1	170	38
Pond B	52.1205	52.1227	30	2.2	73	73
Pond C	55.3201	55.3246	30	4.5	150	45
Pond D	50.1051	50.1068	30	1.7	57	79
Pond E	51.1151	51.1175	30	2.4	80	71
Pond F	48.4018	48.403	30	1.2	40	85
Pond G	54.6084	54.6119	30	3.5	117	57
Pond H	54.5482	54.5521	30	3.9	130	52

12th Reading collected on 27.11.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.1928	60.1995	30	6.7	223	
Pond A	55.1135	55.1175	30	4	133	40
Pond B	50.5514	50.5529	30	1.5	50	78
Pond C	54.9104	54.9139	30	3.5	117	48
Pond D	48.3046	48.3058	30	1.2	40	82
Pond E	51.0056	51.0072	30	1.6	53	76
Pond F	47.2007	47.2016	30	0.9	30	87
Pond G	53.4085	53.4113	30	2.8	93	58
Pond H	53.7101	53.7131	30	3	100	55

1st Reading collected on 02.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.7	1.2	275	
Pond A	250	5	5.8	2.8	150	45
Pond B	250	5	7.5	6	75	73
Pond C	250	5	6.0	3.7	115	58
Pond D	250	5	8.9	8.1	40	85
Pond E	250	5	8.6	7.0	80	71
Pond F	250	5	10	9.3	35	87
Pond G	250	5	6.7	4.9	90	67
Pond H	250	5	6.6	4.6	100	64

2nd Reading collected on 05.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.3	290	
Pond A	250	5	6.6	3.3	165	43
Pond B	250	5	9.7	8.0	85	71
Pond C	250	5	8.2	5.5	135	53
Pond D	250	5	9.9	8.9	50	83
Pond E	250	5	9.6	7.7	95	67
Pond F	250	5	9.9	9.0	45	84
Pond G	250	5	9.0	6.8	110	62
Pond H	250	5	8.9	6.6	115	60

3rd Reading collected on 07.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.3	1.6	285	
Pond A	250	5	7.6	4.4	160	44
Pond B	250	5	8.4	6.7	85	70
Pond C	250	5	8.2	5.6	130	54
Pond D	250	5	9.3	8.3	50	82

Pond E	250	5	9.3	7.5	90	68
Pond F	250	5	9.7	8.8	45	84
Pond G	250	5	8.0	6.0	100	65
Pond H	250	5	7.8	5.6	110	61

4th Reading collected on 09.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.4	280	
Pond A	250	5	7.3	4.2	155	45
Pond B	250	5	9.1	7.5	80	71
Pond C	250	5	8.2	5.7	125	55
Pond D	250	5	9.7	8.8	45	84
Pond E	250	5	9.5	7.8	85	70
Pond F	250	5	9.9	9.1	40	86
Pond G	250	5	8.7	6.8	95	66
Pond H	250	5	8.3	6.2	105	63

5th Reading collected on 12.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.2	285	
Pond A	250	5	7.1	4.4	135	53
Pond B	250	5	9.9	8.7	60	79
Pond C	250	5	8.8	6.9	95	67
Pond D	250	5	9.8	9.2	30	89
Pond E	250	5	9.5	8.1	70	75
Pond F	250	5	10.4	9.9	25	91
Pond G	250	5	9.0	7.4	80	72
Pond H	250	5	8.9	7.2	85	70

6th Reading collected on 14.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.3	1.5	240	
Pond A	250	5	7.1	4.6	125	48
Pond B	250	5	9.5	8.3	60	75
Pond C	250	5	7.8	5.9	95	60
Pond D	250	5	9.8	9.2	30	88
Pond E	250	5	9.5	8.2	65	73
Pond F	250	5	10.4	9.9	25	90
Pond G	250	5	8.9	7.5	70	71
Pond H	250	5	8.8	7.2	80	67

7th Reading collected on 16.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	5.8	1.1	235	
Pond A	250	5	5.7	2.8	145	38
Pond B	250	5	7.4	5.1	115	51
Pond C	250	5	5.9	3.2	135	43
Pond D	250	5	8.1	6.9	60	74
Pond E	250	5	7.5	5.8	85	64
Pond F	250	5	8.7	7.8	45	81
Pond G	250	5	6.8	4.4	120	49
Pond H	250	5	6.6	4.1	125	47

8th Reading collected on 18.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	1.3	275	
Pond A	250	5	4.7	1.5	160	42
Pond B	250	5	7.7	6.0	85	69
Pond C	250	5	5.3	2.4	145	47
Pond D	250	5	8.9	7.8	55	80
Pond E	250	5	7.2	5.3	95	65
Pond F	250	5	9.1	8.2	45	84
Pond G	250	5	6.9	4.5	120	56
Pond H	250	5	6.8	4.3	125	55

9th Reading collected on 21.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.5	275	
Pond A	250	5	7.8	5.1	135	51
Pond B	250	5	9.7	8.4	65	76
Pond C	250	5	8.4	6.3	105	62
Pond D	250	5	10.2	9.6	30	89
Pond E	250	5	10.1	8.7	70	75
Pond F	250	5	11	10.5	25	91
Pond G	250	5	9.0	7.4	80	71
Pond H	250	5	8.8	7.1	85	69

10th Reading collected on 23.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.7	265	
Pond A	250	5	6.6	3.8	140	47
Pond B	250	5	9.7	8.3	70	74
Pond C	250	5	7.9	5.7	110	58
Pond D	250	5	9.7	9	35	87
Pond E	250	5	9.6	8.1	75	72
Pond F	250	5	9.5	8.9	30	89
Pond G	250	5	8.5	6.9	80	70
Pond H	250	5	7.8	5.9	95	64

11th Reading collected on 25.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.2	295	
Pond A	250	5	7.8	4.3	175	41
Pond B	250	5	9	7.1	95	68
Pond C	250	5	8.7	5.5	160	46
Pond D	250	5	9.8	8.3	75	75

Pond E	250	5	8.9	6.8	105	64
Pond F	250	5	9.8	8.8	50	83
Pond G	250	5	8.5	5.8	135	54
Pond H	250	5	8.4	5.7	135	54

12th Reading collected on 27.11.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.4	1.3	255	
Pond A	250	5	7.0	4.1	145	43
Pond B	250	5	9.9	8.4	75	71
Pond C	250	5	7.0	4.5	125	51
Pond D	250	5	10.1	9.2	45	82
Pond E	250	5	9.7	8.0	85	67
Pond F	250	5	9.9	9.1	40	84
Pond G	250	5	7.8	5.8	100	61
Pond H	250	5	7.6	5.4	110	57

1st Reading collected on 02.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 0	240	90
Pond E	3 - 3 - 0	240	90
Pond F	3 - 2 - 2	210	91
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

2nd Reading collected on 05.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 1	150	86

Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 07.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

4th Reading collected on 09.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 2	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 -2 - 0	93	92
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

5th Reading collected on 12.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 1 - 1	75	93
Pond C	3 - 1 - 2	120	89
Pond D	3 - 1 - 1	75	93
Pond E	3 - 1 - 1	75	93
Pond F	3 - 0 - 2	64	94
Pond G	3 - 2 - 0	93	92
Pond H	3 - 2 - 0	93	92

6th Reading collected on 14.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	

Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 2 - 2	210	91
Pond E	3 - 3 - 0	240	90
Pond F	3 - 2 - 1	150	94
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

7th Reading collected on 16.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 2	460	58
Pond C	3 - 3 - 2	460	58
Pond D	3 - 3 - 2	460	58
Pond E	3 - 3 - 2	460	58
Pond F	3 - 3 - 2	460	58
Pond G	3 - 3 - 2	460	58
Pond H	3 - 3 - 2	460	58

8th Reading collected on 18.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 1	460	58
Pond F	3 - 2 - 2	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

9th Reading collected on 21.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 1 - 2	120	89
Pond C	3 - 1 - 2	120	89

Pond D	3 - 2 - 0	93	92
Pond E	3 - 1 - 2	120	89
Pond F	3 - 1 - 1	75	93
Pond G	3 - 2 - 1	150	86
Pond H	3 - 2 - 1	150	86

10th Reading collected on 23.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 0	93	92
Pond E	3 - 1 - 2	120	89
Pond F	3 - 1 - 1	75	93
Pond G	3 - 2 - 1	150	86
Pond H	3 - 2 - 2	210	81

11th Reading collected on 25.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	1100	0
Pond B	3 - 3 - 1	460	58
Pond C	3 - 3 - 1	460	58
Pond D	3 - 3 - 0	240	78
Pond E	3 - 3 - 1	460	58
Pond F	3 - 3 - 0	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

12th Reading collected on 27.11.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 1	460	81
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81

Pond H	3 - 3 - 1	460	81

1st Reading collected on 02.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	39	81
Pond C	3 - 1 - 1	75	64
Pond D	2 - 2 - 1	28	87
Pond E	3 - 1 - 0	39	81
Pond F	3 - 0 - 0	23	89
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

2nd Reading collected on 05.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 2 - 1	28	81
Pond E	3 - 0 - 2	39	74
Pond F	2 - 1 - 1	20	87
Pond G	3 - 1 - 0	43	71
Pond H	3 - 0 - 2	64	57

3rd Reading collected on 07.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 2 - 1	28	81
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 1	20	87
Pond G	3 - 0 - 2	64	57
Pond H	3 - 0 - 2	64	57

4th Reading collected on 09.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 0 - 2	64	47
Pond B	3 - 0 - 0	23	81
Pond C	3 - 1 - 0	43	64
Pond D	2 - 1 - 1	20	83
Pond E	3 - 0 - 0	23	81
Pond F	2 - 0 - 1	14	88
Pond G	3 - 0 - 1	39	68
Pond H	3 - 1 - 0	43	64

5th Reading collected on 12.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	210	
Pond A	2 - 2 - 1	28	87
Pond B	2 - 0 - 1	14	93
Pond C	2 - 2 - 1	28	87
Pond D	2 - 0 - 1	14	93
Pond E	2 - 1 - 1	20	90
Pond F	1 - 1 - 1	11	95
Pond G	2 - 2 - 1	28	87
Pond H	2 - 2 - 1	28	87

6th Reading collected on 14.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	64	73
Pond B	2 - 2 - 1	28	88
Pond C	3 - 0 - 2	64	73
Pond D	2 - 1 - 1	20	92
Pond E	2 - 2 - 1	28	88
Pond F	3 - 0 - 0	20	92
Pond G	3 - 1 - 0	43	82
Pond H	3 - 1 - 0	43	82

7th Reading collected on 16.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)

Influent	3 - 3 - 2	460	
Pond A	3 - 3 - 2	460	0
Pond B	3 - 2 - 1	210	54
Pond C	3 - 3 - 2	460	0
Pond D	3 - 2 - 1	210	54
Pond E	3 - 2 - 1	210	54
Pond F	3 - 2 - 1	150	67
Pond G	3 - 3 - 0	240	48
Pond H	3 - 3 - 0	240	48

8th Reading collected on 18.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 3 - 0	240	0
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 2	120	50
Pond D	3 - 1 - 0	43	82
Pond E	3 - 0 - 2	64	73
Pond F	3 - 1 - 0	39	84
Pond G	3 - 1 - 2	93	61
Pond H	3 - 1 - 2	93	61

9th Reading collected on 21.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 1	39	74
Pond B	2 - 0 - 1	14	91
Pond C	3 - 0 - 1	39	74
Pond D	2 - 0 - 1	14	91
Pond E	2 - 1 - 0	15	90
Pond F	2 - 0 - 0	9	94
Pond G	3 - 0 - 1	28	81
Pond H	3 - 0 - 1	28	81

10th Reading collected on 23.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	

Pond A	3 - 0 - 2	64	57
Pond B	3 - 0 - 0	23	85
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 1	20	87
Pond E	3 - 0 - 0	23	85
Pond F	2 - 1 - 0	15	90
Pond G	2 - 2 - 1	28	81
Pond H	2 - 2 - 1	28	81

11th Reading collected on 25.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 2 - 1	150	0
Pond B	3 - 1 - 0	43	71
Pond C	3 - 1 - 1	75	50
Pond D	3 - 1 - 0	43	71
Pond E	3 - 1 - 0	43	71
Pond F	2 - 2 - 1	28	81
Pond G	3 - 0 - 2	64	57
Pond H	3 - 0 - 2	64	57

12th Reading collected on 27.11.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	120	50
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 2	120	50
Pond D	3 - 1 - 0	43	82
Pond E	3 - 0 - 2	64	73
Pond F	3 - 1 - 0	39	84
Pond G	3 - 2 - 0	93	61
Pond H	3 - 2 - 0	93	61

Variation of pond parameters with time (Set 2, V2)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H

Week 1	02.12.13	2.2	7.5	9.4	8.5	9.6	9.2	9.8	9	8.9
Week 1	04.12.13	2.3	8	9.4	8.7	9.7	9.3	10	9.1	8.9
Week 1	07.12.13	2.5	8.1	9.7	8.9	9.9	9.4	10.2	9.2	9.1
Week 2	09.12.13	2.1	8.1	9.1	8.5	9.6	9.1	9.7	8.9	8.8
Week 2	11.12.13	2.7	8	9.6	9.3	10.2	9.6	10.4	9.4	9.2
Week 2	13.12.13	2.6	8.1	9.8	9.1	10.1	9.5	10.2	9.3	9.2
Week 3	17.12.13	2.4	8.0	9.4	8.8	9.8	9.3	10.1	9.2	9
Week 3	19.12.13	1.7	7.4	8.9	7.5	9.1	8.6	9.3	8.3	8
Week 3	21.12.13	1.9	7.5	9.2	7.8	9.4	9.0	9.6	8.7	8.5
Week 4	23.12.13	2	8.1	9.2	8.3	9.4	9.1	9.7	8.8	8.6
Week 4	27.12.13	1.6	7	8.8	7.4	8.9	8.4	9.2	8.1	7.9
Week 4	30.12.13	1.8	7.2	9.1	7.7	9.3	8.9	9.5	8.6	8.3

Variation of pond parameters with time (Set 2, V2)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.12.13	25.3	30.3	33.3	31.2	33.5	33.0	34.3	32.3	32.1
Week 1	04.12.13	25.0	30.5	32.5	31.0	32.9	32.3	33.5	31.7	31.5
Week 1	07.12.13	25.8	29.9	32.4	30.6	32.6	31.8	34.4	31.1	30.9
Week 1	09.12.13	25.2	30.4	33.8	31.4	34.0	33.4	34.4	32.9	32.5
Week 2	11.12.13	26.5	27.5	30.4	27.9	30.5	30.2	32.0	29.0	28.6
Week 2	13.12.13	26.1	29.8	31.9	30.2	32.4	31.1	34.0	31.0	30.8
Week 2	17.12.13	25.8	30.0	32.4	30.8	32.7	32.1	34.5	31.8	31.7
Week 3	19.12.13	25.0	33.3	35.4	33.8	35.8	35.2	35.9	34.5	34.3
Week 3	21.12.13	25.1	32.3	34.4	32.4	34.6	34.2	35.0	33.8	33.6
Week 3	23.12.13	25.1	31.8	34.0	32.1	34.5	33.9	34.5	33.5	33.1
Week 3	27.12.13	25.1	33.8	35.3	34.2	36.2	34.8	36.7	34.5	34.4
Week 4	30.12.13	25.1	31.7	34.7	32.6	35.1	34.7	35.4	34.2	34.1

Variation of pond parameters with time (Set 2, V2)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.12.13	7.3	7.6	9.0	7.8	9.5	8.6	9.9	8.0	7.9
Week 1	04.12.13	7.1	7.7	8.9	7.9	9.2	8.5	9.5	7.9	7.8
Week 1	07.12.13	6.9	7.0	8.1	7.5	8.7	7.9	9.1	7.8	7.6
Week 1	09.12.13	7.5	7.8	9.4	8.0	9.8	9.0	10.3	8.3	8.1
Week 2	11.12.13	6.6	6.6	8.4	7.1	8.6	8.2	8.7	7.8	7.5
Week 2	13.12.13	6.7	6.8	8.2	7.2	8.5	8.2	8.9	8.0	7.8
Week 2	17.12.13	7.0	7.4	8.6	7.6	8.9	8.3	9.2	7.7	7.7
Week 3	19.12.13	6.7	8.9	10.3	8.9	10.7	10.0	11.0	9.1	9.0
Week 3	21.12.13	7.2	8.0	9.9	8.0	10.2	9.6	10.5	8.7	8.5
Week 3	23.12.13	7.4	7.8	9.7	7.9	10.1	9.2	10.4	8.4	8.2
Week 3	27.12.13	6.4	9.0	10.5	9.0	10.9	10.2	11.2	9.4	9.2
Week 4	30.12.13	6.9	8.5	10.2	8.7	10.5	9.8	10.8	9.0	8.9

Variation of pond algae concentration with time (Set 2, V_2)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.12.13	100	158	293	168	343	274	399	228	218
Week 1	04.12.13	99	155	290	168	314	274	378	230	211
Week 1	07.12.13	100	145	273	158	286	242	315	201	182
Week 1	09.12.13	104	161	318	183	362	295	417	252	233
Week 2	11.12.13	96	143	250	146	281	221	271	186	176
Week 2	13.12.13	99	143	273	157	284	233	303	187	177
Week 2	17.12.13	100	153	290	168	291	251	355	220	199
Week 3	19.12.13	86	191	361	213	392	318	424	274	255
Week 3	21.12.13	100	179	348	197	380	309	422	260	239
Week 3	23.12.13	102	172	342	192	373	301	417	254	233
Week 3	27.12.13	78	192	368	214	393	327	433	276	255
Week 4	30.12.13	92	187	354	206	383	310	423	269	247

1st Reading collected on 02.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.5320	62.5401	30	8.1	270	
Pond A	56.1439	56.1483	30	4.4	147	46
Pond B	53.0410	53.0423	30	1.3	43	84
Pond C	56.0200	56.0236	30	3.6	120	56
Pond D	50.8058	50.8068	30	1	33	88
Pond E	51.8061	51.8075	30	1.4	47	83
Pond F	48.7026	48.7032	30	0.6	20	93
Pond G	55.0191	55.0216	30	2.5	83	69
Pond H	55.1404	55.1431	30	2.7	90	67

2nd Reading collected on 04.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.4422	62.4503	30	8.1	270	
Pond A	54.4733	54.4779	30	4.6	153	43
Pond B	51.0607	51.0621	30	1.4	47	83
Pond C	54.3407	54.3445	30	3.8	127	53
Pond D	50.0151	50.0163	30	1.2	40	85
Pond E	53.0156	53.0171	30	1.5	50	81
Pond F	48.0023	48.0031	30	0.8	27	90
Pond G	54.2289	54.2317	30	2.8	93	65
Pond H	54.2499	54.2529	30	3	100	63

3rd Reading collected on 07.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.9419	64.9503	30	8.4	280	
Pond A	55.6528	55.6578	30	5	167	40
Pond B	51.0253	51.0271	30	1.8	60	79
Pond C	55.5298	55.5341	30	4.3	143	49
Pond D	51.0051	51.0066	30	1.5	50	82
Pond E	52.0601	52.0622	30	2.1	70	75
Pond F	51.0023	51.0034	30	1.1	37	87
Pond G	54.9169	54.9201	30	3.2	107	62
Pond H	55.4491	55.4526	30	3.5	117	58

4th Reading collected on 09.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.3326	63.3398	30	7.2	240	
Pond A	56.1109	56.1147	30	3.8	127	47
Pond B	50.1115	50.1126	30	1.1	37	85
Pond C	55.7206	55.7237	30	3.1	103	57
Pond D	49.9062	49.9070	30	0.8	27	89
Pond E	51.5058	51.5070	30	1.2	40	83
Pond F	47.9028	47.9033	30	0.5	17	93
Pond G	54.5091	54.5111	30	2	67	72
Pond H	54.8413	54.8434	30	2.1	70	71

5th Reading collected on 11.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.6412	64.6501	30	8.9	297	
Pond A	56.9719	56.9776	30	5.7	190	36
Pond B	52.3795	52.3818	30	2.3	77	74
Pond C	55.7387	55.7436	30	4.9	163	45
Pond D	50.5147	50.5165	30	1.8	60	80
Pond E	51.6551	51.6576	30	2.5	83	72
Pond F	50.8036	50.8049	30	1.3	43	85
Pond G	54.5272	54.5311	30	3.9	130	56
Pond H	54.7487	54.7528	30	4.1	137	54

6th Reading collected on 13.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.4309	64.4395	30	8.6	287	
Pond A	55.3628	55.3681	30	5.3	177	38
Pond B	52.5204	52.5224	30	2	67	77
Pond C	55.4201	55.4246	30	4.5	150	48
Pond D	50.7051	50.7067	30	1.6	53	81
Pond E	51.9152	51.9175	30	2.3	77	73
Pond F	48.7021	48.7033	30	1.2	40	86
Pond G	54.5084	54.5119	30	3.5	117	59
Pond H	54.8483	54.8521	30	3.8	127	56

7th Reading collected on 17.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.1919	62.2002	30	8.3	277	
Pond A	55.1131	55.1179	30	4.8	160	42
Pond B	50.5513	50.5529	30	1.6	53	81
Pond C	54.9099	54.9139	30	4	133	52
Pond D	48.3046	48.3059	30	1.3	43	84
Pond E	51.0056	51.0074	30	1.8	60	78
Pond F	47.2007	47.2016	30	0.9	30	89
Pond G	53.4083	53.4113	30	3	100	64

Pond H	54.7096	54.7128	30	3.2	107	61

8th Reading collected on 19.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.0129	60.0201	30	7.2	240	
Pond A	54.1145	54.1178	30	3.3	110	54
Pond B	49.0063	49.0073	30	1	33	86
Pond C	53.9112	53.9138	30	2.6	87	64
Pond D	47.3048	47.3055	30	0.7	23	90
Pond E	50.5513	50.5524	30	1.1	37	85
Pond F	46.2013	46.2016	30	0.3	10	96
Pond G	52.4093	52.4109	30	1.6	53	78
Pond H	52.9106	52.9124	30	1.8	60	75

9th Reading collected on 21.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.0332	62.0407	30	7.5	250	
Pond A	54.0142	54.0180	30	3.8	127	49
Pond B	50.0016	50.0027	30	1.1	37	85
Pond C	54.0109	54.0139	30	3	100	60
Pond D	49.7057	49.7065	30	0.8	27	89
Pond E	51.5064	51.5076	30	1.2	40	84
Pond F	47.5027	47.5032	30	0.5	17	93
Pond G	52.9081	52.9100	30	1.9	63	75
Pond H	53.0306	53.0326	30	2	67	73

10th Reading collected on 23.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.5532	63.5606	30	7.4	247	
Pond A	55.2726	55.2765	30	3.9	130	47
Pond B	51.0614	51.0625	30	1.1	37	85
Pond C	55.1398	55.1429	30	3.1	103	58

Pond D	50.0159	50.0167	30	0.8	27	89
Pond E	52.0059	52.0071	30	1.2	40	84
Pond F	48.0016	48.0021	30	0.5	17	93
Pond G	54.1286	54.1306	30	2	67	73
Pond H	54.2605	54.2626	30	2.1	70	72

11th Reading collected on 27.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.1101	60.1171	30	7	233	
Pond A	55.2672	55.2702	30	3	100	57
Pond B	54.1163	54.1172	30	0.9	30	87
Pond C	55.1598	55.1623	30	2.5	83	64
Pond D	53.4159	53.4165	30	0.6	20	91
Pond E	54.2773	54.2783	30	1	33	86
Pond F	50.2654	50.2657	30	0.3	10	96
Pond G	55.4355	55.4370	30	1.5	50	79
Pond H	55.8486	55.8503	30	1.7	57	76

12th Reading collected on 30.12.13

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.0226	60.0299	30	7.3	243	
Pond A	55.2139	55.2174	30	3.5	117	52
Pond B	51.6514	51.6525	30	1.1	37	85
Pond C	55.0114	55.0142	30	2.8	93	62
Pond D	49.4057	49.4064	30	0.7	23	90
Pond E	52.1063	52.1074	30	1.1	37	85
Pond F	47.3014	47.3018	30	0.4	13	95
Pond G	53.5097	53.5115	30	1.8	60	75
Pond H	53.0109	53.0128	30	1.9	63	74

1st Reading collected on 02.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.2	2.2	300	

Pond A	250	5	7.7	4.4	165	45
Pond B	250	5	8.4	6.7	85	72
Pond C	250	5	8.2	5.6	130	57
Pond D	250	5	9.3	8.3	50	83
Pond E	250	5	9.3	7.5	90	70
Pond F	250	5	9.7	8.8	45	85
Pond G	250	5	8.0	5.9	105	65
Pond H	250	5	7.8	5.6	110	63

2nd Reading collected on 04.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.2	2.1	305	
Pond A	250	5	6.7	3.3	170	44
Pond B	250	5	9.8	8.0	90	70
Pond C	250	5	8.2	5.5	135	56
Pond D	250	5	9.9	8.9	50	84
Pond E	250	5	9.6	7.7	95	69
Pond F	250	5	9.8	8.9	45	85
Pond G	250	5	9.0	6.8	110	64
Pond H	250	5	8.9	6.6	115	62

3rd Reading collected on 07.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.5	285	
Pond A	250	5	4.9	1.6	165	42
Pond B	250	5	7.7	6.0	85	70
Pond C	250	5	5.3	2.5	140	51
Pond D	250	5	8.9	7.9	50	82
Pond E	250	5	7.2	5.3	95	67
Pond F	250	5	9	8.1	45	84
Pond G	250	5	6.9	4.5	120	58
Pond H	250	5	6.8	4.3	125	56

4th Reading collected on 09.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.0	2.1	295	
Pond A	250	5	7.4	4.2	160	46
Pond B	250	5	9.1	7.5	80	73
Pond C	250	5	8.2	5.7	125	58
Pond D	250	5	9.7	8.8	45	85
Pond E	250	5	9.5	7.8	85	71
Pond F	250	5	9.9	9.1	40	86
Pond G	250	5	8.7	6.7	100	66
Pond H	250	5	8.3	6.2	105	64

5th Reading collected on 11.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.3	2	315	
Pond A	250	5	6	2.2	190	40
Pond B	250	5	7.1	5	105	67
Pond C	250	5	6.6	3.2	170	46
Pond D	250	5	8.2	6.8	70	78
Pond E	250	5	7.9	5.7	110	65
Pond F	250	5	8.8	7.7	55	83
Pond G	250	5	7	4.1	145	54
Pond H	250	5	6.9	3.9	150	52

6th Reading collected on 13.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1.2	310	
Pond A	250	5	7.9	4.3	180	42
Pond B	250	5	9	7.1	95	69
Pond C	250	5	8.7	5.5	160	48
Pond D	250	5	9.6	8.3	65	79
Pond E	250	5	8.9	6.8	105	66
Pond F	250	5	9.8	8.8	50	84
Pond G	250	5	8.5	5.8	135	56

Pond H	250	5	8.4	5.6	140	55

7th Reading collected on 17.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.3	1.9	320	
Pond A	250	5	6.7	3.1	180	44
Pond B	250	5	9.2	7.3	95	70
Pond C	250	5	7.0	4.0	150	53
Pond D	250	5	9.4	8.3	55	83
Pond E	250	5	9.2	7.1	105	67
Pond F	250	5	9.6	8.6	50	84
Pond G	250	5	7.7	5.3	120	63
Pond H	250	5	7.5	5	125	61

8^{th} Reading collected on 19.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.5	280	
Pond A	250	5	7.9	5.3	130	54
Pond B	250	5	9.8	8.6	60	79
Pond C	250	5	8.4	6.3	105	63
Pond D	250	5	10.2	9.6	30	89
Pond E	250	5	10.0	8.7	65	77
Pond F	250	5	10.8	10.3	25	91
Pond G	250	5	9.1	7.6	75	73
Pond H	250	5	8.9	7.3	80	71

9th Reading collected on 21.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.3	290	
Pond A	250	5	6.7	3.7	150	48
Pond B	250	5	9.7	8.3	70	76
Pond C	250	5	7.8	5.5	115	60

Pond D	250	5	9.7	9	35	88
Pond E	250	5	9.7	8.1	80	72
Pond F	250	5	9.5	8.9	30	90
Pond G	250	5	8.5	6.8	85	71
Pond H	250	5	8.3	6.4	95	67

10th Reading collected on 23.12.13

Biochemical Oxygen Demand (BOD)						
Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	0.9	300	
Pond A	250	5	6.0	2.8	160	47
Pond B	250	5	7.4	5.8	80	73
Pond C	250	5	6.1	3.6	125	58
Pond D	250	5	8.8	8.0	40	87
Pond E	250	5	8.6	6.9	85	72
Pond F	250	5	9.9	9.2	35	88
Pond G	250	5	6.6	4.7	95	68
Pond H	250	5	6.6	4.6	100	67

11th Reading collected on 27.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	1.5	265	
Pond A	250	5	7.2	4.8	120	55
Pond B	250	5	9.9	8.9	50	81
Pond C	250	5	8.7	7.0	85	68
Pond D	250	5	9.9	9.4	25	91
Pond E	250	5	9.6	8.4	60	77
Pond F	250	5	10.5	10.1	20	92
Pond G	250	5	9.2	7.8	70	74
Pond H	250	5	9	7.5	75	72

12th Reading collected on 30.12.13

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.2	290	
Pond A	250	5	7.2	4.4	140	52
Pond B	250	5	9.6	8.3	65	78
Pond C	250	5	7.8	5.6	110	62
Pond D	250	5	9.8	9.2	30	90
Pond E	250	5	9.5	8.0	75	74
Pond F	250	5	10.2	9.6	30	90
Pond G	250	5	9.0	7.4	80	72
Pond H	250	5	8.8	7	90	69

1st Reading collected on 02.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

2nd Reading collected on 04.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 07.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 3 - 0	240	78
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

4th Reading collected on 09.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 2	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 0	93	92
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

5th Reading collected on 11.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 2	460	58
Pond C	3 - 3 - 2	460	58
Pond D	3 - 3 - 2	240	78
Pond E	3 - 3 - 2	460	58
Pond F	3 - 3 - 2	240	78
Pond G	3 - 3 - 2	460	58
Pond H	3 - 3 - 2	460	58

6th Reading collected on 13.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 1	460	58
Pond C	3 - 3 - 1	460	58
Pond D	3 - 3 - 0	240	78
Pond E	3 - 3 - 1	460	58
Pond F	3 - 3 - 0	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

7th Reading collected on 17.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 1	460	81
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

8th Reading collected on 19.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 1	150	86
Pond B	3 - 2 - 0	93	92
Pond C	3 - 1 - 2	120	89
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 0	93	92
Pond F	3 - 1 - 1	75	93
Pond G	3 - 1 - 2	120	89
Pond H	3 - 1 - 2	120	89

9th Reading collected on 21.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	

Pond A	3 - 3 - 1	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 1	150	86
Pond H	3 - 2 - 2	210	81

10th Reading collected on 23.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 0	240	90
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

11th Reading collected on 27.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 1 - 2	120	89
Pond B	3 - 1 - 1	75	93
Pond C	3 - 1 - 1	75	93
Pond D	3 - 0 - 2	64	94
Pond E	3 - 1 - 1	75	93
Pond F	3 - 1 - 0	43	96
Pond G	3 - 1 - 1	75	93
Pond H	3 - 1 - 1	75	93

12th Reading collected on 30.12.13

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 2 - 2	210	91
Pond E	3 - 3 - 0	240	90

Pond F	3 - 2 - 2	210	91
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

1st Reading collected on 02.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

2nd Reading collected on 04.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	3 - 0 - 0	23	85
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 0 - 2	64	57

3rd Reading collected on 07.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	150	38
Pond B	3 - 0 - 2	64	73
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 2	64	73
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 1 - 2	93	61

Pond H	3 - 1 - 2	93	61

4th Reading collected on 09.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

5th Reading collected on 11.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	460	
Pond A	3 - 3 - 2	460	0
Pond B	3 - 2 - 2	210	54
Pond C	3 - 3 - 2	460	0
Pond D	3 - 2 - 2	210	54
Pond E	3 - 2 - 2	210	54
Pond F	3 - 2 - 2	210	54
Pond G	3 - 2 - 2	210	54
Pond H	3 - 2 - 2	210	54

6th Reading collected on 13.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 2 - 1	150	0
Pond B	3 - 1 - 0	43	71
Pond C	3 - 1 - 1	75	50
Pond D	3 - 1 - 0	43	71
Pond E	3 - 1 - 0	43	71
Pond F	2 - 1 - 1	20	87
Pond G	3 - 0 - 2	64	57
Pond H	3 - 0 - 2	64	57

7th Reading collected on 17.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	150	38
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 1	39	84
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 2 - 0	93	61
Pond H	3 - 2 - 0	93	61

8th Reading collected on 19.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 0	43	71
Pond B	2 - 0 - 1	14	91
Pond C	3 - 1 - 0	43	71
Pond D	2 - 0 - 1	14	91
Pond E	3 - 0 - 0	23	85
Pond F	1 - 2 - 0	11	93
Pond G	3 - 0 - 1	39	74
Pond H	3 - 0 - 1	39	74

9th Reading collected on 21.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 1 - 0	15	90
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 0	15	90
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

10th Reading collected on 23.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 0 - 1	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

11th Reading collected on 27.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	2 - 2 - 1	28	88
Pond B	2 - 0 - 1	14	94
Pond C	2 - 2 - 1	28	88
Pond D	2 - 0 - 1	14	94
Pond E	2 - 1 - 0	15	94
Pond F	2 - 0 - 1	14	94
Pond G	3 - 0 - 0	23	90
Pond H	2 - 2 - 1	28	88

12th Reading collected on 30.12.13

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 0 - 0	23	90
Pond C	3 - 0 - 2	64	73
Pond D	3 - 0 - 0	23	90
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	20	92
Pond G	3 - 0 - 2	64	73
Pond H	3 - 0 - 2	64	73

Variation of pond parameters with time (Set 2, V3)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	06.01.14	2.1	8.3	9.3	8.7	9.8	9.3	9.9	9.1	9.0
Week 1	08.01.14	1.8	7.4	9.3	7.9	9.5	9.1	9.7	8.8	8.5
Week 1	10.01.14	1.7	7.6	9.1	7.7	9.3	8.8	9.5	8.5	8.2
Week 2	13.01.14	1.5	7.2	9	7.6	9.1	8.6	9.4	8.3	8.1
Week 2	15.01.14	2	8.3	9.4	8.5	9.6	9.3	9.9	9	8.8
Week 2	17.01.14	1.9	7.7	9.4	8.0	9.6	9.2	9.8	8.9	8.7
Week 3	20.01.14	2.6	8.2	10.0	9.1	10.2	9.7	10.4	9.4	9.4
Week 3	22.01.14	2.5	8.2	9.6	9	10	9.5	10.3	9.3	9.2
Week 3	24.01.14	2.5	8.3	9.9	9.1	10.1	9.6	10.3	9.4	9.3
Week 4	26.01.14	2.4	8.2	9.6	8.9	9.9	9.5	10.2	9.3	9.1
Week 4	28.01.14	2.2	7.7	9.6	8.7	9.8	9.4	10	9.2	9.1
Week 4	30.01.14	2.7	8.3	10.0	9.2	10.4	9.8	10.6	9.5	9.4

Variation of pond parameters with time (Set 2, V3)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	06.01.14	25.2	30.6	34.1	31.2	34.3	33.7	34.6	33.1	32.7
Week 1	08.01.14	25.1	31.9	34.9	32.8	35.3	35	35.6	34.5	34.3
Week 1	10.01.14	25.1	33.5	35.6	34	36	35.4	36.2	34.7	34.5
Week 1	13.01.14	25.2	34	35.5	34.4	36.5	35	37.1	34.7	34.6
Week 2	15.01.14	25.1	32	34.2	32.3	34.7	34.1	34.8	33.6	33.3
Week 2	17.01.14	25.1	32.5	34.7	32.6	34.8	34.4	35.3	34	33.8
Week 2	20.01.14	26.4	30	32.1	30.4	32.6	31.3	34.4	31.3	31
Week 3	22.01.14	25.9	30.2	32.6	31	32.9	32.3	34.7	32	31.8
Week 3	24.01.14	25.9	30.1	32.6	30.8	32.8	32	34.6	31.3	31
Week 3	26.01.14	25.1	30.7	32.7	31.2	33.2	32.5	33.7	31.9	31.7
Week 3	28.01.14	25.2	30.5	33.5	31.4	33.7	33.2	34.5	32.5	32.3
Week 4	30.01.14	25.9	27.7	30.6	28.1	30.7	30.4	32.3	29.2	28.9

Variation of pond parameters with time (Set 2, V3)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	06.01.14	7.6	7.8	9.5	7.9	9.9	9.1	10.3	8.3	8.2
Week 1	08.01.14	6.6	8.6	10.2	8.8	10.5	9.9	10.8	9.1	9
Week 1	10.01.14	6.5	8.7	10.4	8.9	10.8	10.1	11.1	9.3	9.2
Week 1	13.01.14	6.5	9	10.6	9.1	11	10.3	11.3	9.4	9.3
Week 2	15.01.14	7.5	7.9	9.7	8	10.1	9.2	10.4	8.5	8.3
Week 2	17.01.14	6.8	7.9	10	8.1	10.2	9.6	10.5	8.7	8.5

Week 2	20.01.14	6.9	6.9	8.3	7.3	8.6	8.3	9	8.1	7.9
Week 3	22.01.14	7.1	7.5	8.6	7.7	9	8.4	9.3	7.9	7.8
Week 3	24.01.14	7.1	7.1	8.2	7.5	8.8	8	9.2	7.9	7.7
Week 3	26.01.14	7.2	7.7	8.9	7.9	9.2	8.6	9.5	8.1	7.9
Week 3	28.01.14	7.5	7.9	9.1	8	9.5	8.7	9.9	8.2	8
Week 4	30.01.14	6.7	6.7	8.2	7.1	8.5	8.2	8.8	7.8	7.6

Variation of pond algae concentration with time (Set 2, V_3)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	06.01.14	111	169	371	199	414	315	472	271	240
Week 1	08.01.14	112	201	412	223	444	380	523	300	259
Week 1	10.01.14	111	213	424	243	456	388	533	309	261
Week 1	13.01.14	100	243	478	265	511	385	562	336	305
Week 2	15.01.14	111	180	381	210	424	325	482	281	249
Week 2	17.01.14	111	191	392	214	424	347	503	280	249
Week 2	20.01.14	114	146	322	158	342	249	406	199	189
Week 3	22.01.14	123	167	340	168	373	292	448	230	210
Week 3	24.01.14	123	157	330	160	352	271	428	220	199
Week 3	26.01.14	114	176	351	169	383	302	459	240	218
Week 3	28.01.14	113	179	361	179	393	312	469	251	230
Week 4	30.01.14	111	145	301	148	319	229	387	191	179

1st Reading collected on 06.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	59.3326	59.3398	30	7.2	240	
Pond A	54.111	54.1147	30	3.7	123	49
Pond B	49.1115	49.1125	30	1	33	86
Pond C	55.7206	55.7236	30	3	100	58
Pond D	49.9062	49.9069	30	0.7	23	90
Pond E	50.5058	50.5069	30	1.1	37	85
Pond F	46.9028	46.9032	30	0.4	13	94
Pond G	52.5091	52.5111	30	2	67	72
Pond H	52.8413	52.8434	30	2.1	70	71

2nd Reading collected on 08.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.0226	58.0294	30	6.8	227	
Pond A	54.2139	54.2170	30	3.1	103	54
Pond B	47.6514	47.6523	30	0.9	30	87
Pond C	53.0114	53.0139	30	2.5	83	63
Pond D	46.4057	46.4063	30	0.6	20	91
Pond E	49.1063	49.1073	30	1	33	85
Pond F	45.3014	45.3017	30	0.3	10	96
Pond G	51.5097	51.5113	30	1.6	53	76
Pond H	51.0109	51.0126	30	1.7	57	75

3rd Reading collected on 10.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.1124	58.1194	30	7	233	
Pond A	54.2145	54.2176	30	3.1	103	56
Pond B	47.0063	47.0072	30	0.9	30	87
Pond C	52.0212	52.0237	30	2.5	83	64
Pond D	46.4048	46.4054	30	0.6	20	91
Pond E	49.6513	49.6523	30	1	33	86
Pond F	44.4013	44.4016	30	0.3	10	96
Pond G	51.5093	51.5108	30	1.5	50	79
Pond H	51.8106	51.8123	30	1.7	57	76

4th Reading collected on 13.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.1102	58.1174	30	7.2	240	
Pond A	54.2672	54.2702	30	3	100	58
Pond B	47.1163	47.1172	30	0.9	30	88
Pond C	52.1598	52.1623	30	2.5	83	65
Pond D	46.4159	46.4165	30	0.6	20	92
Pond E	49.2773	49.2783	30	1	33	86
Pond F	44.2654	44.2657	30	0.3	10	96

Pond G	51.4355	51.4370	30	1.5	50	79
Pond H	51.8486	51.8503	30	1.7	57	76

5th Reading collected on 15.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	59.1532	59.1606	30	7.4	247	
Pond A	54.8728	54.8765	30	3.7	123	50
Pond B	49.0515	49.0525	30	1	33	86
Pond C	55.8398	55.8428	30	3	100	59
Pond D	49.0159	49.0166	30	0.7	23	91
Pond E	50.2059	50.207	30	1.1	37	85
Pond F	46.7018	46.7022	30	0.4	13	95
Pond G	52.0286	52.0305	30	1.9	63	74
Pond H	52.2605	52.2625	30	2	67	73

6th Reading collected on 17.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.0332	58.0407	30	7.5	250	
Pond A	54.8144	54.8180	30	3.6	120	52
Pond B	48.9017	48.9027	30	1	33	87
Pond C	55.1110	55.1139	30	2.9	97	61
Pond D	48.6058	48.6065	30	0.7	23	91
Pond E	50.5066	50.5077	30	1.1	37	85
Pond F	46.5028	46.5032	30	0.4	13	95
Pond G	51.9082	51.9100	30	1.8	60	76
Pond H	52.0307	52.0326	30	1.9	63	75

7th Reading collected on 20.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.4309	63.4393	30	8.4	280	
Pond A	56.3631	56.3679	30	4.8	160	43
Pond B	52.9206	52.9224	30	1.8	60	79
Pond C	56.1202	56.1244	30	4.2	140	50
Pond D	51.7052	51.7066	30	1.4	47	83

Pond E	53.9153	53.9173	30	2	67	76
Pond F	50.7022	50.7032	30	1	33	88
Pond G	55.8086	55.8117	30	3.1	103	63
Pond H	56.1485	56.1520	30	3.5	117	58

8th Reading collected on 22.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.1917	60.1996	30	7.9	263	
Pond A	55.8133	55.8176	30	4.3	143	46
Pond B	52.5513	52.5527	30	1.4	47	82
Pond C	55.9101	55.9137	30	3.6	120	54
Pond D	51.3046	51.3057	30	1.1	37	86
Pond E	54.0258	54.0272	30	1.4	47	82
Pond F	49.4006	49.4013	30	0.7	23	91
Pond G	55.4084	55.4110	30	2.6	87	67
Pond H	55.9098	55.9126	30	2.8	93	65

9th Reading collected on 24.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.3419	62.3501	30	8.2	273	
Pond A	56.2532	56.2578	30	4.6	153	44
Pond B	52.4252	52.4268	30	1.6	53	80
Pond C	56.3300	56.3339	30	3.9	130	52
Pond D	52.3151	52.3164	30	1.3	43	84
Pond E	53.7604	53.7621	30	1.7	57	79
Pond F	52.0623	52.0632	30	0.9	30	89
Pond G	55.1167	55.1196	30	2.9	97	65
Pond H	56.3492	56.3524	30	3.2	107	61

10th Reading collected on 26.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.443	60.4507	30	7.7	257	

Pond A	55.4735	55.4776	30	4.1	137	47
Pond B	52.0606	52.0618	30	1.2	40	84
Pond C	55.3411	55.3445	30	3.4	113	56
Pond D	51.0149	51.0159	30	1	33	87
Pond E	54.0157	54.0170	30	1.3	43	83
Pond F	49.0125	49.0131	30	0.6	20	92
Pond G	55.2292	55.2316	30	2.4	80	69
Pond H	55.2502	55.2528	30	2.6	87	66

11th Reading collected on 28.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	59.9326	59.9401	30	7.5	250	
Pond A	54.7442	54.7481	30	3.9	130	48
Pond B	50.1409	50.1420	30	1.1	37	85
Pond C	55.2201	55.2233	30	3.2	107	57
Pond D	50.2158	50.2166	30	0.8	27	89
Pond E	51.9061	51.9073	30	1.2	40	84
Pond F	47.7126	47.7131	30	0.5	17	93
Pond G	53.0192	53.0214	30	2.2	73	71
Pond H	53.1405	53.1429	30	2.4	80	68

12th Reading collected on 30.01.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.1409	64.1506	30	9.7	323	
Pond A	56.5722	56.5779	30	5.7	190	41
Pond B	53.5797	53.582	30	2.3	77	76
Pond C	56.7391	56.7441	30	5	167	48
Pond D	51.5148	51.5165	30	1.7	57	82
Pond E	54.6554	54.6578	30	2.4	80	75
Pond F	50.9035	50.9048	30	1.3	43	87
Pond G	55.5273	55.531	30	3.7	123	62
Pond H	56.7486	56.7529	30	4.3	143	56

1st Reading collected on 06.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.2	1.9	315	
Pond A	250	5	7.5	4.2	165	48
Pond B	250	5	9.1	7.5	80	75
Pond C	250	5	8.2	5.8	120	62
Pond D	250	5	9.7	8.8	45	86
Pond E	250	5	9.6	7.9	85	73
Pond F	250	5	9.9	9.1	40	87
Pond G	250	5	8.8	6.8	100	68
Pond H	250	5	8.4	6.3	105	67

2nd Reading collected on 08.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.3	295	
Pond A	250	5	7.1	4.4	135	54
Pond B	250	5	9.6	8.3	65	78
Pond C	250	5	7.9	5.8	105	64
Pond D	250	5	9.7	9	35	88
Pond E	250	5	9.4	8.0	70	76
Pond F	250	5	10.1	9.5	30	90
Pond G	250	5	8.9	7.3	80	73
Pond H	250	5	8.8	7.1	85	71

3rd Reading collected on 10.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1.7	285	
Pond A	250	5	7.9	5.3	130	54
Pond B	250	5	9.8	8.6	60	79
Pond C	250	5	8.2	6.3	95	67
Pond D	250	5	10.2	9.6	30	89
Pond E	250	5	10.0	8.7	65	77
Pond F	250	5	10.8	10.3	25	91

Pond G	250	5	9.1	7.6	75	74
Pond H	250	5	8.9	7.3	80	72

4th Reading collected on 13.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.6	1.1	275	
Pond A	250	5	7.2	4.8	120	56
Pond B	250	5	9.9	8.9	50	82
Pond C	250	5	8.7	7.0	85	69
Pond D	250	5	9.9	9.4	25	91
Pond E	250	5	9.6	8.4	60	78
Pond F	250	5	10.6	10.2	20	93
Pond G	250	5	9.2	7.8	70	75
Pond H	250	5	9	7.5	75	73

5th Reading collected on 15.01.14

Biochemical Oxygen Demand (BOD)						
Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1	310	
Pond A	250	5	6.1	2.9	160	48
Pond B	250	5	7.4	5.9	75	76
Pond C	250	5	6.2	3.9	115	63
Pond D	250	5	8.7	7.9	40	87
Pond E	250	5	8.6	7.0	80	74
Pond F	250	5	9.9	9.2	35	89
Pond G	250	5	6.6	4.8	90	71
Pond H	250	5	6.5	4.5	100	68

6th Reading collected on 17.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1.4	300	
Pond A	250	5	6.8	4.0	140	53
Pond B	250	5	9.8	8.4	70	77

Pond C	250	5	7.9	5.7	110	63
Pond D	250	5	9.6	8.9	35	88
Pond E	250	5	9.8	8.3	75	75
Pond F	250	5	9.4	8.8	30	90
Pond G	250	5	8.5	6.8	85	72
Pond H	250	5	8.5	6.7	90	70

7th Reading collected on 20.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	0.3	325	
Pond A	250	5	8.2	4.5	185	43
Pond B	250	5	9	7.1	95	71
Pond C	250	5	8.9	5.7	160	51
Pond D	250	5	9.7	8.5	60	82
Pond E	250	5	9	6.9	105	68
Pond F	250	5	9.9	8.9	50	85
Pond G	250	5	8.7	6.1	130	60
Pond H	250	5	8.5	5.8	135	58

8th Reading collected on 22.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.2	1.7	325	
Pond A	250	5	6.8	3.2	180	45
Pond B	250	5	9.1	7.3	90	72
Pond C	250	5	7.0	4.1	145	55
Pond D	250	5	9.4	8.3	55	83
Pond E	250	5	9.1	7.1	100	69
Pond F	250	5	9.5	8.5	50	85
Pond G	250	5	7.7	5.3	120	63
Pond H	250	5	7.5	5	125	62

9th Reading collected on 24.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.3	0.9	320	
Pond A	250	5	5.3	1.7	180	44
Pond B	250	5	9.2	7.4	90	72
Pond C	250	5	5.5	2.5	150	53
Pond D	250	5	9.3	8.2	55	83
Pond E	250	5	7.5	5.5	100	69
Pond F	250	5	9.4	8.4	50	84
Pond G	250	5	7.0	4.6	120	63
Pond H	250	5	6.8	4.3	125	61

10th Reading collected on 26.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.1	1.8	315	
Pond A	250	5	6.8	3.4	170	46
Pond B	250	5	9.8	8.1	85	73
Pond C	250	5	8.1	5.4	135	57
Pond D	250	5	9.8	8.8	50	84
Pond E	250	5	9.5	7.7	90	71
Pond F	250	5	9.7	8.8	45	86
Pond G	250	5	9.0	6.8	110	65
Pond H	250	5	8.9	6.6	115	63

11th Reading collected on 28.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.4	2.3	305	
Pond A	250	5	7.6	4.4	160	48
Pond B	250	5	8.5	6.9	80	74
Pond C	250	5	8.3	5.8	125	59
Pond D	250	5	9.3	8.4	45	85
Pond E	250	5	9.4	7.7	85	72
Pond F	250	5	9.8	9.0	40	87

Pond G	250	5	8.0	6.0	100	67
Pond H	250	5	7.9	5.8	105	66

12th Reading collected on 30.01.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.4	1.8	330	
Pond A	250	5	6	2.2	190	42
Pond B	250	5	7.1	5	105	68
Pond C	250	5	6.6	3.2	170	48
Pond D	250	5	8.2	6.8	70	79
Pond E	250	5	7.9	5.7	110	67
Pond F	250	5	8.8	7.7	55	83
Pond G	250	5	7.8	5	140	58
Pond H	250	5	7.8	4.9	145	56

1st Reading collected on 06.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 1 - 2	120	89
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

2nd Reading collected on 08.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92

Pond G	3 - 2 - 2	210	81
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 10.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 1	75	93
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

4th Reading collected on 13.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 1 - 1	75	93
Pond E	3 - 2 - 2	210	81
Pond F	3 - 0 - 2	64	94
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

5th Reading collected on 15.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

6th Reading collected on 17.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

7th Reading collected on 20.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 3 - 0	240	78
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

8th Reading collected on 22.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 1	120	43
Pond B	3 - 1 - 0	43	80
Pond C	3 - 2 - 0	93	56
Pond D	2 - 2 - 1	28	87
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 1 - 0	43	80
Pond H	3 - 1 - 0	43	80

9th Reading collected on 24.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 3 - 1	460	0
Pond B	3 - 1 - 2	120	74
Pond C	3 - 2 - 2	210	54
Pond D	3 - 0 - 2	64	86
Pond E	3 - 1 - 2	120	74
Pond F	3 - 0 - 2	64	86
Pond G	3 - 1 - 2	120	74
Pond H	3 - 1 - 2	120	74

10th Reading collected on 26.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 1	150	86
Pond H	3 - 3 - 0	240	78

11th Reading collected on 28.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 1	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

12th Reading collected on 30.01.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)

Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

1st Reading collected on 06.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 2 - 0	93	61
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

2nd Reading collected on 08.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 0 - 2	64	73
Pond B	3 - 0 - 1	39	84
Pond C	3 - 2 - 0	93	61
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

3rd Reading collected on 10.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 1 - 0	43	82
Pond B	2 - 2 - 1	28	88

Pond C	3 - 1 - 0	43	82
Pond D	3 - 0 - 0	23	90
Pond E	2 - 2 - 1	28	88
Pond F	2 - 2 - 0	21	91
Pond G	3 - 0 - 1	39	84
Pond H	3 - 1 - 0	43	82

4th Reading collected on 13.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	240	
Pond A	3 - 0 - 0	23	90
Pond B	2 - 1 - 1	20	92
Pond C	3 - 0 - 0	23	90
Pond D	2 - 1 - 1	20	92
Pond E	3 - 0 - 0	23	90
Pond F	2 - 1 - 0	15	94
Pond G	3 - 0 - 0	23	90
Pond H	3 - 0 - 0	23	90

5th Reading collected on 15.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 1	75	69
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

6th Reading collected on 17.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	43	71
Pond D	2 - 1 - 1	20	87

Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

7th Reading collected on 20.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 3 - 0	240	0
Pond B	3 - 0 - 2	64	73
Pond C	3 - 1 - 2	120	50
Pond D	3 - 1 - 0	43	82
Pond E	3 - 1 - 1	75	69
Pond F	3 - 0 - 1	39	84
Pond G	3 - 2 - 0	93	61
Pond H	3 - 2 - 0	93	61

8th Reading collected on 22.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 1 - 1	75	38
Pond B	3 - 0 - 0	23	81
Pond C	3 - 1 - 0	43	64
Pond D	2 - 1 - 1	20	83
Pond E	2 - 2 - 1	28	77
Pond F	2 - 0 - 1	14	88
Pond G	3 - 1 - 0	28	77
Pond H	3 - 0 - 1	39	68

9th Reading collected on 24.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 1	150	29
Pond B	3 - 1 - 0	43	80
Pond C	3 - 2 - 0	93	56
Pond D	3 - 0 - 1	39	81
Pond E	3 - 0 - 2	64	70
Pond F	2 - 2 - 1	28	87

Pond G	3 - 0 - 2	64	70
Pond H	3 - 1 - 1	75	64

10th Reading collected on 26.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 2 - 0	21	86
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 0 - 1	39	74
Pond H	3 - 1 - 0	43	71

11th Reading collected on 28.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 0 - 1	39	74
Pond H	3 - 1 - 0	43	71

12th Reading collected on 30.01.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 3 - 1	460	0
Pond B	3 - 2 - 1	150	67
Pond C	3 - 3 - 0	240	48
Pond D	3 - 1 - 2	120	74
Pond E	3 - 2 - 1	150	67
Pond F	3 - 2 - 0	93	80
Pond G	3 - 3 - 0	240	48
Pond H	3 - 3 - 0	240	48

Variation of pond parameters with time (Set 3, V1)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	01.02.14	2.4	8.5	10.1	9.3	10.3	9.8	10.5	9.6	9.5
Week 1	03.02.14	1.6	7.8	9.3	7.9	9.5	9	9.7	8.7	8.4
Week 1	05.02.14	1.8	7.9	9.6	8.2	9.8	9.4	10	9.1	8.9
Week 2	07.02.14	1.7	7.6	9.5	8.1	9.7	9.3	9.9	9	8.7
Week 2	11.02.14	2.1	7.9	9.8	8.9	10	9.6	10.2	9.4	9.3
Week 2	13.02.14	1.5	7.4	9.2	7.8	9.3	8.8	9.6	8.5	8.3
Week 3	15.02.14	2.7	8.5	10.2	9.4	10.6	10	11	9.7	9.6
Week 3	17.02.14	1.9	8.5	9.6	8.7	9.8	9.5	10.1	9.2	9.0
Week 3	19.02.14	2.0	8.5	9.5	8.9	10	9.5	10.1	9.3	9.2
Week 4	21.02.14	2.2	8.4	9.8	9.1	10.1	9.7	10.4	9.5	9.3
Week 4	23.02.14	2.5	8.4	10.2	9.3	10.4	9.9	10.6	9.6	9.6
Week 4	25.02.14	2.3	8.4	9.8	9.2	10.2	9.7	10.5	9.5	9.4

Variation of pond parameters with time (Set 3, V1)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	01.02.14	25.9	31.1	33.6	31.8	33.8	33	34.4	32.3	32
Week 1	03.02.14	25.1	34.5	36.6	35	37	36.4	37.2	35.7	35.5
Week 1	05.02.14	25.1	33.5	35.7	33.6	35.8	35.4	36.3	35	34.8
Week 1	07.02.14	25.1	32.9	35.9	33.8	36.3	36	36.6	35.5	35.3
Week 2	11.02.14	25.9	31.5	34.5	32.4	34.7	34.2	35.5	33.5	33.3
Week 2	13.02.14	24.8	35	36.5	35.4	37.5	36	38.1	35.7	35.6
Week 2	15.02.14	25.2	28.7	31.6	29.1	31.7	31.4	33.2	30.2	29.9
Week 3	17.02.14	25.2	33	35.2	33.3	35.7	35.1	35.8	34.6	34.3
Week 3	19.02.14	25.8	31.6	35.1	32.2	35.3	34.7	35.6	34.1	33.7
Week 3	21.02.14	25.9	31.7	33.7	32.2	34.2	33.5	34.7	32.9	32.7
Week 3	23.02.14	25.1	31	33.1	31.4	33.6	32.3	33.2	32.3	32
Week 4	25.02.14	25.2	31.2	33.6	32	33.9	33.3	34.5	33	32.8

Variation of pond parameters with time (Set 3, V1)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	01.02.14	7.1	7.3	8.4	7.7	9.0	8.2	9.4	8.1	7.9
Week 1	03.02.14	6.6	8.9	10.6	9.1	11.0	10.3	11.3	9.5	9.4
Week 1	05.02.14	6.8	8.1	10.2	8.3	10.4	9.8	10.7	8.9	8.7
Week 1	07.02.14	6.7	8.8	10.4	9.0	10.7	10.1	11.0	9.3	9.2
Week 2	11.02.14	7.4	8.1	9.3	8.2	9.7	8.9	10.1	8.4	8.2
Week 2	13.02.14	6.5	9.2	10.8	9.3	11.2	10.5	11.5	9.6	9.5
Week 2	15.02.14	6.8	6.9	8.4	7.3	8.7	8.4	9.0	7.9	7.8

Week 3	17.02.14	7.4	8.1	9.9	8.2	10.3	9.4	10.6	8.7	8.5
Week 3	19.02.14	7.8	8.0	9.7	8.1	10.1	9.3	10.5	8.5	8.4
Week 3	21.02.14	7.2	7.9	9.1	8.1	9.4	8.8	9.7	8.3	8.1
Week 3	23.02.14	7.0	7.1	8.5	7.5	8.8	8.1	9.2	7.7	7.6
Week 4	25.02.14	7.2	7.7	8.8	7.9	9.2	8.6	9.5	8.1	8.0

Variation of pond algae concentration with time (Set 3, V_1)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (μg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.02.14	133	158	386	170	427	332	473	221	201
Week 1	03.02.14	102	254	511	276	567	436	606	356	325
Week 1	05.02.14	124	223	470	255	512	403	577	313	293
Week 1	07.02.14	102	243	490	264	534	425	597	334	315
Week 2	11.02.14	145	189	439	223	481	373	526	272	252
Week 2	13.02.14	102	264	521	286	575	446	616	366	325
Week 2	15.02.14	123	146	354	148	395	310	429	199	179
Week 3	17.02.14	134	209	459	243	502	393	556	303	283
Week 3	19.02.14	143	199	449	233	492	383	546	283	262
Week 3	21.02.14	142	179	429	202	471	362	515	252	231
Week 3	23.02.14	122	146	364	158	405	320	439	209	189
Week 4	25.02.14	136	168	408	192	449	354	495	242	221

1st Reading collected on 01.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.7516	62.7593	30	7.7	257	
Pond A	56.2536	56.2578	30	4.2	140	45
Pond B	52.8758	52.8771	30	1.3	43	83
Pond C	56.3304	56.3339	30	3.5	117	55
Pond D	51.3153	51.3164	30	1.1	37	86
Pond E	53.7607	53.7621	30	1.4	47	82
Pond F	49.0625	49.0632	30	0.7	23	91
Pond G	55.7970	55.7996	30	2.6	87	66
Pond H	56.6496	56.6524	30	2.8	93	64

2nd Reading collected on 03.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.6719	58.6794	30	7.5	250	
Pond A	56.2145	56.2177	30	3.2	107	57
Pond B	48.0063	48.0071	30	0.8	27	89
Pond C	53.0223	53.0247	30	2.4	80	68
Pond D	46.4049	46.4054	30	0.5	17	93
Pond E	49.8515	49.8524	30	0.9	30	88
Pond F	45.4013	45.4016	30	0.3	10	96
Pond G	52.5091	52.5107	30	1.6	53	79
Pond H	52.8106	52.8123	30	1.7	57	77

3rd Reading collected on 05.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	59.0335	59.0412	30	7.7	257	
Pond A	55.8145	55.8180	30	3.5	117	55
Pond B	49.9017	49.9027	30	1	33	87
Pond C	56.1212	56.1239	30	2.7	90	65
Pond D	49.6058	49.6065	30	0.7	23	91
Pond E	51.5066	51.5077	30	1.1	37	86
Pond F	47.5031	47.5035	30	0.4	13	95
Pond G	52.9082	52.9100	30	1.8	60	77
Pond H	53.0307	53.0326	30	1.9	63	75

4th Reading collected on 07.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	59.8226	59.8294	30	6.8	227	
Pond A	56.9138	56.9168	30	3	100	56
Pond B	47.8516	47.8524	30	0.8	27	88
Pond C	54.0114	54.0137	30	2.3	77	66
Pond D	46.8058	46.8063	30	0.5	17	93
Pond E	49.0063	49.0072	30	0.9	30	87
Pond F	45.5014	45.5017	30	0.3	10	96

Pond G	52.5098	52.5113	30	1.5	50	78
Pond H	52.9110	52.9126	30	1.6	53	76

5th Reading collected on 11.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.9324	60.9401	30	7.7	257	
Pond A	56.7443	56.7481	30	3.8	127	51
Pond B	51.1409	51.1420	30	1.1	37	86
Pond C	57.2201	57.2233	30	3.2	107	58
Pond D	50.2158	50.2166	30	0.8	27	90
Pond E	52.9061	52.9073	30	1.2	40	84
Pond F	48.7126	48.7131	30	0.5	17	94
Pond G	54.0191	54.0214	30	2.3	77	70
Pond H	54.1405	54.1429	30	2.4	80	69

6th Reading collected on 13.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	58.4105	58.4181	30	7.6	253	
Pond A	56.2772	56.2801	30	2.9	97	62
Pond B	49.1263	49.1271	30	0.8	27	89
Pond C	53.4598	53.4622	30	2.4	80	68
Pond D	48.4159	48.4164	30	0.5	17	93
Pond E	50.2773	50.2782	30	0.9	30	88
Pond F	46.2654	46.2657	30	0.3	10	96
Pond G	52.4355	52.4369	30	1.4	47	82
Pond H	52.8486	52.8502	30	1.6	53	79

7th Reading collected on 15.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	65.1390	65.1481	30	9.1	303	
Pond A	57.5422	57.5474	30	5.2	173	43
Pond B	53.5797	53.5818	30	2.1	70	77

Pond C	56.7391	56.7436	30	4.5	150	51
Pond D	51.5148	51.5163	30	1.5	50	84
Pond E	54.6554	54.6575	30	2.1	70	77
Pond F	48.9035	48.9046	30	1.1	37	88
Pond G	55.5273	55.5306	30	3.3	110	64
Pond H	56.7486	56.7523	30	3.7	123	59

8th Reading collected on 17.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	59.4535	59.4609	30	7.4	247	
Pond A	55.9829	55.9863	30	3.4	113	54
Pond B	50.2516	50.2526	30	1	33	86
Pond C	56.8399	56.8427	30	2.8	93	62
Pond D	49.8157	49.8164	30	0.7	23	91
Pond E	51.2159	51.2170	30	1.1	37	85
Pond F	47.7218	47.7222	30	0.4	13	95
Pond G	53.0287	53.0305	30	1.8	60	76
Pond H	53.2606	53.2625	30	1.9	63	74

9th Reading collected on 19.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.3329	60.3405	30	7.6	253	
Pond A	56.1111	56.1147	30	3.6	120	53
Pond B	51.1115	51.1125	30	1	33	87
Pond C	57.7306	57.7336	30	3	100	61
Pond D	50.9061	50.9069	30	0.8	27	89
Pond E	52.5057	52.5069	30	1.2	40	84
Pond F	48.9027	48.9032	30	0.5	17	93
Pond G	54.0092	54.0111	30	1.9	63	75
Pond H	54.8414	54.8434	30	2	67	74

10th Reading collected on 21.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	60.9729	60.9807	30	7.8	260	
Pond A	56.4735	56.4775	30	4	133	49
Pond B	52.0606	52.0618	30	1.2	40	85
Pond C	57.3412	57.3445	30	3.3	110	58
Pond D	51.015	51.0159	30	0.9	30	88
Pond E	53.6157	53.6170	30	1.3	43	83
Pond F	49.0325	49.0331	30	0.6	20	92
Pond G	55.1492	55.1516	30	2.4	80	69
Pond H	55.7503	55.7528	30	2.5	83	68

11th Reading collected on 23.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.1311	63.1396	30	8.5	283	
Pond A	56.1331	56.1379	30	4.8	160	44
Pond B	52.7206	52.7224	30	1.8	60	79
Pond C	56.6203	56.6244	30	4.1	137	52
Pond D	51.4053	51.4066	30	1.3	43	85
Pond E	53.6154	53.6173	30	1.9	63	78
Pond F	49.7022	49.7032	30	1	33	88
Pond G	55.2087	55.2117	30	3	100	65
Pond H	56.4486	56.4520	30	3.4	113	60

12th Reading collected on 25.02.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.1917	62.1996	30	7.9	263	
Pond A	57.4434	57.4476	30	4.2	140	47
Pond B	54.5514	54.5527	30	1.3	43	84
Pond C	56.9102	56.9137	30	3.5	117	56
Pond D	52.3048	52.3058	30	1	33	87
Pond E	54.0259	54.0273	30	1.4	47	82
Pond F	50.4008	50.4014	30	0.6	20	92
Pond G	55.8085	55.8110	30	2.5	83	68

Pond H	56.0099	56.0126	30	2.7	90	66

1st Reading collected on 01.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.5	1.0	325	
Pond A	250	5	5.3	1.7	180	45
Pond B	250	5	9.2	7.4	90	72
Pond C	250	5	5.6	2.7	145	55
Pond D	250	5	9.2	8.1	55	83
Pond E	250	5	7.5	5.5	100	69
Pond F	250	5	9.3	8.3	50	85
Pond G	250	5	7.0	4.6	120	63
Pond H	250	5	6.8	4.3	125	62

2nd Reading collected on 03.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.6	275	
Pond A	250	5	8.0	5.6	120	56
Pond B	250	5	9.9	8.9	50	82
Pond C	250	5	8.2	6.4	90	67
Pond D	250	5	10.3	9.8	25	91
Pond E	250	5	9.9	8.8	55	80
Pond F	250	5	10.7	10.3	20	93
Pond G	250	5	9.3	7.9	70	75
Pond H	250	5	8.8	7.3	75	73

3rd Reading collected on 05.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1.5	295	
Pond A	250	5	6.9	4.3	130	56
Pond B	250	5	9.3	8.1	60	80
Pond C	250	5	8.0	5.9	105	64

Pond D	250	5	9.4	8.8	30	90
Pond E	250	5	9.3	7.9	70	76
Pond F	250	5	9.5	9.0	25	92
Pond G	250	5	8.6	7	80	73
Pond H	250	5	8.5	6.8	85	71

4th Reading collected on 07.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.3	1.6	285	
Pond A	250	5	7.0	4.5	125	56
Pond B	250	5	9.4	8.3	55	81
Pond C	250	5	7.8	5.9	95	67
Pond D	250	5	9.6	9	30	89
Pond E	250	5	9.2	8.0	60	79
Pond F	250	5	10.2	9.7	25	91
Pond G	250	5	9.0	7.5	75	74
Pond H	250	5	8.9	7.3	80	72

5th Reading collected on 11.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1.2	310	
Pond A	250	5	7.5	4.4	155	50
Pond B	250	5	8.5	6.9	80	74
Pond C	250	5	7.8	5.4	120	61
Pond D	250	5	9.2	8.4	40	87
Pond E	250	5	8.3	6.6	85	73
Pond F	250	5	9.8	9.0	40	87
Pond G	250	5	8.1	6.2	95	69
Pond H	250	5	7.9	5.9	100	68

6th Reading collected on 13.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.3	280	
Pond A	250	5	7.2	4.9	115	59
Pond B	250	5	10	9.5	25	91
Pond C	250	5	8.8	7.2	80	71
Pond D	250	5	10.2	9.8	20	93
Pond E	250	5	9.8	8.9	45	84
Pond F	250	5	10.7	10.4	15	95
Pond G	250	5	9.1	7.8	65	77
Pond H	250	5	9	7.6	70	75

7th Reading collected on 15.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.4	1.3	355	
Pond A	250	5	6.3	2.3	200	44
Pond B	250	5	7.2	5.1	105	70
Pond C	250	5	6.7	3.1	180	49
Pond D	250	5	8.2	6.7	75	79
Pond E	250	5	7.2	4.9	115	68
Pond F	250	5	8.9	7.7	60	83
Pond G	250	5	7.8	5	140	61
Pond H	250	5	7.7	4.8	145	59

8th Reading collected on 17.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	1	290	
Pond A	250	5	6.7	4.1	130	55
Pond B	250	5	7.9	6.6	65	78
Pond C	250	5	6.9	4.8	105	64
Pond D	250	5	8.9	8.3	30	90
Pond E	250	5	7.8	6.4	70	76
Pond F	250	5	9.7	9.2	25	91
Pond G	250	5	6.7	5.1	80	72

Pond H	250	5	6.5	4.8	85	71

9th Reading collected on 19.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.5	1.8	285	
Pond A	250	5	7.6	4.9	135	53
Pond B	250	5	9.4	8.0	70	75
Pond C	250	5	8.1	6.0	105	63
Pond D	250	5	9.6	8.9	35	88
Pond E	250	5	9.4	7.9	75	74
Pond F	250	5	9.8	9.2	30	89
Pond G	250	5	8.9	7.2	85	70
Pond H	250	5	8.6	6.8	90	68

10th Reading collected on 21.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1	320	
Pond A	250	5	6.8	3.4	170	47
Pond B	250	5	9.8	8.1	85	73
Pond C	250	5	8.1	5.4	135	58
Pond D	250	5	9.8	8.8	50	84
Pond E	250	5	9.5	7.7	90	72
Pond F	250	5	9.4	8.5	45	86
Pond G	250	5	9.0	6.8	110	66
Pond H	250	5	8.9	6.6	115	64

11th Reading collected on 23.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7	0.6	320	
Pond A	250	5	8	4.4	180	44
Pond B	250	5	9.1	7.3	90	72
Pond C	250	5	8.4	5.5	145	55
Pond D	250	5	9.6	8.5	55	83
Pond E	250	5	9.0	7.0	100	69
Pond F	250	5	9.7	8.7	50	84
Pond G	250	5	8.9	6.5	120	63
Pond H	250	5	8.6	6.1	125	61

12th Reading collected on 25.02.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.1	305	
Pond A	250	5	7.0	3.7	165	46
Pond B	250	5	9.3	7.7	80	74
Pond C	250	5	7.3	4.7	130	57
Pond D	250	5	9.4	8.4	50	84
Pond E	250	5	9.2	7.4	90	70
Pond F	250	5	9.5	8.6	45	85
Pond G	250	5	7.9	5.7	110	64
Pond H	250	5	7.7	5.4	115	62

1st Reading collected on 01.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 3 - 1	460	0
Pond B	3 - 1 - 2	120	74
Pond C	3 - 2 - 2	210	54
Pond D	3 - 0 - 2	64	86
Pond E	3 - 1 - 2	120	74
Pond F	3 - 0 - 2	64	86
Pond G	3 - 1 - 2	120	74
Pond H	3 - 1 - 2	120	74

2nd Reading collected on 03.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 1	75	93
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 05.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

4th Reading collected on 07.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 3 - 0	240	78

5th Reading collected on 11.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 1	150	86

Pond C	3 - 3 - 1	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

6th Reading collected on 13.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 1 - 2	120	89
Pond C	3 - 2 - 2	210	81
Pond D	3 - 0 - 2	64	94
Pond E	3 - 2 - 1	150	86
Pond F	3 - 1 - 0	43	96
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

7th Reading collected on 15.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

8th Reading collected on 17.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 2 - 1	150	86
Pond C	3 - 2 - 2	210	81
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81

Pond H	3 - 2 - 2	210	81

9th Reading collected on 19.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 0	240	78
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 1 - 2	120	89
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

10th Reading collected on 21.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58.2
Pond B	3 - 2 - 1	150	86.4
Pond C	3 - 3 - 1	460	58.2
Pond D	3 - 2 - 1	150	86.4
Pond E	3 - 2 - 1	150	86.4
Pond F	3 - 2 - 0	93	91.5
Pond G	3 - 2 - 1	150	86.4
Pond H	3 - 3 - 0	240	78.2

11th Reading collected on 23.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 3 - 0	240	78
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

12th Reading collected on 25.02.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 1	120	43
Pond B	3 - 1 - 0	43	80
Pond C	3 - 2 - 0	93	56
Pond D	2 - 2 - 1	28	87
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 1 - 0	43	80
Pond H	3 - 1 - 0	43	80

1st Reading collected on 01.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 1	150	29
Pond B	3 - 1 - 0	43	80
Pond C	3 - 2 - 0	93	56
Pond D	3 - 0 - 1	39	81
Pond E	3 - 0 - 2	64	70
Pond F	2 - 2 - 1	28	87
Pond G	3 - 0 - 2	64	70
Pond H	3 - 1 - 1	75	64

2nd Reading collected on 03.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 1 - 0	43	82
Pond B	2 - 2 - 1	28	88
Pond C	3 - 1 - 0	43	82
Pond D	3 - 0 - 0	23	90
Pond E	2 - 2 - 1	28	88
Pond F	2 - 2 - 0	21	91
Pond G	3 - 0 - 1	39	84
Pond H	3 - 1 - 0	43	82

3rd Reading collected on 05.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81

Pond C	3 - 0 - 2	43	71
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

4th Reading collected on 07.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 0 - 2	64	73
Pond B	3 - 0 - 1	39	84
Pond C	3 - 0 - 2	64	73
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 0 - 2	64	73

5th Reading collected on 11.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 0 - 1	39	74
Pond H	3 - 1 - 0	43	71

6th Reading collected on 13.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	240	
Pond A	3 - 0 - 1	39	84
Pond B	2 - 1 - 1	20	92
Pond C	3 - 0 - 1	39	84
Pond D	2 - 1 - 0	15	94
Pond E	3 - 0 - 0	23	90
Pond F	1 - 2 - 0	11	95
Pond G	3 - 0 - 1	39	84

Pond H	3 - 0 - 1	39	84

7th Reading collected on 15.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 1	460	
Pond A	3 - 3 - 1	460	0
Pond B	3 - 2 - 1	150	67
Pond C	3 - 3 - 0	240	48
Pond D	3 - 1 - 2	120	74
Pond E	3 - 2 - 1	150	67
Pond F	3 - 2 - 0	93	80
Pond G	3 - 2 - 2	210	54
Pond H	3 - 2 - 2	210	54

8th Reading collected on 17.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 1	75	69
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

9th Reading collected on 19.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 1 - 0	43	82
Pond C	3 - 2 - 0	93	61
Pond D	2 - 2 - 1	28	88
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	23	90
Pond G	3 - 0 - 2	64	73
Pond H	3 - 1 - 1	75	69

10th Reading collected on 21.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 0 - 1	39	74
Pond H	3 - 1 - 0	43	71

12th Reading collected on 25.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 1 - 1	75	38
Pond B	3 - 0 - 0	23	81
Pond C	3 - 1 - 0	43	64
Pond D	2 - 1 - 1	20	83
Pond E	2 - 2 - 1	28	77
Pond F	2 - 0 - 1	14	88
Pond G	3 - 1 - 0	28	77
Pond H	3 - 0 - 1	39	68

12th Reading collected on 25.02.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 1 - 2	120	
Pond A	3 - 1 - 1	75	38
Pond B	3 - 0 - 0	23	81
Pond C	3 - 1 - 0	43	64
Pond D	2 - 1 - 1	20	83
Pond E	2 - 2 - 1	28	77
Pond F	2 - 0 - 1	14	88
Pond G	3 - 1 - 0	28	77
Pond H	3 - 0 - 1	39	68

Variation of pond parameters with time (Set 3, V2)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	01.03.14	2.9	7.9	9.6	9.0	9.9	9.3	10.0	9.1	9.0
Week 1	03.03.14	2.6	7.8	9.2	8.5	9.5	9.1	9.8	9.0	8.7
Week 1	05.03.14	1.9	7.9	9.0	8.1	9.2	8.9	9.5	8.6	8.4
Week 2	07.03.14	2.9	7.8	9.4	9.1	10.0	9.4	10.1	9.2	9.0
Week 2	11.03.14	2.8	7.9	9.5	8.7	9.7	9.2	9.9	9.0	8.9
Week 2	13.03.14	2.4	7.3	9.2	8.3	9.4	9.0	9.6	8.8	8.7
Week 3	15.03.14	1.5	7.2	8.7	7.3	8.9	8.4	9.0	8.1	7.8
Week 3	17.03.14	1.4	6.9	8.5	7.3	8.8	8.4	9.0	8.0	7.8
Week 3	19.03.14	2.8	7.8	9.2	8.6	9.6	9.1	9.9	9.0	8.8
Week 4	21.03.14	1.7	7.3	9.0	7.6	9.2	8.8	9.4	8.5	8.3
Week 4	25.03.14	1.6	7.0	8.9	7.5	9.1	8.7	9.3	8.4	8.1
Week 4	28.03.14	2.1	7.9	8.9	8.3	9.4	8.9	9.5	8.7	8.6

Variation of pond parameters with time (Set 3, V2)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	01.03.14	25.9	28.8	30.9	29.2	31.4	30.1	33.0	30.0	29.8
Week 1	03.03.14	24.9	29.5	31.5	30.0	31.9	31.3	32.5	30.7	30.5
Week 1	05.03.14	24.9	30.8	33.0	31.1	33.5	32.9	33.5	32.5	32.1
Week 1	07.03.14	26.3	26.5	29.4	26.9	29.5	29.2	31.0	28.0	27.6
Week 2	11.03.14	25.6	28.9	31.4	29.6	31.6	30.8	33.4	30.1	29.9
Week 2	13.03.14	25.1	29.3	32.3	30.2	32.5	32.0	33.3	31.3	31.1
Week 2	15.03.14	24.8	32.5	34.2	32.8	34.9	34.0	34.9	33.3	33.2
Week 3	17.03.14	24.7	32.9	34.4	33.3	35.3	34.0	35.6	33.6	33.5
Week 3	19.03.14	25.6	29.0	31.4	29.8	31.7	31.1	33.5	30.8	30.7
Week 3	21.03.14	24.9	31.3	33.4	31.4	33.6	33.2	34.0	32.8	32.6
Week 3	25.03.14	24.9	30.7	33.7	31.6	34.1	33.7	34.4	33.2	33.1
Week 4	28.03.14	25.0	29.4	32.8	30.4	33.0	32.4	33.4	31.9	31.5

Variation of pond parameters with time (Set 3, V2)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	01.03.14	6.7	6.7	8.1	7.1	8.4	8.1	8.8	7.9	7.7
Week 1	03.03.14	7.0	7.6	8.8	7.8	9.1	8.4	9.4	7.8	7.7
Week 1	05.03.14	7.3	7.7	9.6	7.8	10.0	9.1	10.3	8.3	8.1
Week 1	07.03.14	6.5	6.5	8.3	7.0	8.5	8.1	8.6	7.7	7.4
Week 2	11.03.14	6.8	6.9	8.0	7.4	8.6	7.8	9.0	7.7	7.5
Week 2	13.03.14	7.2	7.5	8.9	7.7	9.4	8.5	9.8	7.9	7.8
Week 2	15.03.14	6.9	8.8	10.2	8.7	10.6	9.9	10.9	9.0	8.9
Week 3	17.03.14	6.8	8.9	10.2	8.9	10.7	10.1	11.0	9.2	9.0

Week 3	19.03.14	6.8	7.3	8.5	7.5	8.8	8.2	9.1	7.6	7.6
Week 3	21.03.14	7.3	7.9	9.8	7.9	10.1	9.5	10.4	8.6	8.5
Week 3	25.03.14	6.8	8.4	10.1	8.6	10.4	9.7	10.7	8.9	8.8
Week 4	28.03.14	7.4	7.7	9.3	7.9	9.7	8.9	10.2	8.2	8.0

Variation of pond algae concentration with time (Set 3, V_2)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	01.03.14	89	100	193	100	205	154	234	142	131
Week 1	03.03.14	87	112	240	114	249	221	302	165	167
Week 1	05.03.14	109	135	302	146	334	261	375	218	186
Week 1	07.03.14	87	99	183	100	194	143	224	131	121
Week 2	11.03.14	89	100	217	111	227	176	268	152	142
Week 2	13.03.14	90	114	250	126	283	232	312	176	177
Week 2	15.03.14	100	146	324	168	356	283	397	240	208
Week 3	17.03.14	97	155	332	177	365	291	406	249	218
Week 3	19.03.14	82	111	228	114	239	187	280	155	146
Week 3	21.03.14	99	136	283	146	303	252	346	210	189
Week 3	25.03.14	109	135	312	157	344	271	385	228	196
Week 4	28.03.14	94	124	249	126	283	232	324	188	179

1st Reading collected on 01.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.4308	64.4393	30	8.5	283	
Pond A	55.4729	55.4784	30	5.5	183	35
Pond B	52.6705	52.6729	30	2.4	80	72
Pond C	55.4199	55.4247	30	4.8	160	44
Pond D	50.6048	50.6067	30	1.9	63	78
Pond E	51.9148	51.9172	30	2.4	80	72
Pond F	48.4021	48.4034	30	1.3	43	85
Pond G	54.5179	54.5217	30	3.8	127	55
Pond H	54.9476	54.9517	30	4.1	137	52

2nd Reading collected on 03.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.6421	62.6503	30	8.2	273	
Pond A	55.4735	55.4785	30	5	167	39
Pond B	51.0601	51.0618	30	1.7	57	79
Pond C	54.9402	54.9445	30	4.3	143	48
Pond D	50.0148	50.0163	30	1.5	50	82
Pond E	53.0153	53.0171	30	1.8	60	78
Pond F	48.0020	48.0030	30	1	33	88
Pond G	54.2281	54.2315	30	3.4	113	59
Pond H	54.2492	54.2528	30	3.6	120	56

3rd Reading collected on 05.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.6533	63.6606	30	7.3	243	
Pond A	55.3725	55.3766	30	4.1	137	44
Pond B	51.2612	51.2624	30	1.2	40	84
Pond C	55.1400	55.1433	30	3.3	110	55
Pond D	50.0158	50.0167	30	0.9	30	88
Pond E	52.1058	52.1071	30	1.3	43	82
Pond F	49.0015	49.0021	30	0.6	20	92
Pond G	54.1284	54.1306	30	2.2	73	70
Pond H	54.4603	54.4626	30	2.3	77	68

4th Reading collected on 07.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.6411	64.6497	30	8.6	287	
Pond A	57.0719	57.0776	30	5.7	190	34
Pond B	52.3794	52.3818	30	2.4	80	72
Pond C	55.7387	55.7437	30	5	167	42
Pond D	50.5147	50.5170	30	2.3	77	73
Pond E	51.6551	51.6576	30	2.5	83	71
Pond F	50.8036	50.8051	30	1.5	50	83
Pond G	54.5272	54.5314	30	4.2	140	51

Pond H	54.7487	54.7530	30	4.3	143	50

5th Reading collected on 11.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.9418	64.9503	30	8.5	283	
Pond A	55.6524	55.6578	30	5.4	180	36
Pond B	51.0249	51.0271	30	2.2	73	74
Pond C	55.5293	55.5341	30	4.8	160	44
Pond D	51.0048	51.0066	30	1.8	60	79
Pond E	52.0599	52.06211	30	2.21	74	74
Pond F	51.0021	51.0034	30	1.3	43	85
Pond G	54.9163	54.9201	30	3.8	127	55
Pond H	55.4485	55.4526	30	4.1	137	52

6th Reading collected on 13.03.14

Table 1.5: Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.5321	62.5401	30	8.0	267	
Pond A	56.1436	56.1483	30	4.7	157	41
Pond B	53.0407	53.0423	30	1.6	53	80
Pond C	56.0201	56.024	30	3.9	130	51
Pond D	50.8052	50.8065	30	1.3	43	84
Pond E	53.8056	53.8074	30	1.8	60	77
Pond F	48.7023	48.7032	30	0.9	30	89
Pond G	55.0185	55.0216	30	3.1	103	61
Pond H	55.1401	55.1434	30	3.3	110	59

7th Reading collected on 15.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.0129	61.0203	30	7.4	247	
Pond A	54.1141	54.1178	30	3.7	123	50
Pond B	49.0061	49.0072	30	1.1	37	85
Pond C	53.9109	53.9138	30	2.9	97	61

Pond D	47.3047	47.3055	30	0.8	27	89
Pond E	50.5512	50.5524	30	1.2	40	84
Pond F	46.2013	46.2017	30	0.4	13	95
Pond G	52.4089	52.4109	30	2	67	73
Pond H	52.9101	52.9123	30	2.2	73	70

8th Reading collected on 17.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.1101	61.1185	30	8.4	280	
Pond A	55.4671	55.4710	30	3.9	130	54
Pond B	54.3159	54.3171	30	1.2	40	86
Pond C	55.2592	55.2623	30	3.1	103	63
Pond D	53.5160	53.5168	30	0.8	27	90
Pond E	54.6769	54.6782	30	1.3	43	85
Pond F	50.2653	50.2657	30	0.4	13	95
Pond G	55.5351	55.5370	30	1.9	63	77
Pond H	55.9483	55.9504	30	2.1	70	75

9th Reading collected on 19.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.1919	62.2002	30	8.3	277	
Pond A	55.1134	55.1185	30	5.1	170	39
Pond B	50.5513	50.5533	30	2	67	76
Pond C	54.9099	54.9143	30	4.4	147	47
Pond D	48.3055	48.3071	30	1.6	53	81
Pond E	51.0054	51.0073	30	1.9	63	77
Pond F	47.2105	47.2116	30	1.1	37	87
Pond G	53.4079	53.4113	30	3.4	113	59
Pond H	54.709	54.7128	30	3.8	127	54

10th Reading collected on 21.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.0331	62.0407	30	7.6	253	
Pond A	54.0139	54.0180	30	4.1	137	46
Pond B	50.0015	50.0027	30	1.2	40	84
Pond C	54.0107	54.0139	30	3.2	107	58
Pond D	49.7056	49.7065	30	0.9	30	88
Pond E	51.5064	51.5076	30	1.2	40	84
Pond F	47.5026	47.5032	30	0.6	20	92
Pond G	52.9079	52.9100	30	2.1	70	72
Pond H	53.0304	53.0326	30	2.2	73	71

11th Reading collected on 25.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.0225	61.0299	30	7.4	247	
Pond A	55.5137	55.5174	30	3.7	123	50
Pond B	51.7512	51.7524	30	1.2	40	84
Pond C	55.2113	55.2142	30	2.9	97	61
Pond D	49.5056	49.5064	30	0.8	27	89
Pond E	52.3062	52.3074	30	1.2	40	84
Pond F	47.5013	47.5018	30	0.5	17	93
Pond G	53.049	53.051	30	2	67	73
Pond H	53.7111	53.7132	30	2.1	70	72

12th Reading collected on 28.03.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.3324	63.3398	30	7.4	247	
Pond A	56.1109	56.1151	30	4.2	140	43
Pond B	50.1112	50.1125	30	1.3	43	82
Pond C	55.7203	55.7237	30	3.4	113	54
Pond D	49.9071	49.9081	30	1	33	86
Pond E	51.5061	51.5074	30	1.3	43	82
Pond F	47.9027	47.9033	30	0.6	20	92
Pond G	54.5094	54.5118	30	2.4	80	68

Pond H	54.8409	54.8434	30	2.5	83	66

1st Reading collected on 01.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	0.8	315	
Pond A	250	5	7.7	3.9	190	40
Pond B	250	5	9.1	7.0	105	67
Pond C	250	5	8.9	5.4	175	44
Pond D	250	5	9.7	8.3	70	78
Pond E	250	5	8.9	6.7	110	65
Pond F	250	5	9.8	8.7	55	83
Pond G	250	5	8.6	5.7	145	54
Pond H	250	5	8.4	5.4	150	52

2nd Reading collected on 03.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.2	2.1	305	
Pond A	250	5	6.8	3.3	175	43
Pond B	250	5	9.7	7.9	90	70
Pond C	250	5	8.1	5.2	145	52
Pond D	250	5	9.7	8.5	60	80
Pond E	250	5	9.6	7.6	100	67
Pond F	250	5	9.9	8.9	50	84
Pond G	250	5	8.9	6.5	120	61
Pond H	250	5	8.8	6.3	125	59

3rd Reading collected on 05.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.0	295	
Pond A	250	5	6.1	2.8	165	44
Pond B	250	5	7.4	5.8	80	73
Pond C	250	5	6.1	3.6	125	58

Pond D	250	5	8.8	7.9	45	85
Pond E	250	5	8.6	6.9	85	71
Pond F	250	5	9.9	9.1	40	86
Pond G	250	5	6.6	4.6	100	66
Pond H	250	5	6.6	4.4	110	63

4th Reading collected on 07.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.7	1.9	340	
Pond A	250	5	6.1	1.9	210	38
Pond B	250	5	7.2	4.8	120	65
Pond C	250	5	6.6	2.7	195	43
Pond D	250	5	8.2	6.4	90	74
Pond E	250	5	7.0	4.5	125	63
Pond F	250	5	8.9	7.6	65	81
Pond G	250	5	7.2	3.9	165	51
Pond H	250	5	7.1	3.6	175	49

5th Reading collected on 11.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.5	1.1	320	
Pond A	250	5	5.1	1.3	190	41
Pond B	250	5	8.0	6.0	100	69
Pond C	250	5	5.6	2.2	170	47
Pond D	250	5	8.8	7.5	65	80
Pond E	250	5	7.3	5.1	110	66
Pond F	250	5	9.1	8.0	55	83
Pond G	250	5	6.8	4.1	135	58
Pond H	250	5	6.8	3.9	145	55

6th Reading collected on 13.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.1	300	
Pond A	250	5	7.8	4.4	170	43
Pond B	250	5	8.3	6.5	90	70
Pond C	250	5	8.1	5.3	140	53
Pond D	250	5	9.4	8.3	55	82
Pond E	250	5	8.2	6.3	95	68
Pond F	250	5	9.6	8.6	50	83
Pond G	250	5	8.0	5.8	110	63
Pond H	250	5	7.8	5.4	120	60

7th Reading collected on 15.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.5	285	
Pond A	250	5	7.8	5.0	140	51
Pond B	250	5	9.7	8.3	70	75
Pond C	250	5	8.4	6.3	105	63
Pond D	250	5	10.2	9.6	30	89
Pond E	250	5	9.8	8.4	70	75
Pond F	250	5	10.8	10.3	25	91
Pond G	250	5	9.3	7.6	85	70
Pond H	250	5	9.0	7.2	90	68

8th Reading collected on 17.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.6	1.4	260	
Pond A	250	5	7.3	4.8	125	52
Pond B	250	5	9.8	8.7	55	79
Pond C	250	5	8.9	7.2	85	67
Pond D	250	5	9.8	9.2	30	88
Pond E	250	5	9.6	8.4	60	77
Pond F	250	5	10.4	10	20	92
Pond G	250	5	9.3	7.8	75	71

Pond H	250	5	9.1	7.5	80	69

9th Reading collected on 19.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	8.3	1.9	320	
Pond A	250	5	6.8	3.2	180	44
Pond B	250	5	9.2	7.3	95	70
Pond C	250	5	7.1	3.9	160	50
Pond D	250	5	9.6	8.3	65	80
Pond E	250	5	9.1	6.9	110	66
Pond F	250	5	9.6	8.5	55	83
Pond G	250	5	7.6	5.0	130	59
Pond H	250	5	7.5	4.7	140	56

10th Reading collected on 21.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.2	290	
Pond A	250	5	6.6	3.7	145	50
Pond B	250	5	9.8	8.3	75	74
Pond C	250	5	7.8	5.5	115	60
Pond D	250	5	9.7	8.9	40	86
Pond E	250	5	9.7	8.1	80	72
Pond F	250	5	9.6	8.9	35	88
Pond G	250	5	8.6	6.8	90	69
Pond H	250	5	8.4	6.3	105	64

11th Reading collected on 25.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.3	280	
Pond A	250	5	7.2	4.4	140	50
Pond B	250	5	9.5	8.1	70	75
Pond C	250	5	7.8	5.6	110	61

Pond D	250	5	9.9	9.2	35	88
Pond E	250	5	9.4	8.0	70	75
Pond F	250	5	10.2	9.6	30	89
Pond G	250	5	8.9	7.2	85	70
Pond H	250	5	8.7	6.8	95	66

12th Reading collected on 28.03.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.8	2.1	285	
Pond A	250	5	7.4	4.2	160	44
Pond B	250	5	9.2	7.5	85	70
Pond C	250	5	8.3	5.7	130	54
Pond D	250	5	9.6	8.6	50	82
Pond E	250	5	9.5	7.7	90	68
Pond F	250	5	9.8	8.9	45	84
Pond G	250	5	8.7	6.7	100	65
Pond H	250	5	8.4	6.2	110	61

1st Reading collected on 01.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 1	460	58
Pond C	3 - 3 - 1	460	58
Pond D	3 - 3 - 1	460	58
Pond E	3 - 3 - 1	460	58
Pond F	3 - 3 - 0	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

2nd Reading collected on 03.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 1	150	86
Pond E	3 - 2 - 2	210	81

Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 05.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 3 - 0	240	90
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

4th Reading collected on 07.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 2	460	58
Pond C	3 - 3 - 2	1100	0
Pond D	3 - 3 - 2	460	58
Pond E	3 - 3 - 2	460	58
Pond F	3 - 3 - 2	460	58
Pond G	3 - 3 - 2	460	58
Pond H	3 - 3 - 2	460	58

5th Reading collected on 11.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 3 - 0	240	78
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 2	210	81
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

6th Reading collected on 13.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 1 - 2	120	89
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

7th Reading collected on 15.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 1 - 2	120	89
Pond C	3 - 1 - 2	120	89
Pond D	3 - 2 - 0	93	92
Pond E	3 - 1 - 2	120	89
Pond F	3 - 1 - 1	75	93
Pond G	3 - 1 - 2	120	89
Pond H	3 - 2 - 1	150	86

8th Reading collected on 17.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 2 - 0	93	92
Pond C	3 - 2 - 0	93	92
Pond D	3 - 0 - 2	64	94
Pond E	3 - 2 - 0	93	92
Pond F	3 - 1 - 0	43	96
Pond G	3 - 2 - 0	93	92
Pond H	3 - 2 - 0	93	92

9th Reading collected on 19.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81

Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 1	460	81
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

10th Reading collected on 21.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 0	240	78
Pond D	3 - 2 - 0	93	92
Pond E	3 - 2 - 1	150	86
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 1	150	86
Pond H	3 - 2 - 2	210	81

11th Reading collected on 25.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 2 - 2	210	91
Pond E	3 - 3 - 0	240	90
Pond F	3 - 2 - 1	150	94
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

12th Reading collected on 28.03.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 2	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 0	93	92
Pond G	3 - 3 - 0	240	78

Pond H	3 - 3 - 0	240	78

1st Reading collected on 01.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 2 - 1	150	0
Pond B	3 - 1 - 1	75	50
Pond C	3 - 2 - 0	93	38
Pond D	3 - 0 - 2	64	57
Pond E	3 - 1 - 1	75	50
Pond F	3 - 1 - 0	43	71
Pond G	3 - 1 - 1	75	50
Pond H	3 - 1 - 1	75	50

2nd Reading collected on 03.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	3 - 0 - 0	23	85
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 0 - 2	64	57

3rd Reading collected on 05.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

4th Reading collected on 07.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	460	
Pond A	3 - 3 - 2	460	0
Pond B	3 - 2 - 2	210	54
Pond C	3 - 3 - 2	460	0
Pond D	3 - 2 - 2	210	54
Pond E	3 - 2 - 2	210	54
Pond F	3 - 2 - 2	210	54
Pond G	3 - 2 - 2	210	54
Pond H	3 - 2 - 2	210	54

5th Reading collected on 11.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	150	38
Pond B	3 - 0 - 2	64	73
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 2	64	73
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 1 - 2	93	61
Pond H	3 - 1 - 2	93	61

6th Reading collected on 13.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

7th Reading collected on 15.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 0	43	71
Pond B	2 - 1 - 1	20	87
Pond C	3 - 1 - 0	43	71
Pond D	2 - 0 - 1	14	91
Pond E	3 - 0 - 0	23	85
Pond F	1 - 2 - 0	11	93
Pond G	3 - 0 - 1	39	74
Pond H	3 - 0 - 1	39	74

8th Reading collected on 17.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 0 - 1	39	84
Pond B	2 - 1 - 0	15	94
Pond C	2 - 2 - 1	28	88
Pond D	2 - 1 - 0	15	94
Pond E	2 - 1 - 0	15	94
Pond F	2 - 0 - 1	14	94
Pond G	3 - 0 - 0	23	90
Pond H	2 - 2 - 1	28	88

9th Reading collected on 19.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	150	38
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 1	39	84
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 2 - 0	93	61
Pond H	3 - 2 - 0	93	61

10th Reading collected on 21.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	3 - 0 - 0	23	85
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 0	15	90
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

11th Reading collected on 25.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	3 - 0 - 1	39	84
Pond C	3 - 0 - 2	64	73
Pond D	3 - 0 - 0	23	90
Pond E	3 - 1 - 0	43	82
Pond F	3 - 0 - 0	20	92
Pond G	3 - 0 - 2	64	73
Pond H	3 - 0 - 2	64	73

12th Reading collected on 28.03.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

Variation of pond parameters with time (Set 3, V3)

Sample collection	Effluent collection date	PARAMEMTER: DO (mg/l) of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.04.14	1.7	7.0	8.7	7.2	9.0	8.4	9.2	8.0	7.8
Week 1	05.04.14	2.2	7.5	9.4	8.5	9.6	9.2	9.8	9.0	8.9
Week 1	07.04.14	1.9	7.5	9.2	7.8	9.4	9.0	9.6	8.7	8.5
Week 2	09.04.14	2.7	8.1	9.7	9.0	10.2	9.6	10.4	9.3	9.2
Week 2	11.04.14	1.5	6.8	8.6	6.9	8.8	8.5	9.1	7.9	7.7
Week 2	14.04.14	2.6	8.0	9.8	8.9	10.0	9.7	10.2	9.2	9.2
Week 3	16.04.14	2.1	8.1	9.1	8.5	9.6	9.1	9.7	8.9	8.8
Week 3	18.04.14	2.5	8.1	9.7	8.9	9.9	9.4	10.1	9.2	9.1
Week 3	21.04.14	1.8	7.2	9.1	7.7	9.3	8.9	9.5	8.6	8.3
Week 4	24.04.14	2.5	8.0	9.4	8.8	9.8	9.3	10.1	9.1	9.0
Week 4	26.04.14	2.4	8.0	9.4	8.7	9.7	9.3	10.0	9.1	8.9
Week 4	30.04.14	2.0	8.1	9.2	8.3	9.4	9.1	9.7	8.8	8.6

Variation of pond parameters with time (Set 3, V3)

Sample collection	Effluent collection date	PARAMEMTER: Average Temperature (°C)								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.04.14	25.0	32.4	34.4	33.1	36.1	34.2	36.3	33.6	33.5
Week 1	05.04.14	25.1	29.5	32.5	30.4	32.7	32.2	33.5	31.5	31.3
Week 1	07.04.14	25.0	31.5	34.0	31.6	34.8	34.0	34.3	33.0	32.8
Week 1	09.04.14	25.8	26.7	29.6	27.1	29.7	29.4	31.3	28.2	27.9
Week 2	11.04.14	25.1	33.0	35.0	33.2	36.4	34.7	36.5	33.7	33.6
Week 2	14.04.14	26.1	29.0	31.1	29.4	31.6	30.9	33.4	30.3	30.0
Week 2	16.04.14	25.1	29.6	33.1	30.2	33.3	32.9	33.6	32.1	31.7
Week 3	18.04.14	25.8	29.1	31.6	29.8	31.8	31.3	33.6	30.3	30.0
Week 3	21.04.14	25.0	30.9	34.1	31.8	35.3	34.0	34.6	33.5	33.3
Week 3	24.04.14	25.8	29.2	31.6	30.0	31.9	31.4	33.7	31.0	30.8
Week 3	26.04.14	25.0	29.7	31.7	30.2	32.2	31.5	32.7	30.9	30.7
Week 4	30.04.14	25.0	31.0	33.2	31.3	34.5	33.1	33.8	32.6	32.3

Variation of pond parameters with time (Set 3, V3)

Sample collection	Effluent collection date	PARAMEMTER: pH of wastewater								
		Influent	POND A	POND B	POND C	POND D	POND E	POND F	POND G	POND H
Week 1	02.04.14	6.8	8.4	10.3	8.7	10.7	10.0	11.0	9.1	9.0
Week 1	05.04.14	7.4	7.8	9.0	7.9	9.4	8.6	9.8	8.1	7.9
Week 1	07.04.14	6.7	7.8	9.9	8.0	10.1	9.5	10.4	8.6	8.4
Week 1	09.04.14	6.6	6.7	8.1	7.0	8.4	8.1	8.7	7.7	7.5
Week 2	11.04.14	6.9	8.6	10.4	8.8	10.9	10.1	11.3	9.2	9.1
Week 2	14.04.14	6.8	6.8	8.2	7.2	8.5	8.2	8.8	8.0	7.8
Week 2	16.04.14	7.5	7.7	9.4	7.8	9.8	9.0	10.2	8.2	8.1

Week 3	18.04.14	7.0	7.0	8.1	7.4	8.7	7.9	9.1	7.8	7.6
Week 3	21.04.14	6.7	8.5	10.1	8.7	10.4	9.8	10.7	9.0	8.9
Week 3	24.04.14	7.0	7.4	8.5	7.6	8.9	8.3	9.2	7.8	7.7
Week 3	26.04.14	7.1	7.6	8.8	7.8	9.1	8.5	9.4	8.0	7.8
Week 4	30.04.14	7.4	7.8	9.6	7.9	10.0	9.1	10.3	8.4	8.2

Variation of pond algae concentration with time (Set 3, V_3)

Sample collection	Effluent collection date	PARAMEMTER: Algae concentration (µg chlorophyll-a/litre)								
		Influent	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	Pond G	Pond H
Week 1	02.04.14	90	189	337	192	380	307	422	262	243
Week 1	05.04.14	90	148	283	158	332	264	353	218	208
Week 1	07.04.14	102	179	315	179	359	286	390	254	232
Week 1	09.04.14	96	141	249	146	259	210	259	176	164
Week 2	11.04.14	87	191	358	202	390	317	431	274	243
Week 2	14.04.14	99	141	271	155	283	232	290	174	164
Week 2	16.04.14	90	149	295	160	337	271	358	240	230
Week 3	18.04.14	99	143	271	156	284	240	314	189	180
Week 3	21.04.14	90	183	317	191	370	298	407	257	233
Week 3	24.04.14	102	145	281	158	290	242	333	198	188
Week 3	26.04.14	100	145	281	158	303	252	344	208	189
Week 4	30.04.14	92	160	308	167	339	274	380	243	230

1^{st} Reading collected on 02.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.0132	62.0211	30	7.9	263	
Pond A	56.0041	56.0078	30	3.7	123	53
Pond B	53.2061	53.2072	30	1.1	37	86
Pond C	55.9109	55.9138	30	2.9	97	63
Pond D	52.3047	52.3055	30	0.8	27	90
Pond E	53.8512	53.8524	30	1.2	40	85
Pond F	49.6013	49.6017	30	0.4	13	95
Pond G	54.9092	54.9111	30	1.9	63	76
Pond H	55.1103	55.1123	30	2	67	75

2nd Reading collected on 05.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	61.8409	61.8494	30	8.5	283	
Pond A	54.3636	54.3683	30	4.7	157	45
Pond B	51.1207	51.1223	30	1.6	53	81
Pond C	54.0801	54.0840	30	3.9	130	54
Pond D	48.9652	48.9665	30	1.3	43	85
Pond E	51.8756	51.8774	30	1.8	60	79
Pond F	46.5923	46.5932	30	0.9	30	89
Pond G	53.2186	53.2216	30	3.0	100	65
Pond H	53.5402	53.5434	30	3.2	107	62

3rd Reading collected on 07.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.0334	63.0415	30	8.1	270	
Pond A	55.4138	55.4180	30	4.2	140	48
Pond B	51.1016	51.1028	30	1.2	40	85
Pond C	55.2107	55.2139	30	3.2	107	60
Pond D	50.3056	50.3065	30	0.9	30	89
Pond E	52.2062	52.2075	30	1.3	43	84
Pond F	48.4026	48.4032	30	0.6	20	93
Pond G	53.8079	53.8100	30	2.1	70	74
Pond H	54.6304	54.6326	30	2.2	73	73

4th Reading collected on 09.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.8410	64.8497	30	8.7	290	
Pond A	56.6719	56.6776	30	5.7	190	34
Pond B	51.4794	51.4818	30	2.4	80	72
Pond C	55.8387	55.8437	30	5	167	43
Pond D	49.7149	49.7170	30	2.1	70	76
Pond E	51.6551	51.6576	30	2.5	83	71
Pond F	49.1037	49.1051	30	1.4	47	84
Pond G	53.4274	53.4314	30	4	133	54

Pond H	53.8489	53.8530	30	4.1	137	53

5th Reading collected on 11.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.3102	62.3183	30	8.1	270	
Pond A	56.8674	56.8712	30	3.8	127	53
Pond B	55.3161	55.3172	30	1.1	37	86
Pond C	56.7594	56.7623	30	2.9	97	64
Pond D	54.5161	54.5168	30	0.7	23	91
Pond E	55.6771	55.6783	30	1.2	40	85
Pond F	48.2652	48.2656	30	0.4	13	95
Pond G	56.3353	56.3371	30	1.8	60	78
Pond H	56.6484	56.6504	30	2.0	67	75

6th Reading collected on 14.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.8307	64.8393	30	8.6	287	
Pond A	55.7729	55.7784	30	5.5	183	36
Pond B	52.9705	52.9729	30	2.4	80	72
Pond C	55.6199	55.6247	30	4.8	160	44
Pond D	50.5049	50.5067	30	1.8	60	79
Pond E	52.2148	52.2172	30	2.4	80	72
Pond F	48.7022	48.7034	30	1.2	40	86
Pond G	54.6178	54.6215	30	3.7	123	57
Pond H	54.8476	54.8516	30	4.0	133	53

7th Reading collected on 16.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	62.6327	62.6411	30	8.4	280	
Pond A	53.3106	53.3151	30	4.5	150	46
Pond B	48.2111	48.2125	30	1.4	47	83
Pond C	53.7499	53.7536	30	3.7	123	56

Pond D	47.7370	47.7381	30	1.1	37	87
Pond E	49.4559	49.4574	30	1.5	50	82
Pond F	45.6627	45.6633	30	0.6	20	93
Pond G	52.5194	52.5218	30	2.4	80	71
Pond H	52.8709	52.8734	30	2.5	83	70

8th Reading collected on 18.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	65.8425	65.8511	30	8.6	287	
Pond A	58.7523	58.7575	30	5.2	173	40
Pond B	54.8247	54.8266	30	1.9	63	78
Pond C	58.6293	58.6338	30	4.5	150	48
Pond D	54.0049	54.0065	30	1.6	53	81
Pond E	55.1598	55.1619	30	2.1	70	76
Pond F	53.0219	53.0231	30	1.2	40	86
Pond G	57.9181	57.9215	30	3.4	113	60
Pond H	58.1489	58.1526	30	3.7	123	57

9th Reading collected on 21.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.22139	63.2289	30	7.51	250	
Pond A	56.5138	56.5174	30	3.6	120	52
Pond B	53.7513	53.7524	30	1.1	37	85
Pond C	56.3114	56.3142	30	2.8	93	63
Pond D	52.5056	52.5064	30	0.8	27	89
Pond E	54.3062	54.3074	30	1.2	40	84
Pond F	48.5013	48.5018	30	0.5	17	93
Pond G	55.0491	55.051	30	1.9	63	75
Pond H	55.7112	55.7132	30	2	67	73

10th Reading collected on 24.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)

Influent	64.1924	64.2002	30	7.8	260	
Pond A	56.2138	56.2184	30	4.6	153	41
Pond B	51.3115	51.3131	30	1.6	53	79
Pond C	55.8087	55.8126	30	3.9	130	50
Pond D	49.1047	49.1061	30	1.4	47	82
Pond E	52.2256	52.2273	30	1.7	57	78
Pond F	48.4206	48.4216	30	1.0	33	87
Pond G	54.5082	54.5112	30	3.0	100	62
Pond H	55.6096	55.6128	30	3.2	107	59

11th Reading collected on 26.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	63.7420	63.7503	30	8.3	277	
Pond A	56.3736	56.3784	30	4.8	160	42
Pond B	51.1603	51.1619	30	1.6	53	81
Pond C	55.9399	55.9438	30	3.9	130	53
Pond D	50.6153	50.6167	30	1.4	47	83
Pond E	52.0153	52.0171	30	1.8	60	78
Pond F	49.2109	49.2118	30	0.9	30	89
Pond G	55.1285	55.1315	30	3.0	100	64
Pond H	55.2595	55.2627	30	3.2	107	61

12th Reading collected on 30.04.14

Suspended solid (SS)

Sample	Initial Weight (g)	Final Weight (g)	Volume of sample (ml)	Difference in weight (mg)	Suspended solid (mg/l)	Efficiency (%)
Influent	64.1533	64.1603	30	7.0	233	
Pond A	55.8727	55.8764	30	3.7	123	47
Pond B	51.5712	51.5723	30	1.1	37	84
Pond C	55.5401	55.5431	30	3.0	100	57
Pond D	50.5458	50.5466	30	0.8	27	89
Pond E	52.6059	52.6071	30	1.2	40	83
Pond F	49.6614	49.6619	30	0.5	17	93
Pond G	54.8286	54.8305	30	1.9	63	73
Pond H	55.2605	55.2625	30	2.0	67	71

1st Reading collected on 02.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.1	1.2	295	
Pond A	250	5	7.7	4.9	140	53
Pond B	250	5	9.7	8.3	70	76
Pond C	250	5	8.5	6.5	100	66
Pond D	250	5	10.2	9.6	30	90
Pond E	250	5	9.8	8.4	70	76
Pond F	250	5	10.8	10.3	25	92
Pond G	250	5	9.2	7.5	85	71
Pond H	250	5	9.0	7.2	90	69

2nd Reading collected on 05.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.1	305	
Pond A	250	5	7.6	4.2	170	44
Pond B	250	5	8.1	6.3	90	70
Pond C	250	5	7.7	4.9	140	54
Pond D	250	5	9	7.9	55	82
Pond E	250	5	8	6.1	95	69
Pond F	250	5	9.3	8.3	50	84
Pond G	250	5	8.0	5.8	110	64
Pond H	250	5	7.8	5.4	120	61

3rd Reading collected on 07.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	1.3	280	
Pond A	250	5	7.0	4.1	145	48
Pond B	250	5	9.7	8.3	70	75
Pond C	250	5	7.7	5.5	110	61
Pond D	250	5	9.8	9.1	35	88
Pond E	250	5	9.7	8.2	75	73
Pond F	250	5	9.5	8.9	30	89

Pond G	250	5	8.7	7.0	85	70
Pond H	250	5	8.5	6.6	95	66

4th Reading collected on 09.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	0.6	330	
Pond A	250	5	7.3	3.3	200	39
Pond B	250	5	7.5	5.2	115	65
Pond C	250	5	7.4	3.7	185	44
Pond D	250	5	8	6.4	80	76
Pond E	250	5	7.2	4.9	115	65
Pond F	250	5	8.8	7.6	60	82
Pond G	250	5	7.4	4.3	155	53
Pond H	250	5	7.3	4.0	165	50

5th Reading collected on 11.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	1.4	270	
Pond A	250	5	7.2	4.8	120	56
Pond B	250	5	9.7	8.6	55	80
Pond C	250	5	8.8	7.1	85	69
Pond D	250	5	9.9	9.4	25	91
Pond E	250	5	9.7	8.5	60	78
Pond F	250	5	10.3	9.9	20	93
Pond G	250	5	9.2	7.7	75	72
Pond H	250	5	9.0	7.4	80	70

6th Reading collected on 14.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.4	1.0	320	
Pond A	250	5	7.7	3.9	190	41
Pond B	250	5	9.0	6.9	105	67
Pond C	250	5	8.8	5.3	175	45
Pond D	250	5	9.6	8.2	70	78

Pond E	250	5	8.8	6.6	110	66
Pond F	250	5	9.7	8.6	55	83
Pond G	250	5	8.5	5.6	145	55
Pond H	250	5	8.3	5.3	150	53

7th Reading collected on 16.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.6	1.8	290	
Pond A	250	5	7.4	4.2	160	45
Pond B	250	5	9.0	7.3	85	71
Pond C	250	5	8.2	5.6	130	55
Pond D	250	5	9.5	8.6	45	84
Pond E	250	5	9.1	7.4	85	71
Pond F	250	5	9.7	8.8	45	84
Pond G	250	5	8.6	6.6	100	66
Pond H	250	5	8.4	6.2	110	62

8th Reading collected on 18.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.9	0.6	315	
Pond A	250	5	7.0	3.4	180	43
Pond B	250	5	7.8	5.9	95	70
Pond C	250	5	7.3	4.0	165	48
Pond D	250	5	8.8	7.5	65	79
Pond E	250	5	7.4	5.3	105	67
Pond F	250	5	9.0	8.0	50	84
Pond G	250	5	7.1	4.5	130	59
Pond H	250	5	6.9	4.2	135	57

9th Reading collected on 21.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	6.8	1.3	275	

Pond A	250	5	7.3	4.6	135	51
Pond B	250	5	9.6	8.2	70	75
Pond C	250	5	7.7	5.7	100	64
Pond D	250	5	9.8	9.2	30	89
Pond E	250	5	9.5	8.1	70	75
Pond F	250	5	10.4	9.8	30	89
Pond G	250	5	9.0	7.4	80	71
Pond H	250	5	8.9	7.1	90	67

10th Reading collected on 24.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.3	1.0	315	
Pond A	250	5	7.0	3.4	180	43
Pond B	250	5	9.3	7.4	95	70
Pond C	250	5	7.2	4.2	150	52
Pond D	250	5	9.5	8.2	65	79
Pond E	250	5	9.2	7.1	105	67
Pond F	250	5	9.7	8.7	50	84
Pond G	250	5	8.2	5.8	120	62
Pond H	250	5	7.9	5.3	130	59

11th Reading collected on 26.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.2	1.0	310	
Pond A	250	5	7.4	3.9	175	44
Pond B	250	5	9.6	7.8	90	71
Pond C	250	5	8.2	5.3	145	53
Pond D	250	5	9.7	8.5	60	81
Pond E	250	5	9.5	7.5	100	68
Pond F	250	5	9.8	8.8	50	84
Pond G	250	5	8.8	6.5	115	63
Pond H	250	5	8.7	6.2	125	60

12th Reading collected on 30.04.14

Biochemical Oxygen Demand (BOD)

Sample	Vol. of bottle (ml)	Vol. of sample used (ml)	DO_1	DO_5	BOD (mg/l)	Efficiency (%)
Influent	250	5	7.0	1.0	300	
Pond A	250	5	6.4	3.1	165	45
Pond B	250	5	7.5	5.8	85	72
Pond C	250	5	6.2	3.6	130	57
Pond D	250	5	8.8	7.9	45	85
Pond E	250	5	8.6	6.9	85	72
Pond F	250	5	9.9	9.1	40	87
Pond G	250	5	6.6	4.6	100	67
Pond H	250	5	6.6	4.4	110	63

1st Reading collected on 02.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 2	210	81
Pond B	3 - 1 - 2	120	89
Pond C	3 - 1 - 2	120	89
Pond D	3 - 1 - 1	75	93
Pond E	3 - 1 - 2	120	89
Pond F	3 - 0 - 2	64	94
Pond G	3 - 1 - 2	120	89
Pond H	3 - 1 - 2	120	89

2nd Reading collected on 05.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 1	460	58
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 3 - 0	240	78

3rd Reading collected on 07.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 1 - 2	120	89
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 1	75	93
Pond E	3 - 1 - 2	120	89
Pond F	3 - 1 - 1	75	93
Pond G	3 - 2 - 2	210	81
Pond H	3 - 2 - 2	210	81

4th Reading collected on 09.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 2	460	58
Pond C	3 - 3 - 2	1100	0
Pond D	3 - 3 - 2	460	58
Pond E	3 - 3 - 2	460	58
Pond F	3 - 3 - 2	460	58
Pond G	3 - 3 - 2	460	58
Pond H	3 - 3 - 2	460	58

5th Reading collected on 11.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 2 - 1	150	86
Pond B	3 - 1 - 0	43	96
Pond C	3 - 2 - 0	93	92
Pond D	3 - 0 - 2	64	94
Pond E	3 - 2 - 0	93	92
Pond F	3 - 0 - 1	39	96
Pond G	3 - 2 - 0	93	92
Pond H	3 - 2 - 0	93	92

6th Reading collected on 14.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	1100	0
Pond B	3 - 3 - 1	460	58

Pond C	3 - 3 - 1	460	58
Pond D	3 - 3 - 1	460	58
Pond E	3 - 3 - 1	460	58
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

7th Reading collected on 16.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 2	460	58
Pond B	3 - 2 - 1	150	86
Pond C	3 - 3 - 0	240	78
Pond D	3 - 1 - 2	120	89
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 0	93	92
Pond G	3 - 2 - 2	210	81
Pond H	3 - 3 - 0	240	78

8th Reading collected on 18.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 3 - 0	240	78
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 3 - 0	240	78
Pond F	3 - 2 - 1	150	86
Pond G	3 - 3 - 1	460	58
Pond H	3 - 3 - 1	460	58

9th Reading collected on 21.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 2 - 1	150	94
Pond E	3 - 3 - 0	240	90
Pond F	3 - 2 - 1	150	94
Pond G	3 - 3 - 0	240	90
Pond H	3 - 3 - 1	460	81

10th Reading collected on 24.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 3	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 1	460	81
Pond C	3 - 3 - 2	1100	54
Pond D	3 - 3 - 1	460	81
Pond E	3 - 3 - 1	460	81
Pond F	3 - 3 - 0	240	90
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

11th Reading collected on 26.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	1100	
Pond A	3 - 3 - 1	460	58
Pond B	3 - 2 - 2	210	81
Pond C	3 - 3 - 1	460	58
Pond D	3 - 2 - 2	210	81
Pond E	3 - 2 - 2	210	81
Pond F	3 - 2 - 0	93	92
Pond G	3 - 3 - 0	240	78
Pond H	3 - 3 - 0	240	78

12th Reading collected on 30.04.14

COLIFORM

Sample	Coliform	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	≥ 2400	
Pond A	3 - 3 - 2	1100	54
Pond B	3 - 3 - 0	240	90
Pond C	3 - 3 - 1	460	81
Pond D	3 - 3 - 0	240	90
Pond E	3 - 3 - 1	460	81
Pond F	3 - 2 - 2	210	91
Pond G	3 - 3 - 1	460	81
Pond H	3 - 3 - 1	460	81

1st Reading collected on 02.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)

Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 0	43	71
Pond B	2 - 1 - 0	15	90
Pond C	3 - 0 - 1	39	74
Pond D	2 - 0 - 1	14	91
Pond E	2 - 1 - 1	20	87
Pond F	1 - 2 - 0	11	93
Pond G	2 - 2 - 1	28	81
Pond H	3 - 0 - 1	39	74

2nd Reading collected on 05.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	2 - 1 - 1	20	87
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

3rd Reading collected on 07.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 0 - 2	64	57
Pond B	3 - 0 - 0	23	85
Pond C	3 - 1 - 0	43	71
Pond D	2 - 1 - 0	15	90
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

4th Reading collected on 09.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 2	460	
Pond A	3 - 3 - 2	460	0
Pond B	3 - 2 - 2	210	54
Pond C	3 - 3 - 2	460	0
Pond D	3 - 2 - 2	210	54

Pond E	3 - 2 - 2	210	54
Pond F	3 - 2 - 2	210	54
Pond G	3 - 2 - 2	210	54
Pond H	3 - 2 - 2	210	54

5th Reading collected on 11.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 0 - 0	23	90
Pond B	2 - 0 - 1	14	94
Pond C	3 - 0 - 0	23	90
Pond D	2 - 0 - 1	14	94
Pond E	2 - 1 - 0	15	94
Pond F	1 - 2 - 0	11	95
Pond G	3 - 0 - 0	23	90
Pond H	3 - 0 - 0	23	90

6th Reading collected on 14.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 1	150	
Pond A	3 - 2 - 1	150	0
Pond B	3 - 1 - 0	43	71
Pond C	3 - 2 - 0	93	38
Pond D	3 - 1 - 0	43	71
Pond E	3 - 1 - 0	43	71
Pond F	3 - 1 - 0	43	71
Pond G	3 - 1 - 1	75	50
Pond H	3 - 1 - 1	75	50

7th Reading collected on 16.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

8th Reading collected on 18.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	150	38
Pond B	3 - 0 - 2	64	73
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 2	64	73
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 1 - 2	93	61
Pond H	3 - 1 - 2	93	61

9th Reading collected on 21.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 0	93	61
Pond B	2 - 2 - 1	28	88
Pond C	3 - 0 - 2	64	73
Pond D	3 - 0 - 0	23	90
Pond E	3 - 1 - 0	39	84
Pond F	3 - 0 - 0	20	92
Pond G	3 - 0 - 2	64	73
Pond H	3 - 0 - 2	64	73

10th Reading collected on 24.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 3 - 0	240	
Pond A	3 - 2 - 1	150	38
Pond B	3 - 1 - 0	43	82
Pond C	3 - 1 - 2	120	50
Pond D	3 - 0 - 1	39	84
Pond E	3 - 0 - 2	64	73
Pond F	2 - 2 - 1	28	88
Pond G	3 - 2 - 0	93	61
Pond H	3 - 2 - 0	93	61

11th Reading collected on 26.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)

Influent	3 - 2 - 1	150	
Pond A	3 - 1 - 1	75	50
Pond B	2 - 2 - 1	28	81
Pond C	3 - 0 - 2	64	57
Pond D	3 - 0 - 0	23	85
Pond E	2 - 2 - 1	28	81
Pond F	2 - 1 - 0	15	90
Pond G	3 - 1 - 0	43	71
Pond H	3 - 1 - 0	43	71

12th Reading collected on 30.04.14

E - COLI

Sample	E-Coli	MPN/100ml (mg/l)	Efficiency (%)
Influent	3 - 2 - 2	210	
Pond A	3 - 2 - 0	93	56
Pond B	3 - 1 - 0	39	81
Pond C	3 - 1 - 1	75	64
Pond D	3 - 0 - 0	23	89
Pond E	3 - 1 - 0	43	80
Pond F	2 - 2 - 0	21	90
Pond G	3 - 0 - 2	64	70
Pond H	3 - 0 - 2	64	70

TRACERS STUDIES - POND D (Set 2 - V_1)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.6	18.6	0	0.0141	0	50	0	0	0	0
15	18.6	16.3	2.3	0.0141	111.88	50	2.24	15	33.57	2520.987
20	18.6	17.5	1.1	0.0141	53.51	50	1.07	20	21.40	490.2783
25	18.6	16.5	2.1	0.0141	102.15	50	2.04	25	51.08	5330.188
30	18.6	17.5	1.1	0.0141	53.51	50	1.07	30	32.11	1103.126
35	18.6	18	0.6	0.0141	29.19	50	0.58	35	20.43	243.6657
40	18.6	17.5	1.1	0.0141	53.51	50	1.07	40	42.81	1961.113
50	18.6	17.4	1.2	0.0141	58.37	50	1.17	50	58.37	3978.216
60	18.6	18.3	0.3	0.0141	14.59	50	0.29	60	17.51	89.50986
70	18.6	18.6	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.6	18.6	0	0.0141	0.00	50	0.00	90	0.00	0
							9.5344	**435**	**277.277**	**15717.08**

TRACERS STUDIES - POND D (Set 2 - V_2)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$

0	18.3	18.3	0	0.0141	0	50	0	0	0	0
15	18.3	16	2.3	0.0141	111.88	50	2.24	15	33.57	2520.987
20	18.3	17.4	0.9	0.0141	43.78	50	0.88	20	17.51	268.5296
25	18.3	16.3	2	0.0141	97.29	50	1.95	25	48.65	4604.417
30	18.3	16.9	1.4	0.0141	68.10	50	1.36	30	40.86	2274.213
35	18.3	17.4	0.9	0.0141	43.78	50	0.88	35	30.65	822.3718
40	18.3	17.1	1.2	0.0141	58.37	50	1.17	40	46.70	2546.058
50	18.3	17.4	0.9	0.0141	43.78	50	0.88	50	43.78	1678.31
60	18.3	18.3	0	0.0141	0.00	50	0.00	60	0.00	0
70	18.3	18.3	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.3	18.3	0	0.0141	0.00	50	0.00	90	0.00	0
							9.3398	**435**	**261.71**	**14714.89**

TRACERS STUDIES - POND D (Set 2 - V_3)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	18.4	18.4	0	0.0141	0	50	0	0	0	0
15	18.4	15.9	2.5	0.0141	121.61	50	2.43	15	36.48	3237.48
20	18.4	17.4	1	0.0141	48.65	50	0.97	20	19.46	368.3533
25	18.4	16.3	2.1	0.0141	102.15	50	2.04	25	51.08	5330.188
30	18.4	17.4	1	0.0141	48.65	50	0.97	30	29.19	828.795
35	18.4	18.1	0.3	0.0141	14.59	50	0.29	35	10.22	30.45822
40	18.4	17.6	0.8	0.0141	38.92	50	0.78	40	31.13	754.3876
50	18.4	17.9	0.5	0.0141	24.32	50	0.49	50	24.32	287.776
60	18.4	18.4	0	0.0141	0.00	50	0.00	60	0.00	0
70	18.4	18.4	0	0.0141	0.00	50	0.00	70	0.00	0
90	18.4	18.4	0	0.0141	0.00	50	0.00	90	0.00	0
							7.9778	**435**	**201.877**	**10837.44**

TRACERS STUDIES - POND D (Set 3 - V_1)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	16.3	16.3	0	0.0141	0	50	0	0	0	0
15	16.3	13.9	2.4	0.0141	116.75	50	2.33	15	35.02	2864.316
20	16.3	15.4	0.9	0.0141	43.78	50	0.88	20	17.51	268.5296
25	16.3	14.1	2.2	0.0141	107.02	50	2.14	25	53.51	6128.479
30	16.3	15.2	1.1	0.0141	53.51	50	1.07	30	32.11	1103.126
35	16.3	15.7	0.6	0.0141	29.19	50	0.58	35	20.43	243.6657
40	16.3	15.7	0.6	0.0141	29.19	50	0.58	40	23.35	318.2573
50	16.3	15.1	1.2	0.0141	58.37	50	1.17	50	58.37	3978.216
60	16.3	16.3	0	0.0141	0.00	50	0.00	60	0.00	0
70	16.3	16.3	0	0.0141	0.00	50	0.00	70	0.00	0
90	16.3	16.3	0	0.0141	0.00	50	0.00	90	0.00	0
							8.7561	**435**	**240.3063**	**14904.59**

TRACERS STUDIES - POND D (Set 3 - V_2)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	15.8	15.8	0	0.0141	0	50	0	0	0	0
15	15.8	13.3	2.5	0.0141	121.61	50	2.43	15	36.48	3237.48
20	15.8	14.8	1	0.0141	48.65	50	0.97	20	19.46	368.3533
25	15.8	13.8	2	0.0141	97.29	50	1.95	25	48.65	4604.417
30	15.8	14.4	1.4	0.0141	68.10	50	1.36	30	40.86	2274.213
35	15.8	15.2	0.6	0.0141	29.19	50	0.58	35	20.43	243.6657
40	15.8	14.2	1.6	0.0141	77.83	50	1.56	40	62.27	6035.101
50	15.8	14.9	0.9	0.0141	43.78	50	0.88	50	43.78	1678.31
60	15.8	15.8	0	0.0141	0.00	50	0.00	60	0.00	0
70	15.8	15.8	0	0.0141	0.00	50	0.00	70	0.00	0
90	15.8	15.8	0	0.0141	0.00	50	0.00	90	0.00	0
							9.729	**435**	**271.9256**	**18441.54**

TRACERS STUDIES - POND D (Set 3 - V_3)

t(min.)	a	b	(a-b)	N	(a-b)*N*3450	ml of sample	C_i	t_i	C_it_i	$C_it_i^2$
0	15.2	15.2	0	0.0141	0	50	0	0	0	0
15	15.2	12.6	2.6	0.0141	126.48	50	2.53	15	37.94	3641.725
20	15.2	14.5	0.7	0.0141	34.05	50	0.68	20	13.62	126.3452
25	15.2	13.1	2.1	0.0141	102.15	50	2.04	25	51.08	5330.188
30	15.2	13.6	1.6	0.0141	77.83	50	1.56	30	46.70	3394.744
35	15.2	14.1	1.1	0.0141	53.51	50	1.07	35	37.46	1501.477
40	15.2	13.6	1.6	0.0141	77.83	50	1.56	40	62.27	6035.101
50	15.2	14.5	0.7	0.0141	34.05	50	0.68	50	34.05	789.6575
60	15.2	15.2	0	0.0141	0.00	50	0.00	60	0.00	0
70	15.2	15.2	0	0.0141	0.00	50	0.00	70	0.00	0
90	15.2	15.2	0	0.0141	0.00	50	0.00	90	0.00	0
							10.11816	**435**	**283.1139**	**20819.24**

APPENDIX C

DETERMINATION OF DAILY SOLAR ALTITUDE ANGLES FOR 365 DAYS

Day Number	Angular Fractional of a Year	Sun Declination	T(GMT)	T(GMT)	Solar Hour Angle	Solar elevation angle
n	d	D			SHA	
1	0.000	-23.012	12:04	12.07	-5.543	59.644
2	0.986	-22.931	12:04	12.07	-5.496	59.731
3	1.971	-22.843	12:04	12.07	-5.451	59.826
4	2.957	-22.748	12:05	12.08	-5.166	59.967
5	3.943	-22.647	12:05	12.08	-5.123	60.074
6	4.928	-22.538	12:06	12.10	-4.826	60.228
7	5.914	-22.424	12:06	12.10	-4.785	60.347
8	6.900	-22.302	12:07	12.12	-4.492	60.511
9	7.885	-22.174	12:07	12.12	-4.454	60.643
10	8.871	-22.040	12:08	12.13	-4.179	60.815
11	9.856	-21.898	12:08	12.13	-4.145	60.959
12	10.842	-21.751	12:08	12.13	-4.113	61.110
13	11.828	-21.597	12:09	12.15	-3.828	61.300
14	12.813	-21.436	12:09	12.15	-3.800	61.462
15	13.799	-21.269	12:09	12.15	-3.774	61.631
16	14.785	-21.096	12:10	12.17	-3.494	61.837
17	15.770	-20.917	12:10	12.17	-3.473	62.018
18	16.756	-20.731	12:10	12.17	-3.453	62.204
19	17.742	-20.540	12:11	12.18	-3.195	62.424
20	18.727	-20.342	12:11	12.18	-3.180	62.622
21	19.713	-20.138	12:11	12.18	-3.167	62.826
22	20.699	-19.928	12:12	12.20	-2.902	63.063
23	21.684	-19.713	12:12	12.20	-2.893	63.279
24	22.670	-19.491	12:12	12.20	-2.888	63.499
25	23.656	-19.264	12:12	12.20	-2.884	63.726
26	24.641	-19.031	12:13	12.22	-2.633	63.983
27	25.627	-18.792	12:13	12.22	-2.635	64.220
28	26.612	-18.548	12:13	12.22	-2.639	64.463
29	27.598	-18.298	12:13	12.22	-2.646	64.710
30	28.584	-18.043	12:13	12.22	-2.656	64.963
31	29.569	-17.782	12:13	12.22	-2.668	65.221
32	30.555	-17.516	12:14	12.23	-2.438	65.508
33	31.541	-17.246	12:14	12.23	-2.455	65.776
34	32.526	-16.969	12:14	12.23	-2.475	66.048
35	33.512	-16.688	12:14	12.23	-2.498	66.326
36	34.498	-16.402	12:14	12.23	-2.523	66.607
37	35.483	-16.111	12:14	12.23	-2.551	66.894
38	36.469	-15.816	12:14	12.23	-2.581	67.184
39	37.455	-15.515	12:14	12.23	-2.614	67.479
40	38.440	-15.210	12:14	12.23	-2.650	67.777
41	39.426	-14.901	12:14	12.23	-2.688	68.080
42	40.412	-14.587	12:14	12.23	-2.728	68.386

43	41.397	-14.269	12:14	12.23	-2.771	68.696
44	42.383	-13.946	12:14	12.23	-2.817	69.010
45	43.369	-13.620	12:14	12.23	-2.865	69.327
46	44.354	-13.289	12:14	12.23	-2.916	69.647
47	45.340	-12.955	12:14	12.23	-2.968	69.970
48	46.325	-12.616	12:14	12.23	-3.023	70.297
49	47.311	-12.274	12:14	12.23	-3.081	70.626
50	48.297	-11.928	12:14	12.23	-3.140	70.957
51	49.282	-11.579	12:14	12.23	-3.202	71.291
52	50.268	-11.226	12:14	12.23	-3.266	71.627
53	51.254	-10.870	12:13	12.22	-3.576	71.919
54	52.239	-10.511	12:13	12.22	-3.644	72.257
55	53.225	-10.149	12:13	12.22	-3.714	72.597
56	54.211	-9.783	12:13	12.22	-3.786	72.938
57	55.196	-9.415	12:13	12.22	-3.859	73.280
58	56.182	-9.044	12:13	12.22	-3.934	73.623
59	57.168	-8.670	12:13	12.22	-4.011	73.967
60	58.153	-8.294	12:12	12.20	-4.340	74.244
61	59.139	-7.915	12:12	12.20	-4.420	74.585
62	60.125	-7.534	12:12	12.20	-4.501	74.925
63	61.110	-7.150	12:12	12.20	-4.584	75.265
64	62.096	-6.765	12:11	12.18	-4.918	75.522
65	63.081	-6.377	12:11	12.18	-5.004	75.856
66	64.067	-5.988	12:11	12.18	-5.090	76.188
67	65.053	-5.597	12:11	12.18	-5.177	76.517
68	66.038	-5.204	12:11	12.18	-5.265	76.844
69	67.024	-4.810	12:10	12.17	-5.598	77.065
70	68.010	-4.414	12:10	12.17	-5.688	77.380
71	68.995	-4.017	12:10	12.17	-5.778	77.692
72	69.981	-3.619	12:09	12.15	-6.123	77.872
73	70.967	-3.219	12:09	12.15	-6.214	78.168
74	71.952	-2.819	12:09	12.15	-6.306	78.457
75	72.938	-2.418	12:09	12.15	-6.397	78.740
76	73.924	-2.016	12:08	12.13	-6.744	78.863
77	74.909	-1.613	12:08	12.13	-6.835	79.124
78	75.895	-1.210	12:08	12.13	-6.927	79.376
79	76.881	-0.807	12:07	12.12	-7.263	79.452
80	77.866	-0.404	12:07	12.12	-7.354	79.677
81	78.852	0.000	12:07	12.12	-7.445	79.892
82	79.837	0.404	12:07	12.12	-7.535	80.094
83	80.823	0.807	12:06	12.10	-7.875	80.087
84	81.809	1.210	12:06	12.10	-7.964	80.257
85	82.794	1.613	12:06	12.10	-8.052	80.412
86	83.780	2.016	12:05	12.08	-8.389	80.339
87	84.766	2.418	12:05	12.08	-8.475	80.459
88	85.751	2.819	12:05	12.08	-8.560	80.565

89	86.737	3.219	12:04	12.07	-8.893	80.425
90	87.723	3.619	12:04	12.07	-8.976	80.495
91	88.708	4.017	12:04	12.07	-9.057	80.548
92	89.694	4.414	12:04	12.07	-9.136	80.586
93	90.680	4.810	12:03	12.05	-9.465	80.365
94	91.665	5.204	12:03	12.05	-9.541	80.369
95	92.651	5.597	12:03	12.05	-9.615	80.359
96	93.637	5.988	12:02	12.03	-9.943	80.082
97	94.622	6.377	12:02	12.03	-10.014	80.042
98	95.608	6.765	12:02	12.03	-10.082	79.989
99	96.593	7.150	12:02	12.03	-10.149	79.923
100	97.579	7.534	12:01	12.02	-10.457	79.603
101	98.565	7.915	12:01	12.02	-10.519	79.515
102	99.550	8.294	12:01	12.02	-10.579	79.416
103	100.536	8.670	12:01	12.02	-10.636	79.307
104	101.522	9.044	12:00	12.00	-10.941	78.946
105	102.507	9.415	12:00	12.00	-10.993	78.822
106	103.493	9.783	12:00	12.00	-11.043	78.690
107	104.479	10.149	12:00	12.00	-11.089	78.551
108	105.464	10.511	11:59	11.98	-11.388	78.167
109	106.450	10.870	11:59	11.98	-11.429	78.018
110	107.436	11.226	11:59	11.98	-11.467	77.865
111	108.421	11.579	11:59	11.98	-11.502	77.707
112	109.407	11.928	11:59	11.98	-11.534	77.546
113	110.393	12.274	11:58	11.97	-11.803	77.167
114	111.378	12.616	11:58	11.97	-11.829	77.002
115	112.364	12.955	11:58	11.97	-11.852	76.834
116	113.350	13.289	11:58	11.97	-11.871	76.665
117	114.335	13.620	11:58	11.97	-11.888	76.494
118	115.321	13.946	11:57	11.95	-12.156	76.108
119	116.306	14.269	11:57	11.95	-12.166	75.938
120	117.292	14.587	11:57	11.95	-12.172	75.769
121	118.278	14.901	11:57	11.95	-12.175	75.599
122	119.263	15.210	11:57	11.95	-12.175	75.430
123	120.249	15.515	11:57	11.95	-12.172	75.262
124	121.235	15.816	11:57	11.95	-12.165	75.094
125	122.220	16.111	11:57	11.95	-12.154	74.928
126	123.206	16.402	11:57	11.95	-12.141	74.764
127	124.192	16.688	11:57	11.95	-12.124	74.602
128	125.177	16.969	11:56	11.93	-12.358	74.251
129	126.163	17.246	11:56	11.93	-12.334	74.095
130	127.149	17.516	11:56	11.93	-12.307	73.942
131	128.134	17.782	11:56	11.93	-12.277	73.792
132	129.120	18.043	11:56	11.93	-12.243	73.645
133	130.106	18.298	11:56	11.93	-12.206	73.500
134	131.091	18.548	11:56	11.93	-12.165	73.359

135	132.077	18.792	11:56	11.93	-12.121	73.221
136	133.062	19.031	11:56	11.93	-12.075	73.087
137	134.048	19.264	11:56	11.93	-12.024	72.956
138	135.034	19.491	11:56	11.93	-11.971	72.830
139	136.019	19.713	11:56	11.93	-11.915	72.707
140	137.005	19.928	11:57	11.95	-11.600	72.751
141	137.991	20.138	11:57	11.95	-11.538	72.634
142	138.976	20.342	11:57	11.95	-11.473	72.522
143	139.962	20.540	11:57	11.95	-11.404	72.414
144	140.948	20.731	11:57	11.95	-11.333	72.310
145	141.933	20.917	11:57	11.95	-11.259	72.212
146	142.919	21.096	11:57	11.95	-11.183	72.117
147	143.905	21.269	11:57	11.95	-11.104	72.028
148	144.890	21.436	11:57	11.95	-11.022	71.944
149	145.876	21.597	11:57	11.95	-10.937	71.864
150	146.862	21.751	11:58	11.97	-10.596	71.930
151	147.847	21.898	11:58	11.97	-10.506	71.859
152	148.833	22.040	11:58	11.97	-10.415	71.793
153	149.818	22.174	11:58	11.97	-10.321	71.732
154	150.804	22.302	11:58	11.97	-10.226	71.676
155	151.790	22.424	11:58	11.97	-10.128	71.625
156	152.775	22.538	11:59	11.98	-9.789	71.700
157	153.761	22.647	11:59	11.98	-9.687	71.659
158	154.747	22.748	11:59	11.98	-9.584	71.623
159	155.732	22.843	11:59	11.98	-9.479	71.593
160	156.718	22.931	11:59	11.98	-9.373	71.568
161	157.704	23.012	11:59	11.98	-9.265	71.548
162	158.689	23.086	12:00	12.00	-8.901	71.650
163	159.675	23.153	12:00	12.00	-8.791	71.640
164	160.661	23.214	12:00	12.00	-8.679	71.636
165	161.646	23.268	12:00	12.00	-8.566	71.638
166	162.632	23.314	12:01	12.02	-8.203	71.750
167	163.618	23.354	12:01	12.02	-8.088	71.762
168	164.603	23.387	12:01	12.02	-7.973	71.779
169	165.589	23.413	12:01	12.02	-7.858	71.802
170	166.574	23.432	12:01	12.02	-7.742	71.831
171	167.560	23.445	12:02	12.03	-7.381	71.959
172	168.546	23.450	12:02	12.03	-7.264	71.998
173	169.531	23.448	12:02	12.03	-7.147	72.043
174	170.517	23.439	12:02	12.03	-7.030	72.094
175	171.503	23.424	12:02	12.03	-6.913	72.150
176	172.488	23.401	12:03	12.05	-6.542	72.301
177	173.474	23.372	12:03	12.05	-6.425	72.368
178	174.460	23.335	12:03	12.05	-6.309	72.441
179	175.445	23.292	12:03	12.05	-6.194	72.519
180	176.431	23.242	12:03	12.05	-6.079	72.603

181	177.417	23.184	12:04	12.07	-5.710	72.773
182	178.402	23.120	12:04	12.07	-5.596	72.868
183	179.388	23.050	12:04	12.07	-5.484	72.969
184	180.374	22.972	12:04	12.07	-5.373	73.076
185	181.359	22.887	12:04	12.07	-5.262	73.188
186	182.345	22.796	12:05	12.08	-4.909	73.374
187	183.331	22.698	12:05	12.08	-4.801	73.497
188	184.316	22.593	12:05	12.08	-4.695	73.626
189	185.302	22.482	12:05	12.08	-4.590	73.761
190	186.287	22.364	12:05	12.08	-4.487	73.901
191	187.273	22.239	12:05	12.08	-4.386	74.047
192	188.259	22.108	12:06	12.10	-4.036	74.260
193	189.244	21.970	12:06	12.10	-3.938	74.416
194	190.230	21.825	12:06	12.10	-3.843	74.578
195	191.216	21.675	12:06	12.10	-3.749	74.746
196	192.201	21.517	12:06	12.10	-3.658	74.919
197	193.187	21.354	12:06	12.10	-3.569	75.098
198	194.173	21.184	12:06	12.10	-3.482	75.283
199	195.158	21.007	12:06	12.10	-3.397	75.472
200	196.144	20.825	12:06	12.10	-3.315	75.668
201	197.130	20.636	12:06	12.10	-3.236	75.868
202	198.115	20.442	12:06	12.10	-3.159	76.074
203	199.101	20.241	12:06	12.10	-3.085	76.286
204	200.087	20.034	12:06	12.10	-3.014	76.502
205	201.072	19.821	12:07	12.12	-2.695	76.774
206	202.058	19.602	12:07	12.12	-2.629	77.001
207	203.043	19.378	12:07	12.12	-2.566	77.233
208	204.029	19.148	12:06	12.10	-2.757	77.420
209	205.015	18.912	12:06	12.10	-2.700	77.662
210	206.000	18.670	12:06	12.10	-2.646	77.909
211	206.986	18.423	12:06	12.10	-2.595	78.160
212	207.972	18.171	12:06	12.10	-2.548	78.417
213	208.957	17.913	12:06	12.10	-2.503	78.677
214	209.943	17.650	12:06	12.10	-2.462	78.943
215	210.929	17.382	12:06	12.10	-2.424	79.212
216	211.914	17.108	12:06	12.10	-2.389	79.486
217	212.900	16.830	12:06	12.10	-2.357	79.765
218	213.886	16.546	12:06	12.10	-2.328	80.047
219	214.871	16.257	12:06	12.10	-2.303	80.333
220	215.857	15.964	12:06	12.10	-2.281	80.623
221	216.843	15.666	12:05	12.08	-2.518	80.852
222	217.828	15.363	12:05	12.08	-2.502	81.147
223	218.814	15.056	12:05	12.08	-2.490	81.445
224	219.799	14.744	12:05	12.08	-2.481	81.745
225	220.785	14.428	12:05	12.08	-2.475	82.048
226	221.771	14.108	12:05	12.08	-2.473	82.352

227	222.756	13.784	12:04	12.07	-2.714	82.577
228	223.742	13.455	12:04	12.07	-2.718	82.881
229	224.728	13.122	12:04	12.07	-2.725	83.184
230	225.713	12.786	12:04	12.07	-2.735	83.488
231	226.699	12.446	12:04	12.07	-2.749	83.789
232	227.685	12.102	12:03	12.05	-3.020	83.969
233	228.670	11.754	12:03	12.05	-3.040	84.257
234	229.656	11.403	12:03	12.05	-3.062	84.541
235	230.642	11.049	12:03	12.05	-3.088	84.816
236	231.627	10.691	12:02	12.03	-3.367	84.924
237	232.613	10.330	12:02	12.03	-3.398	85.168
238	233.599	9.966	12:02	12.03	-3.432	85.397
239	234.584	9.599	12:01	12.02	-3.718	85.411
240	235.570	9.230	12:01	12.02	-3.757	85.588
241	236.555	8.857	12:01	12.02	-3.799	85.738
242	237.541	8.482	12:01	12.02	-3.844	85.858
243	238.527	8.105	12:00	12.00	-4.141	85.709
244	239.512	7.725	12:00	12.00	-4.191	85.753
245	240.498	7.342	12:00	12.00	-4.243	85.762
246	241.484	6.958	11:59	11.98	-4.552	85.480
247	242.469	6.571	11:59	11.98	-4.608	85.414
248	243.455	6.183	11:59	11.98	-4.667	85.315
249	244.441	5.793	11:58	11.97	-4.967	84.950
250	245.426	5.401	11:58	11.97	-5.030	84.792
251	246.412	5.007	11:58	11.97	-5.094	84.606
252	247.398	4.612	11:57	11.95	-5.415	84.163
253	248.383	4.216	11:57	11.95	-5.483	83.938
254	249.369	3.818	11:57	11.95	-5.552	83.692
255	250.355	3.419	11:56	11.93	-5.878	83.212
256	251.340	3.019	11:56	11.93	-5.950	82.939
257	252.326	2.618	11:55	11.92	-6.269	82.452
258	253.312	2.217	11:55	11.92	-6.343	82.158
259	254.297	1.815	11:55	11.92	-6.419	81.853
260	255.283	1.412	11:54	11.90	-6.747	81.346
261	256.268	1.009	11:54	11.90	-6.825	81.027
262	257.254	0.605	11:54	11.90	-6.904	80.700
263	258.240	0.202	11:53	11.88	-7.238	80.181
264	259.225	-0.202	11:53	11.88	-7.319	79.844
265	260.211	-0.605	11:53	11.88	-7.399	79.503
266	261.197	-1.009	11:52	11.87	-7.720	78.990
267	262.182	-1.412	11:52	11.87	-7.802	78.642
268	263.168	-1.815	11:52	11.87	-7.884	78.291
269	264.154	-2.217	11:51	11.85	-8.221	77.767
270	265.139	-2.618	11:51	11.85	-8.303	77.412
271	266.125	-3.019	11:51	11.85	-8.384	77.055
272	267.111	-3.419	11:50	11.83	-8.721	76.532

273	268.096	-3.818	11:50	11.83	-8.803	76.174
274	269.082	-4.216	11:50	11.83	-8.884	75.815
275	270.068	-4.612	11:49	11.82	-9.209	75.302
276	271.053	-5.007	11:49	11.82	-9.289	74.943
277	272.039	-5.401	11:49	11.82	-9.369	74.584
278	273.024	-5.793	11:48	11.80	-9.698	74.073
279	274.010	-6.183	11:48	11.80	-9.776	73.715
280	274.996	-6.571	11:48	11.80	-9.853	73.358
281	275.981	-6.958	11:47	11.78	-10.184	72.852
282	276.967	-7.342	11:47	11.78	-10.259	72.498
283	277.953	-7.725	11:47	11.78	-10.333	72.145
284	278.938	-8.105	11:47	11.78	-10.406	71.793
285	279.924	-8.482	11:46	11.77	-10.717	71.307
286	280.910	-8.857	11:46	11.77	-10.787	70.960
287	281.895	-9.230	11:46	11.77	-10.855	70.615
288	282.881	-9.599	11:46	11.77	-10.922	70.272
289	283.867	-9.966	11:46	11.77	-10.987	69.931
290	284.852	-10.330	11:45	11.75	-11.306	69.454
291	285.838	-10.691	11:45	11.75	-11.368	69.120
292	286.824	-11.049	11:45	11.75	-11.428	68.788
293	287.809	-11.403	11:45	11.75	-11.486	68.459
294	288.795	-11.754	11:45	11.75	-11.542	68.133
295	289.780	-12.102	11:44	11.73	-11.851	67.678
296	290.766	-12.446	11:44	11.73	-11.903	67.360
297	291.752	-12.786	11:44	11.73	-11.953	67.046
298	292.737	-13.122	11:44	11.73	-12.000	66.735
299	293.723	-13.455	11:44	11.73	-12.046	66.428
300	294.709	-13.784	11:44	11.73	-12.089	66.125
301	295.694	-14.108	11:44	11.73	-12.130	65.825
302	296.680	-14.428	11:44	11.73	-12.169	65.530
303	297.666	-14.744	11:44	11.73	-12.205	65.239
304	298.651	-15.056	11:44	11.73	-12.239	64.953
305	299.637	-15.363	11:44	11.73	-12.271	64.671
306	300.623	-15.666	11:44	11.73	-12.300	64.394
307	301.608	-15.964	11:44	11.73	-12.326	64.121
308	302.594	-16.257	11:44	11.73	-12.351	63.853
309	303.580	-16.546	11:44	11.73	-12.372	63.590
310	304.565	-16.830	11:44	11.73	-12.392	63.332
311	305.551	-17.108	11:44	11.73	-12.408	63.079
312	306.536	-17.382	11:44	11.73	-12.422	62.831
313	307.522	-17.650	11:44	11.73	-12.434	62.588
314	308.508	-17.913	11:44	11.73	-12.443	62.351
315	309.493	-18.171	11:44	11.73	-12.450	62.119
316	310.479	-18.423	11:44	11.73	-12.454	61.892
317	311.465	-18.670	11:44	11.73	-12.456	61.671
318	312.450	-18.912	11:44	11.73	-12.456	61.456

319	313.436	-19.148	11:45	11.75	-12.198	61.353
320	314.422	-19.378	11:45	11.75	-12.192	61.148
321	315.407	-19.602	11:45	11.75	-12.184	60.948
322	316.393	-19.821	11:45	11.75	-12.174	60.755
323	317.379	-20.034	11:45	11.75	-12.162	60.568
324	318.364	-20.241	11:46	11.77	-11.892	60.487
325	319.350	-20.442	11:46	11.77	-11.875	60.310
326	320.336	-20.636	11:46	11.77	-11.856	60.140
327	321.321	-20.825	11:46	11.77	-11.834	59.976
328	322.307	-21.007	11:47	11.78	-11.571	59.908
329	323.293	-21.184	11:47	11.78	-11.545	59.756
330	324.278	-21.354	11:47	11.78	-11.518	59.609
331	325.264	-21.517	11:48	11.80	-11.233	59.561
332	326.249	-21.675	11:48	11.80	-11.202	59.427
333	327.235	-21.825	11:48	11.80	-11.169	59.299
334	328.221	-21.970	11:49	11.82	-10.879	59.264
335	329.206	-22.108	11:49	11.82	-10.843	59.148
336	330.192	-22.239	11:49	11.82	-10.804	59.039
337	331.178	-22.364	11:50	11.83	-10.525	59.015
338	332.163	-22.482	11:50	11.83	-10.483	58.918
339	333.149	-22.593	11:51	11.85	-10.186	58.908
340	334.135	-22.698	11:51	11.85	-10.142	58.823
341	335.120	-22.796	11:52	11.87	-9.841	58.823
342	336.106	-22.887	11:52	11.87	-9.795	58.750
343	337.092	-22.972	11:52	11.87	-9.748	58.685
344	338.077	-23.050	11:53	11.88	-9.459	58.696
345	339.063	-23.120	11:53	11.88	-9.410	58.643
346	340.049	-23.184	11:54	11.90	-9.104	58.668
347	341.034	-23.242	11:54	11.90	-9.053	58.628
348	342.020	-23.292	11:55	11.92	-8.747	58.663
349	343.005	-23.335	11:55	11.92	-8.694	58.635
350	343.991	-23.372	11:56	11.93	-8.402	58.676
351	344.977	-23.401	11:56	11.93	-8.348	58.662
352	345.962	-23.424	11:57	11.95	-8.040	58.717
353	346.948	-23.439	11:57	11.95	-7.986	58.715
354	347.934	-23.448	11:58	11.97	-7.677	58.781
355	348.919	-23.450	11:58	11.97	-7.624	58.792
356	349.905	-23.445	11:59	11.98	-7.330	58.864
357	350.891	-23.432	11:59	11.98	-7.276	58.888
358	351.876	-23.413	12:00	12.00	-6.968	58.974
359	352.862	-23.387	12:00	12.00	-6.915	59.010
360	353.848	-23.354	12:01	12.02	-6.607	59.107
361	354.833	-23.314	12:01	12.02	-6.555	59.156
362	355.819	-23.268	12:02	12.03	-6.263	59.260
363	356.805	-23.214	12:02	12.03	-6.212	59.322
364	357.790	-23.153	12:03	12.05	-5.907	59.439

365	358.776	-23.086	12:03	12.05	-5.858	59.514

APPENDIX D

DEPENDENT VARIABLE OF BOD_5 VERSUS INDEPENDENT VARIABLES

BOD	pH	Temp	Algae	DO	Velocity	Jump location from inlet	Angle of inclination causing jump	solar radiation
65	8	31.1	194.4	9.7	0.39	0.5	23.5	0.20
55	8.5	31.4	226.7	9.4	0.39	0.5	23.5	0.29
60	10.1	31.6	238.7	9.3	0.39	0.5	23.5	0.31
30	10.9	34.5	356.1	8.5	0.39	0.5	23.5	0.69
65	9.4	29.9	194.4	9.5	0.39	0.5	23.5	0.01
60	8.8	32.2	248.8	9.3	0.39	0.5	23.5	0.37
55	9.1	33.2	282.7	8.9	0.39	0.5	23.5	0.45
45	10	33.2	300.0	8.9	0.39	0.5	23.5	0.57
55	9.1	32.7	282.7	9.2	0.39	0.5	23.5	0.40
35	10.2	33.9	303.3	9.0	0.39	0.5	23.5	0.59
35	10.8	34.3	344.2	8.6	0.39	0.5	23.5	0.64
60	8	31.3	204.7	9.6	0.39	0.5	23.5	0.24
70	8	28.2	182.6	9.6	0.42	0.5	23.5	0.12
45	9.4	32.1	300.0	8.8	0.42	0.5	23.5	0.44
45	8.2	28.3	204.7	9.4	0.42	0.5	23.5	0.18
55	8.5	30.2	270.9	9.0	0.42	0.5	23.5	0.39
70	7.9	28	182.6	9.8	0.42	0.5	23.5	0.10
60	8.4	28.3	238.7	9.3	0.42	0.5	23.5	0.35
60	8.1	28.2	194.4	9.5	0.42	0.5	23.5	0.13
50	8.3	28.4	226.7	9.3	0.42	0.5	23.5	0.29
55	8.5	29	248.8	9.1	0.42	0.5	23.5	0.35
35	9.5	32.7	304.8	8.8	0.42	0.5	23.5	0.52
45	8.9	31.5	282.7	8.7	0.42	0.5	23.5	0.39
35	9.6	34.3	344.2	8.7	0.42	0.5	23.5	0.57
50	9.6	33.8	293.0	9.5	0.46	0.5	23.5	0.47
55	9.4	33.1	270.9	9.4	0.46	0.5	23.5	0.44
60	9.1	32.6	226.7	9.5	0.46	0.5	23.5	0.39
35	10.2	33.6	366.4	9.0	0.46	0.5	23.5	0.72
60	9.7	33.3	303.3	9.4	0.46	0.5	23.5	0.59
50	9	32.3	260.7	9.2	0.46	0.5	23.5	0.44
55	8.9	32.1	238.6	9.4	0.46	0.5	23.5	0.39
40	9.8	34	347.4	9.5	0.46	0.5	23.5	0.64
80	7.2	31.9	204.7	9.7	0.46	0.5	23.5	0.28
55	9.5	33.8	282.7	9.7	0.46	0.5	23.5	0.45
30	10.3	34	376.6	8.7	0.46	0.5	23.5	0.89
45	9.8	33.9	313.5	9.1	0.46	0.5	23.5	0.62
65	8.5	32.1	272.5	9.9	0.39	0.4	30.0	0.36
45	8.9	32.4	291.5	9.6	0.39	0.4	30.0	0.51
50	9.1	32.6	293.0	9.5	0.39	0.4	30.0	0.52
30	10.8	35.9	378.2	8.7	0.39	0.4	30.0	0.63
60	8.3	30.2	216.5	10.0	0.39	0.4	30.0	0.30
50	9.5	33.2	322.2	9.5	0.39	0.4	30.0	0.53

40	10.1	34.2	326.9	9.2	0.39	0.4	30.0	0.56
35	10.2	34.2	337.2	9.1	0.39	0.4	30.0	0.57
45	9.7	33.7	325.3	9.4	0.39	0.4	30.0	0.54
30	10.4	34.9	347.4	9.1	0.39	0.4	30.0	0.58
30	10.7	35.3	356.1	8.8	0.39	0.4	30.0	0.58
55	8.7	32.3	284.4	9.7	0.39	0.4	30.0	0.44
65	8.5	32.4	284.4	10.1	0.42	0.4	30.0	0.30
55	8.9	32.7	291.4	9.8	0.42	0.4	30.0	0.51
50	9.2	32.9	313.5	9.7	0.42	0.4	30.0	0.52
25	10.9	36.2	393.2	8.9	0.42	0.4	30.0	0.71
70	8.6	30.5	281.1	10.2	0.42	0.4	30.0	0.28
50	9.5	33.5	342.7	9.6	0.42	0.4	30.0	0.54
40	10.1	34.5	372.8	9.4	0.42	0.4	30.0	0.63
35	10.2	34.6	380.2	9.4	0.42	0.4	30.0	0.64
45	9.8	34	362.5	9.6	0.42	0.4	30.0	0.61
30	10.5	35.1	383.2	9.3	0.42	0.4	30.0	0.67
30	10.7	35.8	391.7	9.1	0.42	0.4	30.0	0.67
50	8.7	32.6	286.0	9.9	0.42	0.4	30.0	0.32
60	8.6	32.6	342.2	10.2	0.46	0.4	30.0	0.37
55	9	32.9	372.8	10.0	0.46	0.4	30.0	0.49
50	9.2	33.2	383.1	9.9	0.46	0.4	30.0	0.50
25	11	36.5	510.8	9.1	0.46	0.4	30.0	0.73
70	8.5	30.7	318.5	10.4	0.46	0.4	30.0	0.33
45	9.5	33.7	393.2	9.8	0.46	0.4	30.0	0.55
40	10.1	34.7	423.9	9.6	0.46	0.4	30.0	0.64
35	10.2	34.8	423.9	9.6	0.46	0.4	30.0	0.65
45	9.9	34.3	413.7	9.8	0.46	0.4	30.0	0.62
35	10.5	35.3	444.4	9.5	0.46	0.4	30.0	0.68
30	10.8	36	456.3	9.3	0.46	0.4	30.0	0.73
55	8.8	32.8	352.5	10.1	0.46	0.4	30.0	0.47
75	8.7	31.7	394.9	10.6	0.39	0.3	41.8	0.40
30	10.3	35.7	502.0	9.8	0.39	0.3	41.8	0.63
50	9.4	34.2	471.2	10.1	0.39	0.3	41.8	0.56
30	10.7	36.3	534.3	9.7	0.39	0.3	41.8	0.70
55	8.8	33.6	405.2	10.4	0.39	0.3	41.8	0.47
50	9.2	33.9	449.2	10.2	0.39	0.3	41.8	0.53
40	9.7	34.7	481.5	10.0	0.39	0.3	41.8	0.57
20	11.2	37.5	575.4	9.3	0.39	0.3	41.8	0.75
55	9	33.8	427.2	10.3	0.39	0.3	41.8	0.49
25	11	37	566.7	9.5	0.39	0.3	41.8	0.73
30	10.4	35.8	512.2	9.8	0.39	0.3	41.8	0.65
35	10.1	35.3	491.7	10.0	0.39	0.3	41.8	0.58
70	8.4	31.4	204.7	9.9	0.42	0.3	41.8	0.35
65	8.8	31.7	238.6	9.6	0.42	0.3	41.8	0.40
60	9.1	31.9	248.8	9.5	0.42	0.3	41.8	0.47
30	10.7	35.3	364.7	8.8	0.42	0.3	41.8	0.66

90	8.5	29.5	194.4	10.0	0.42	0.3	41.8	0.23
55	9.4	32.5	282.7	9.4	0.42	0.3	41.8	0.48
45	10	33.5	334.0	9.2	0.42	0.3	41.8	0.51
40	10.1	33.6	303.3	9.2	0.42	0.3	41.8	0.51
50	9.7	33	282.7	9.4	0.42	0.3	41.8	0.49
35	10.4	34.1	344.2	9.1	0.42	0.3	41.8	0.52
30	10.6	34.9	356.1	8.9	0.42	0.3	41.8	0.53
65	8.6	31.6	226.7	9.7	0.42	0.3	41.8	0.37
70	8.5	31.6	282.9	10.0	0.46	0.3	41.8	0.32
65	8.9	31.9	290.0	9.8	0.46	0.3	41.8	0.38
60	9.1	32.2	303.3	9.7	0.46	0.3	41.8	0.38
25	10.9	36.4	390.1	8.8	0.46	0.3	41.8	0.66
80	8.4	29.7	258.9	10.2	0.46	0.3	41.8	0.22
55	9.4	32.7	332.4	9.6	0.46	0.3	41.8	0.46
45	10	34.5	338.8	9.4	0.46	0.3	41.8	0.53
35	10.1	34.8	359.2	9.4	0.46	0.3	41.8	0.56
45	9.8	33.3	337.1	9.6	0.46	0.3	41.8	0.51
30	10.4	35.3	369.6	9.3	0.46	0.3	41.8	0.60
30	10.7	36.1	379.8	9.0	0.46	0.3	41.8	0.62
65	8.7	31.8	284.4	9.9	0.46	0.3	41.8	0.37

APPENDIX E

CLIMATIC DATA FOR EACH DAY AND TIME

TOA5	NSK RECORD/ GEOGRAPHY	CR1000	CR1000.Std.15	

TIMESTAMP TS	STATION RECORD RN	Batt_Volt_Avg Volts Avg	SlrW_Avg W/m^2 Avg	VW Smp
1/5/2013 15:30	59917	14.08	404.9	0.103
10/5/2013 15:30	60349	14.01	366.4	0.061
13-05-13 15:30	60493	13.93	202.8	0.099
15-05-13 15:30	60589	13.99	446.7	0.104
17-05-13 15:30	60685	14.09	291.3	0.114
19-05-13 15:30	60781	13.95	644.6	0.103
21-05-13 15:30	60877	13.99	693.9	0.104
23-05-13 15:30	60973	13.99	574.4	0.098
25-05-13 15:30	61069	12.86	7.24	0.122
28-05-13 15:30	61213	14.05	235.3	0.101
31-05-13 15:30	61357	13.99	590.3	0.104
6/6/2013 15:30	61645	13.97	307.3	0.099
2/8/2013 15:30	64381	14.05	289.6	0.122
5/8/2013 15:30	64525	14.05	352.4	0.103
7/8/2013 15:30	64621	14.06	391.6	0.098
9/8/2013 15:30	64717	14.09	573.9	0.117
12/8/2013 15:30	64861	13.89	96.6	0.108
14-08-13 15:30	64957	13.92	122.1	0.103
16-08-13 15:30	65053	13.98	178.3	0.099
18-08-13 15:30	65149	13.34	125.9	0.101
20-08-13 15:30	65245	13.78	521	0.096
22-08-13 15:30	65341	13.35	283.2	0.121
24-08-13 15:30	65437	12.28	211.2	0.111
27-08-13 15:30	65581	14.08	503	0.111
1/10/2013 15:30	67129	10.6	278.9	0.108
3/10/2013 15:30	67155	11.22	437.3	0.124
5/10/2013 15:00	67177	10.44	718.5	0.111
7/10/2013 15:30	67183	9.17	444.1	0.118
10/10/2013 15:30	67199	9.73	621.1	0.115
12/10/2013 15:30	67220	9.33	394.2	0.108
15-10-13 15:30	67260	9.54	469.9	0.118
21-10-13 15:30	67325	8.93	391.5	0.119
25-10-13 13:30	67327	9.14	891	0.117
27-10-13 13:30	67331	10.96	594.1	0.111
29-10-13 14:30	67335	9.98	637.6	0.106
31-10-13 16:00	67345	9.17	452.4	0.101
2/11/2013 15:30	67351	9.49	555.6	0.099
5/11/2013 15:30	67368	9.17	518.6	0.09
7/11/2013 15:30	67378	9.31	531.8	0.082
9/11/2013 13:30	67388	9.1	536.6	0.074
12/11/2013 15:30	67413	9.68	626.2	0.062
14-11-13 15:30	67442	9.5	577.6	0.066

16-11-13 15:30	67465	11.02	300.3	0.067
18-11-13 15:30	67524	9.64	442.1	0.066
21-11-13 15:30	67561	9.65	582.2	0.064
23-11-13 13:30	67581	9.22	565.1	0.063
25-11-13 15:30	67604	9.32	357.6	0.085
27-11-13 15:30	67634	9.7	512.8	0.091
2/12/2013 14:30	67714	9.56	535.1	0.082
4/12/2013 15:30	67746	9.61	519.9	0.096
7/12/2013 16:00	67808	9.38	315.9	0.088
9/12/2013 15:30	67840	9.85	607	0.084
11/12/2013 15:30	67881	9.06	284.4	0.078
13-12-13 15:30	67899	8.95	300	0.074
17-12-13 15:30	67903	9.47	510	0.06
19-12-13 15:30	67933	9.73	666.6	0.056
21-12-13 15:30	67972	9.77	636.1	0.053
23-12-13 15:30	68015	9.89	629.6	0.052
27-12-13 15:30	68106	10.05	710.2	0.051
30-12-13 15:30	68176	10.04	666	0.05
6/1/2014 15:30	68340	9.87	619.2	0.048
8/1/2014 15:30	68384	10	680.3	0.048
10/1/2014 15:30	68428	9.95	731.6	0.048
13-01-14 15:30	68490	9.9	731.7	0.047
15-01-14 15:30	68535	9.79	644.5	0.047
17-01-14 15:30	68578	9.89	653.7	0.047
20-01-14 15:30	68645	9.27	372.3	0.047
22-01-14 15:30	68678	9.56	488.4	0.047
24-01-14 15:30	68700	9.55	474	0.047
26-01-14 14:30	68726	9.41	492	0.047
28-01-14 12:30	68747	9.06	550.5	0.046
30-01-14 15:00	68800	9.27	332.8	0.047
1/2/2014 15:30	68838	9.44	486.2	0.046
3/2/2014 15:30	68878	9.96	732.7	0.046
5/2/2014 15:30	68919	9.73	651.3	0.046
7/2/2014 15:30	68964	9.85	703.1	0.046
11/2/2014 15:30	69060	9.64	572.2	0.046
13-02-14 15:30	69105	9.97	745.4	0.046
15-02-14 15:30	69148	9.59	399.9	0.045
17-02-14 15:30	69195	9.88	632	0.045
19-02-14 15:30	69239	9.59	584.5	0.045
21-02-14 15:30	69284	9.55	562	0.045
23-02-14 17:00	69329	9.42	470.1	0.045
25-02-14 15:30	69374	9.71	531.7	0.044
3/3/2014 15:30	69531	9.76	469.9	0.093
5/3/2014 15:30	69575	10.31	505.6	0.087
7/3/2014 15:30	69621	9.09	230.2	0.08
11/3/2014 15:30	69708	9.55	372.7	0.068

13-03-14 15:30	69743	10.02	476.7	0.061
15-03-14 15:30	69781	10.18	528.5	0.057
17-03-14 15:30	69821	10.47	661.3	0.054
19-03-14 15:30	69856	9.69	399	0.052
21-03-14 15:30	69893	10.03	511	0.051
25-03-14 15:30	69968	10.25	522.6	0.049
28-03-14 15:30	70014	9.94	488.8	0.053
2/4/2014 15:30	70105	10.5	620.2	0.077
5/4/2014 15:30	70165	10.1	456.4	0.075
7/4/2014 15:30	70205	10.38	559.6	0.066
9/4/2014 15:30	70240	9.17	220.8	0.066
11/4/2014 15:30	70271	10.78	663	0.083
14-04-14 15:30	70331	9.66	316.6	0.077
16-04-14 15:30	70368	10.38	508.1	0.072
18-04-14 15:30	70405	9.97	374.6	0.085
21-04-14 15:30	70466	10.83	595.4	0.093
24-04-14 15:30	70521	10.07	375.3	0.087
26-04-14 15:30	70556	10.13	384.2	0.085
30-04-14 15:30	70622	10.65	527.5	0.096

Source: Centre for Atmospheric Research, National Space Research and Development Agency, Federal Ministry of Science and Technology, Anyigba, Nigeria/Geography Department, University of Nigeria, Nsukka.

APPENDIX F

SUMMARY OF OUTPUT OF REGRESSION ANALYSIS

Regression Statistics	
Multiple R	0.937911
R Square	0.879677
Adjusted R Square	0.869954
Standard Error	5.22354
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*gnificance F*
Regression	8	19748.75	2468.594	90.47316	4.69E-42
Residual	99	2701.252	27.28537		
Total	107	22450			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 90.0%*	*pper 90.0%*
Intercept	-123.452	54.61175	-2.26054	0.025977	-231.813	-15.0904	-214.129	-32.7751
X Variable 1	-2.81805	1.642956	-1.71523	0.089431	-6.07803	0.441932	-5.546	-0.0901
X Variable 2	-0.49194	0.67442	-0.72942	0.467467	-1.83013	0.846261	-1.61174	0.627866
X Variable 3	-0.08732	0.014841	-5.88324	5.49E-08	-0.11676	-0.05787	-0.11196	-0.06267
X Variable 4	16.6776	2.432534	6.85606	6.14E-10	11.85092	21.50427	12.63864	20.71656
X Variable 5	12.68837	18.47712	0.686707	0.493873	-23.9743	49.35099	-17.9909	43.36762
X Variable 6	105.5221	44.64434	2.363618	0.02005	16.93809	194.1062	31.39508	179.6492
X Variable 7	1.165577	0.454581	2.564066	0.011848	0.263588	2.067565	0.410794	1.92036
X Variable 8	1.39793	8.568354	0.16315	0.870733	-15.6035	18.3994	-12.8289	15.62475

APPENDIX G

REFLECTOR ANGLES

APPENDIX H

SUMMARY OF CALCULATED N_e/N_O FOR THE DERIVED AND EXISTING MODEL

MONTH 1 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o
01.05.13	7.7	155	0.17	30.5	0.693	1.394	1.356	0.426
10.05.13	7.4	170	0.17	29.0	0.625	1.360	1.328	0.461
13.05.13	6.5	180	0.17	28.5	0.534	1.314	1.290	0.513
15.05.13	7.6	155	0.17	29.1	0.665	1.380	1.345	0.440
17.05.13	7.1	160	0.17	28.7	0.608	1.352	1.322	0.470
19.05.13	8.7	120	0.17	32.0	0.886	1.485	1.428	0.343
21.05.13	8.8	120	0.17	32.5	0.907	1.495	1.436	0.335
23.05.13	7.7	165	0.17	31.0	0.685	1.390	1.353	0.430
25.05.13	6.3	170	0.17	22.2	0.468	1.279	1.260	0.554
28.05.13	6.7	155	0.17	28.6	0.580	1.338	1.310	0.485
31.05.13	8.2	140	0.17	31.2	0.779	1.435	1.389	0.387
06.06.13	7.2	170	0.17	29.3	0.611	1.353	1.323	0.468

MONTH 1 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2\varepsilon$	$((1+(4\varepsilon I)/(U_c2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c2))^{1/2}$	E ((1
01.05.13	9.1	55	0.00005	0.447	0.2	0.39	33.2	1.104	2.5	1.384	-0.384	
10.05.13	8.8	60	0.00005	0.366	0.2	0.39	32.2	1.027	2.5	1.323	-0.323	
13.05.13	8.0	65	0.00005	0.203	0.2	0.39	31.1	0.889	2.5	1.190	-0.190	
15.05.13	9.1	55	0.00005	0.405	0.2	0.39	32.7	1.093	2.5	1.353	-0.353	
17.05.13	8.5	55	0.00005	0.291	0.2	0.39	31.4	0.980	2.5	1.264	-0.264	
19.05.13	10.8	35	0.00005	0.645	0.2	0.39	34.3	1.494	2.5	1.524	-0.524	
21.05.13	10.9	30	0.00005	0.694	0.2	0.39	34.5	1.538	2.5	1.557	-0.557	
23.05.13	10.0	45	0.00005	0.574	0.2	0.39	33.2	1.279	2.5	1.476	-0.476	
25.05.13	9.4	65	0.00005	0.007	0.2	0.39	29.9	1.055	2.5	1.007	-0.007	
28.05.13	8.0	60	0.00005	0.235	0.2	0.39	31.3	0.902	2.5	1.218	-0.218	
31.05.13	10.2	35	0.00005	0.590	0.2	0.39	33.9	1.363	2.5	1.487	-0.487	
06.06.13	10.1	60	0.00005	0.307	0.2	0.39	31.6	1.217	2.5	1.277	-0.277	

MONTH 2 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o
02.08.13	7.1	180	0.2	26.5	0.558	1.376	1.341	0.524
05.08.13	7.3	165	0.2	26.8	0.596	1.398	1.359	0.503
07.08.13	7.4	135	0.2	28.5	0.667	1.438	1.391	0.466
09.08.13	7.9	140	0.2	31.3	0.748	1.482	1.426	0.427
12.08.13	6.4	135	0.2	25.1	0.542	1.367	1.334	0.533
14.08.13	6.7	170	0.2	25.2	0.525	1.357	1.326	0.543
16.08.13	7.0	140	0.2	26.6	0.601	1.401	1.362	0.500
18.08.13	6.9	150	0.2	26.3	0.577	1.387	1.350	0.514
	7.8	135	0.2	29.1	0.714	1.464	1.412	0.443

20.08.13								
22.09.13	7.7	130	0.2	29.4	0.716	1.465	1.413	0.442
24.09.13	7.2	160	0.2	26.7	0.593	1.396	1.358	0.505
27.09.13	7.5	150	0.2	28.5	0.655	1.431	1.386	0.472

MONTH 2 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2\varepsilon$	$((1+(4\varepsilon I)/(U_c2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c2))^{1/2}$
02.08.13	8.3	50	0.00005	0.290	0.22	0.42	28.4	0.907	2.27	1.268	-0.268
05.08.13	8.5	55	0.00005	0.352	0.22	0.42	29.0	0.934	2.27	1.318	-0.318
07.08.13	8.5	55	0.00005	0.392	0.22	0.42	30.2	0.957	2.27	1.349	-0.349
09.08.13	9.6	35	0.00005	0.574	0.22	0.42	34.3	1.263	2.27	1.484	-0.484
12.08.13	7.9	70	0.00005	0.097	0.22	0.42	28.0	0.815	2.27	1.097	-0.097
14.08.13	8.0	70	0.00005	0.122	0.22	0.42	28.2	0.830	2.27	1.121	-0.121
16.08.13	8.2	45	0.00005	0.178	0.22	0.42	28.3	0.903	2.27	1.172	-0.172
18.08.13	8.1	60	0.00005	0.126	0.22	0.42	28.2	0.860	2.27	1.124	-0.124
20.08.13	9.5	35	0.00005	0.521	0.22	0.42	32.7	1.207	2.27	1.446	-0.446
22.09.13	9.4	45	0.00005	0.438	0.22	0.42	32.1	1.151	2.27	1.385	-0.385
24.09.13	8.4	60	0.00005	0.351	0.22	0.42	28.3	0.899	2.27	1.317	-0.317
27.09.13	8.9	45	0.00005	0.393	0.22	0.42	31.5	1.061	2.27	1.350	-0.350

MONTH 3 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o
01.10.13	6.9	190	0.22	28.5	0.552	1.404	1.365	0.544
03.10.13	7.1	140	0.22	29.0	0.639	1.458	1.407	0.497
05.10.13	7.7	140	0.22	31.0	0.723	1.508	1.446	0.456
07.10.13	7.2	140	0.22	29.8	0.658	1.469	1.416	0.487
10.10.13	7.4	160	0.22	31.6	0.672	1.477	1.423	0.481
12.10.13	7.0	145	0.22	28.9	0.622	1.447	1.399	0.506
15.10.13	7.4	150	0.22	30.8	0.676	1.480	1.424	0.479
21.10.13	7.2	175	0.22	28.7	0.597	1.432	1.387	0.519
25.10.13	7.7	125	0.22	31.0	0.747	1.521	1.456	0.445
27.10.13	7.2	180	0.22	30.7	0.615	1.443	1.395	0.510
29.10.13	7.6	150	0.22	30.1	0.685	1.485	1.429	0.474
31.10.13	7.2	140	0.22	29.8	0.658	1.469	1.416	0.487

MONTH 3 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2\varepsilon$	$((1+(4\varepsilon I)/(U_c2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c2))^{1/2}$
01.10.13	7.2	80	0.00005	0.279	0.24	0.46	31.9	0.782	2.083	1.258	-0.258
03.10.13	9.0	50	0.00005	0.437	0.24	0.46	32.3	1.081	2.083	1.383	-0.383
05.10.13	10.2	35	0.00005	0.719	0.24	0.46	33.6	1.355	2.083	1.581	-0.581

07.10.13	9.4	55	0.00005	0.444	0.24	0.46	33.1	1.149	2.083	1.388	-0.388
10.10.13	9.8	45	0.00005	0.621	0.24	0.46	33.9	1.261	2.083	1.515	-0.515
12.10.13	8.9	55	0.00005	0.394	0.24	0.46	32.1	1.050	2.083	1.350	-0.350
15.10.13	9.6	50	0.00005	0.470	0.24	0.46	33.8	1.211	2.083	1.407	-0.407
21.10.13	9.1	60	0.00005	0.392	0.24	0.46	32.6	1.079	2.083	1.348	-0.348
25.10.13	10.3	30	0.00005	0.891	0.24	0.46	34.0	1.400	2.083	1.691	-0.691
27.10.13	9.7	60	0.00005	0.594	0.24	0.46	33.3	1.190	2.083	1.497	-0.497
29.10.13	9.8	40	0.00005	0.638	0.24	0.46	34.0	1.278	2.083	1.527	-0.527
31.10.13	9.5	55	0.00005	0.453	0.24	0.46	33.8	1.181	2.083	1.394	-0.394

MONTH 4 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o
02.11.13	7.7	150	0.17	31.5	0.715	1.404	1.365	0.416
05.11.13	7.6	165	0.17	30.3	0.666	1.381	1.345	0.439
07.11.13	7.5	160	0.17	30.0	0.660	1.378	1.343	0.442
09.11.13	7.7	155	0.17	30.1	0.688	1.391	1.354	0.429
12.11.13	8.9	135	0.17	33.5	0.908	1.495	1.436	0.335
14.11.13	8.4	125	0.17	32.2	0.844	1.465	1.413	0.360
16.11.13	6.5	145	0.17	27.2	0.561	1.328	1.301	0.496
18.11.13	7.0	160	0.17	29.6	0.611	1.353	1.323	0.468
21.11.13	8.8	135	0.17	33.0	0.887	1.485	1.429	0.343
23.11.13	7.9	140	0.17	32.0	0.758	1.425	1.381	0.395
25.11.13	6.7	175	0.17	29.5	0.566	1.330	1.304	0.493
27.11.13	7.3	145	0.17	29.7	0.659	1.377	1.342	0.443

MONTH 4 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2\varepsilon$	$((1+(4\varepsilon I)/(U_c2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c2))^{1/2}$
02.11.13	10.1	40	0.00005	0.556	0.24	0.39	34.2	1.338	2.083	1.539	-0.539
05.11.13	9.1	50	0.00005	0.519	0.24	0.39	32.6	1.103	2.083	1.509	-0.509
07.11.13	9.5	50	0.00005	0.532	0.24	0.39	33.2	1.180	2.083	1.520	-0.520
09.11.13	9.7	45	0.00005	0.537	0.24	0.39	33.7	1.239	2.083	1.523	-0.523
12.11.13	10.8	30	0.00005	0.626	0.24	0.39	35.9	1.559	2.083	1.594	-0.594
14.11.13	10.4	30	0.00005	0.578	0.24	0.39	34.9	1.445	2.083	1.556	-0.556
16.11.13	8.3	60	0.00005	0.300	0.24	0.39	30.2	0.920	2.083	1.319	-0.319
18.11.13	8.7	55	0.00005	0.442	0.24	0.39	32.3	1.025	2.083	1.445	-0.445
21.11.13	10.7	30	0.00005	0.582	0.24	0.39	35.3	1.519	2.083	1.560	-0.560
23.11.13	10.2	35	0.00005	0.565	0.24	0.39	34.2	1.371	2.083	1.546	-0.546
25.11.13	8.5	65	0.00005	0.358	0.24	0.39	32.1	0.972	2.083	1.371	-0.371
27.11.13	8.9	45	0.00005	0.513	0.24	0.39	32.4	1.080	2.083	1.504	-0.504

MONTH 5 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= ((1+4KθD)$^{1/2}$)	$4a^2/(1+a)^2$	N_e/N_o
02.12.13	7.6	165	0.20	30.3	0.666	1.437	1.391	0.466
04.12.13	7.7	170	0.20	30.5	0.671	1.440	1.393	0.464
07.12.13	7.0	165	0.20	29.9	0.608	1.404	1.365	0.496
09.12.13	7.8	160	0.20	30.4	0.694	1.453	1.403	0.453
11.12.13	6.6	190	0.20	27.5	0.519	1.353	1.323	0.547
13.12.13	6.8	180	0.20	29.8	0.571	1.383	1.348	0.517
17.12.13	7.4	180	0.20	30.0	0.623	1.413	1.372	0.488
19.12.13	8.9	130	0.20	33.3	0.915	1.569	1.492	0.359
21.12.13	8.0	150	0.20	32.3	0.757	1.487	1.430	0.423
23.12.13	7.8	160	0.20	31.8	0.713	1.463	1.412	0.443
27.12.13	9.0	120	0.20	33.8	0.957	1.591	1.508	0.344
30.12.13	8.5	140	0.20	31.7	0.820	1.520	1.456	0.396

MONTH 5 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2ε$	((1+(4εl)/(U_c2))$^{1/2}$	1-((1+(4εl)/(U_c2))$^{1/2}$	
02.12.13	9.5	50	0.00005	0.5351	0.25	0.42	33.5	1.187	2.0	1.508	-0.508	
04.12.13	9.2	50	0.00005	0.5199	0.25	0.42	32.9	1.125	2.0	1.496	-0.496	
07.12.13	8.7	50	0.00005	0.3159	0.25	0.42	32.6	1.043	2.0	1.324	-0.324	
09.12.13	9.8	45	0.00005	0.607	0.25	0.42	34	1.264	2.0	1.564	-0.564	
11.12.13	8.6	70	0.00005	0.2844	0.25	0.42	30.5	0.945	2.0	1.295	-0.295	
13.12.13	8.5	65	0.00005	0.3	0.25	0.42	32.4	0.978	2.0	1.309	-0.309	
17.12.13	8.9	55	0.00005	0.51	0.25	0.42	32.7	1.063	2.0	1.488	-0.488	
19.12.13	10.7	30	0.00005	0.6666	0.25	0.42	35.8	1.534	2.0	1.608	-0.608	
21.12.13	10.2	35	0.00005	0.6361	0.25	0.42	34.6	1.382	2.0	1.586	-0.586	
23.12.13	10.1	40	0.00005	0.6296	0.25	0.42	34.5	1.345	2.0	1.581	-0.581	
27.12.13	10.9	25	0.00005	0.7102	0.25	0.42	36.2	1.607	2.0	1.640	-0.640	
30.12.13	10.5	30	0.00005	0.666	0.25	0.42	35.1	1.471	2.0	1.608	-0.608	

MONTH 6 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= ((1+4KθD)$^{1/2}$)	$4a^2/(1+a)^2$	N_e/N_o
06.01.14	7.8	165	0.22	30.6	0.689	1.488	1.430	0.472
08.01.14	8.6	135	0.22	31.9	0.844	1.576	1.498	0.404
10.01.14	8.7	130	0.22	33.5	0.893	1.604	1.517	0.385
13.01.14	9.0	120	0.22	34	0.961	1.640	1.544	0.360
15.01.14	7.9	160	0.22	32	0.726	1.509	1.447	0.455
17.01.14	7.9	140	0.22	32.5	0.766	1.532	1.465	0.437
20.01.14	6.9	185	0.22	30	0.575	1.419	1.376	0.532
22.01.14	7.5	180	0.22	30.2	0.635	1.455	1.405	0.500

24.01.14	7.1	180	0.22	30.1	0.599	1.433	1.388	0.518
26.01.14	7.7	170	0.22	30.7	0.674	1.478	1.423	0.480
28.01.14	7.9	160	0.22	30.5	0.705	1.497	1.438	0.465
30.01.14	6.7	190	0.22	27.7	0.529	1.389	1.352	0.558

MONTH 6 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_c L/2\varepsilon$	$((1+(4\varepsilon I)/(U_c 2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c 2))^{1/2}$
06.01.14	9.9	45	0.00005	0.619	0.27	0.46	34.3	1.289	1.852	1.566	-0.566
08.01.14	10.5	35	0.00005	0.680	0.27	0.46	35.3	1.461	1.852	1.612	-0.612
10.01.14	10.8	30	0.00005	0.732	0.27	0.46	36.0	1.562	1.852	1.649	-0.649
13.01.14	11.0	25	0.00005	0.732	0.27	0.46	36.5	1.640	1.852	1.649	-0.649
15.01.14	10.1	40	0.00005	0.645	0.27	0.46	34.7	1.351	1.852	1.585	-0.585
17.01.14	10.2	35	0.00005	0.654	0.27	0.46	34.8	1.387	1.852	1.592	-0.592
20.01.14	8.6	60	0.00005	0.372	0.27	0.46	32.6	1.006	1.852	1.369	-0.369
22.01.14	9.0	55	0.00005	0.488	0.27	0.46	32.9	1.082	1.852	1.465	-0.465
24.01.14	8.8	55	0.00005	0.474	0.27	0.46	32.8	1.050	1.852	1.454	-0.454
26.01.14	9.2	50	0.00005	0.500	0.27	0.46	33.2	1.132	1.852	1.474	-0.474
28.01.14	9.5	45	0.00005	0.551	0.27	0.46	33.7	1.205	1.852	1.514	-0.514
30.01.14	8.5	70	0.00005	0.333	0.27	0.46	30.7	0.935	1.852	1.335	-0.335

MONTH 7 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o
01.02.14	7.3	180	0.17	31.1	0.628	1.362	1.330	0.459
03.02.14	8.9	120	0.17	34.5	0.957	1.517	1.453	0.318
05.02.14	8.1	130	0.17	33.5	0.821	1.455	1.405	0.369
07.02.14	8.8	125	0.17	32.9	0.904	1.493	1.435	0.336
11.02.14	8.1	155	0.17	31.5	0.748	1.420	1.377	0.400
13.02.14	9.2	115	0.17	35.0	1.019	1.545	1.474	0.297
15.02.14	6.9	200	0.17	28.7	0.543	1.318	1.293	0.507
17.02.14	8.1	130	0.17	33.0	0.813	1.451	1.402	0.372
19.02.14	8.0	135	0.17	31.6	0.771	1.431	1.386	0.390
21.02.14	7.9	170	0.17	31.7	0.707	1.400	1.361	0.419
23.02.14	7.1	180	0.17	31	0.610	1.353	1.322	0.469
25.02.14	7.7	165	0.17	31.2	0.688	1.391	1.354	0.428

MONTH 7 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_c L/2\varepsilon$	$((1+(4\varepsilon I)/(U_c 2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c 2))^{1/2}$
01.02.14	9.0	55	0.00005	0.486	0.29	0.39	33.8	1.102	1.724	1.564	-0.564
03.02.14	11.0	25	0.00005	0.733	0.29	0.39	37.0	1.656	1.724	1.783	-0.783
05.02.14	10.4	30	0.00005	0.651	0.29	0.39	35.8	1.471	1.724	1.714	-0.714
07.02.14	10.7	30	0.00005	0.703	0.29	0.39	36.3	1.549	1.724	1.758	-0.758
11.02.14	9.7	40	0.00005	0.572	0.29	0.39	34.7	1.277	1.724	1.644	-0.644
13.02.14	11.2	20	0.00005	0.745	0.29	0.39	37.5	1.739	1.724	1.794	-0.794

15.02.14	8.7	75	0.00005	0.400	0.29	0.39	31.7	0.970	1.724	1.480	-0.480
17.02.14	10.3	30	0.00005	0.632	0.29	0.39	35.7	1.448	1.724	1.697	-0.697
19.02.14	10.1	35	0.00005	0.585	0.29	0.39	35.3	1.382	1.724	1.655	-0.655
21.02.14	9.4	50	0.00005	0.562	0.29	0.39	34.2	1.187	1.724	1.634	-0.634
23.02.14	8.8	55	0.00005	0.47	0.29	0.39	33.6	1.067	1.724	1.549	-0.549
25.02.14	9.2	50	0.00005	0.532	0.29	0.39	33.9	1.147	1.724	1.607	-0.607

MONTH 8 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o
01.03.14	6.7	190	0.20	28.8	0.5403	1.3655	1.3329	0.5346
03.03.14	7.6	175	0.20	29.5	0.6417	1.4236	1.3802	0.4786
05.03.14	7.7	165	0.20	30.8	0.6823	1.4463	1.3981	0.4581
07.03.14	6.5	210	0.20	26.5	0.4808	1.3301	1.3034	0.5710
11.03.14	6.9	190	0.20	28.9	0.5567	1.3750	1.3407	0.5250
13.03.14	7.5	170	0.20	29.3	0.6372	1.4211	1.3781	0.4809
15.03.14	8.8	140	0.20	32.5	0.8687	1.5459	1.4748	0.3767
17.03.14	8.9	125	0.20	32.9	0.9172	1.5708	1.4934	0.3584
19.03.14	7.3	180	0.20	29.0	0.6028	1.4016	1.3624	0.4992
21.03.14	7.9	145	0.20	31.3	0.7400	1.4778	1.4229	0.4309
25.03.14	8.4	140	0.20	30.7	0.7927	1.5061	1.4447	0.4077
28.03.14	7.7	160	0.20	29.4	0.6709	1.4399	1.3931	0.4638

MONTH 8 (POND D)

Dates	Ph	BOD	Np	I(kw/m^2)	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2\varepsilon$	$((1+(4\varepsilon I)/(U_c2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c2))^{1/2}$
01.03.14	8.4	70	0.00005	0.348	0.32	0.42	31.4	0.935	1.563	1.435	-0.435
03.03.14	9.1	60	0.00005	0.470	0.32	0.42	31.9	1.064	1.563	1.560	-0.560
05.03.14	10	45	0.00005	0.506	0.32	0.42	33.5	1.287	1.563	1.594	-0.594
07.03.14	8.5	90	0.00005	0.230	0.32	0.42	29.5	0.875	1.563	1.304	-0.304
11.03.14	8.6	65	0.00005	0.373	0.32	0.42	31.6	0.976	1.563	1.461	-0.461
13.03.14	9.4	55	0.00005	0.477	0.32	0.42	32.5	1.135	1.563	1.566	-0.566
15.03.14	10.6	30	0.00005	0.529	0.32	0.42	34.9	1.486	1.563	1.616	-0.616
17.03.14	10.7	30	0.00005	0.661	0.32	0.42	35.3	1.519	1.563	1.736	-0.736
19.03.14	8.8	65	0.00005	0.399	0.32	0.42	31.7	1.006	1.563	1.489	-0.489
21.03.14	10.1	40	0.00005	0.511	0.32	0.42	33.6	1.322	1.563	1.599	-0.599
25.03.14	10.4	35	0.00005	0.523	0.32	0.42	34.1	1.407	1.563	1.610	-0.610
28.03.14	9.7	50	0.00005	0.489	0.32	0.42	33	1.209	1.563	1.578	-0.578

MONTH 9 (POND A)

Dates	Ph	BOD	d	T(°C)	K_T (day^{-1})	a= $((1+4K\theta D)^{1/2})$	$4a^2/(1+a)^2$	N_e/N_o

02.04.14	8.4	140	0.22	32.4	0.820	1.563	1.488	0.414
05.04.14	7.8	170	0.22	29.5	0.667	1.474	1.420	0.483
07.04.14	7.8	145	0.22	31.5	0.733	1.513	1.450	0.452
09.04.14	6.7	200	0.22	26.7	0.507	1.376	1.341	0.571
11.04.14	8.6	120	0.22	33.0	0.891	1.602	1.517	0.386
14.04.14	6.8	190	0.22	29.0	0.550	1.403	1.363	0.546
16.04.14	7.7	160	0.22	29.6	0.674	1.478	1.423	0.480
18.04.14	7.0	180	0.22	29.1	0.579	1.421	1.378	0.529
21.04.14	8.5	135	0.22	30.9	0.816	1.561	1.486	0.415
24.04.14	7.4	180	0.22	29.2	0.614	1.442	1.395	0.511
26.04.14	7.6	175	0.22	29.7	0.644	1.461	1.410	0.495
30.04.14	7.8	165	0.22	31.0	0.695	1.491	1.433	0.470

MONTH 9 (POND D)

Dates	Ph	BOD	Np	$I (kw/m^2)$	d	U(m/s)	T(°C)	K_T (day^{-1})	$u_cL/2\varepsilon$	$((1+(4\varepsilon I)/(U_c2))^{1/2}$	$1-((1+(4\varepsilon I)/(U_c2))^{1/2}$
02.04.14	10.7	30	0.00005	0.620	0.34	0.46	36.1	1.543	1.471	1.683	-0.683
05.04.14	9.4	55	0.00005	0.456	0.34	0.46	32.7	1.140	1.471	1.533	-0.533
07.04.14	10.1	35	0.00005	0.560	0.34	0.46	34.8	1.368	1.471	1.629	-0.629
09.04.14	8.4	80	0.00005	0.221	0.34	0.46	29.7	0.885	1.471	1.286	-0.286
11.04.14	10.9	25	0.00005	0.663	0.34	0.46	36.4	1.614	1.471	1.721	-0.721
14.04.14	8.5	70	0.00005	0.317	0.34	0.46	31.6	0.952	1.471	1.391	-0.391
16.04.14	9.8	45	0.00005	0.508	0.34	0.46	33.3	1.246	1.471	1.582	-0.582
18.04.14	8.7	65	0.00005	0.375	0.34	0.46	31.8	0.994	1.471	1.452	-0.452
21.04.14	10.4	30	0.00005	0.595	0.34	0.46	35.3	1.457	1.471	1.661	-0.661
24.04.14	8.9	65	0.00005	0.375	0.34	0.46	31.9	1.024	1.471	1.452	-0.452
26.04.14	9.1	60	0.00005	0.384	0.34	0.46	32.2	1.071	1.471	1.461	-0.461
30.04.14	10.0	45	0.00005	0.528	0.34	0.46	34.5	1.313	1.471	1.600	-0.600