Appendix A-2

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Via Email – kmeyer@southamptontownny.gov
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Planning Board of the Town of Southampton
116 Hampton Road
Southampton, New York 11968

Re: Southampton Country Day Camp
665 Majors Path

Dear Mr. Chairman and Board Members,

My office represents the Little Fresh Pond Association, (the "Association"), a group of neighbors and concerned citizens which has fought to preserve and enhance Little Fresh Pond and its environs for over thirty (30) years. The group's longstanding interest in protecting and preserving the pond and its watershed, is well known and pre-dated the current controversy over the proposed public day camp.

Currently, the lawfully permitted uses on the property are a membership tennis club and a related accessory children's tennis camp, primarily for members' children. An accessory use is defined as one that is customarily subordinate and incidental to the principal use. See, Town Code Section 330-5.

C1-1

This application seeks approval for a second separate and distinct use. The proposal is for a new day camp with unlimited activities (not only tennis) open to all members of the public. The applicant has made various inconsistent statements regarding its potential size, but has asserted that the public camp could handle as many as 450 campers, and 95 live-in staff. This application seeks site plan approval for this new use AND for the pre-existing membership tennis club, which together would

constitute two separate principal uses. No explanation was provided to show why a single pre-existing, non-conforming tennis club (with an accessory use), could lawfully be converted into two uses. Common sense suggests that a public day camp with up to 450 campers and 95 staffers is not subordinate and incidental to a small, membership tennis club.

It is significant that other environmental groups and activists have indicated that the proposal is likely to cause significant adverse impacts to Little Fresh Pond and its watershed, which cannot be mitigated. The Group for the East End, the North Sea CAC, and Kevin McCallister, former Peconic Bay keeper, have all expressed the view that the proposed expanded public camp use would cause significant adverse impacts to the pond and watershed. Those documented concerns suggest that the application should be denied in its entirety.

This letter is submitted as a written comment further to the public hearing on the DEIS. It confirms comments offered by members of the public and the Association, as well as by the Association's consultants. The consultants include Traffic Engineer, Steve Schneider, P.E., and hydrogeologist, John Zbell. The comments of the Association's noise expert, Michael Bahtiarian, a Board Certified Acoustical Engineer, are submitted in this letter for the first time because of the applicant's delayed disclosure of the DEIS Noise Study. This letter further details a number of inaccuracies and omissions in the applicant's DEIS, which should be addressed in the submission of the FEIS to follow.

C1-1 cont'd

SEQRA Requirements for an FEIS.

The New York State Environmental Quality Review Act ("SEQRA") provides that after the close of a public hearing and the receipt of comments on a Draft Environmental Impact Statement (DEIS), the Planning Board, as Lead Agency, must prepare or cause to be prepared a Final Environmental Impact Statement (FEIS). The time limits to do so are specified in 6 NYCRR 617.9 a. (5). Our understanding is that the applicant is preparing an FEIS.

The date for filing an FEIS may be extended if it is determined that more time is necessary to adequately prepare it. See, 6 NYCRR 617.9 (5) (ii) (a). Likewise, extended time is permissible if problems with the proposal have been identified which require material reconsideration or modification. See, 6 NYCRR 617.9 (5) (ii) (a). Therefore, there should be adequate time for the Planning Board to carefully consider whether the FEIS is sufficient in light of comments submitted showing inadequacies in the DEIS.

The Planning Board may also require a Supplemental EIS for any significant adverse environmental impacts which have not been addressed, or which were inadequately addressed that arise from changes in the proposed project, newly discovered information or a change in circumstances related to the project. See, 6 NYCRR 617.9 (7) (i) (a), (b), (C). The decision to require a Supplemental EIS must be

based on the importance and relevance of the information and the present state of the information in the DEIS.

The public camp use was incorrectly described in the DEIS

The DEIS failed to distinguish the existing membership tennis club and accessory camp use, from the proposed new public camp use. Also, the DEIS description of "existing conditions" inaccurately focused on conditions which later came to exist in years after 2012, during the time that the applicant began illegally operating a public camp use, in violation of a binding ZBA decision.

Logically, describing existing conditions as including a larger scale tennis club and public camp already in operation had the effect of making future expansion plans appear less impacting. A correct description of the existing small-scale membership club, and accessory tennis camp should be contrasted with a full scale public day camp, and an expanded membership club. The FEIS should contain an explanation of the zoning legality of converting a single pre-existing, non-conforming tennis club use, into two principal uses: an expanded non-conforming membership tennis club and new public day camp as another principal use.

An earlier 2012 ZBA determination clearly resolved the legality of the pre-existing uses on site, in comparison to the new proposed public day camp. [1] A copy is annexed as Exhibit "A." The ZBA determined that the tennis club was a membership club, as defined in the table of uses under the standard industrial classification category 7997, "membership club."

C1-1 cont'd

It also determined that the pre-existing tennis camp use on site was an accessory use, ancillary to the membership club. It was solely a tennis camp, which made use of just one non-tennis structure on site, a half court basketball court. See, ZBA Decision, P. 16.

The ZBA explicitly stated that the proposed new public day camp was not compatible or interchangeable with the pre-existing uses. It classified the public day camp within a different use category, SIC code number 7999, which describes uses "primarily engaged in the operation of sports, amusement and recreational facilities." (See, ZBA Decision P. 16)

It is indisputable that this application cannot be for both a tennis club AND a separate public day camp, as the latter is not an accessory use to the former. Also, a single pre-existing, non-conforming use cannot be expanded into two principal uses. Therefore, the "Existing Conditions" section of the DEIS inaccurately described the framework within which the Planning Board is reviewing this application.

[1] The decision was never challenged, and is therefore binding on both the applicant and the Planning Board.

The inaccurate description affected the DEIS discussion of potential significant adverse impacts. The starting point for comparison should have been be the lawfully existing condition of the property without a public day camp operating on site. Thus, the existing conditions should have described a membership tennis club, including the number of members, and an accessory tennis camp, with one half-court basketball court, used by members' children. The description should have been clear that the tennis club and camp were operated and maintained by just two owners, both of whom lived on site. Apart from the owners, the only other employees were tennis professionals. See, ZBA Decision P. 5. No other employees resided on site.

C1-2

The DEIS also omitted any discussion of the fact that a "day camp" is explicitly defined as a special permit use, under Town Code Section 330-162.12 Therefore, the special permit setbacks are applicable. To avoid discussing the project's non-compliance with required special permit setbacks of 100 feet, the applicant claimed that it was seeking to change one non-conforming use into another. However, this sleight-of-hand ignored the clear definition of "day camp" as a special permit use. Just because the applicant proposed to abandon one pre-existing, non-conforming use, did not mean that any replacement use was necessarily another non-conforming use.

C1-3

The DEIS, Section 2.2, Page 6 "Existing Conditions," failed to separate out existing conditions as of 2012, before the public day camp began illegal operations. Instead, the DEIS described years 2013 through 2016, when the owner was already operating the public day camp. By then, the applicant claimed that there were 35 club members, 108 campers and 55 camp staffers.

The use of this time frame had the effect of minimizing impacts from the expansion of the public day camp. Indeed, the DEIS, Section 2.3, at page 8, "Project Description," contained the demonstrably false claim that, "the proposed action would not increase the intensity of use of the subject property, but rather would diversify the recreational activities available to campers…"

The change from a small accessory membership camp to a large scale public day camp with up to 450 campers, is logically an increase in intensity. Furthermore, the DEIS described the elimination of a pool/changing shed, but omitted to mention the construction of two pools, a new full court basketball facility, dining room and counselor overnight dormitory accommodations, as well as large scale busing operations, all of which dramatically increased the intensity of the use.

Only if the FEIS presents accurate "before" and "after" descriptions can the Planning Board properly assess anticipated adverse impacts from the public day camp expansion. Also, the FEIS discussion of the proposed project should include its non-compliance with the required setbacks for a special permit uses. Logically, non-compliance aggravates potential adverse impacts and must be considered by the Planning Board.

C1-2 cont'd

Traffic Issues: Volume

The mis-description of the existing use as a public day camp also affected the traffic analysis. The DEIS, "Alternative and Impacts," P. 152-3, described the public day camp as having a 2016 "occupancy" or "enrollment" totaling 280 campers, and 65 staff, including 22 who resided overnight on premises. However, the DEIS nowhere specified the daily number of campers. The vague word usage implies that the described impacts relate to 280 *daily* campers in 2016. Yet neighbors testified that the number of daily campers was much smaller, ranging from 50 to 70. C1-4

The lack of clarity is critical. While traffic volumes were provided and analyzed, it was unclear what number of daily campers caused the volume. The DEIS suggested it was 280, but that number appears to describe the total enrollment, not daily campers. In other words, far fewer campers could have been causing the described increase in traffic impacts. This fact suggests that greater numbers of campers would cause far greater traffic impacts than reported. The FEIS should include actual daily camper attendance figures so that the Planning Board correlates real attendance with traffic volume increases.

In measuring traffic volumes, the DEIS used data from 2013, the first reported year of public camp activity. See, DEIS, Page 6. By 2016, the reported number of campers had greatly increased. The use of three year old traffic data suggests that traffic volumes were under reported. Also, without explanation, the volumes were collected on the last day of camp, and on days during a more sparsely attended "post-camp" session. The FEIS should substitute current data, and correlate traffic volumes with an accurate count of the daily camper's attendance which created the volumes.

Instead of providing 2016 attendance and traffic volume counts, the DEIS applied an artificial growth factor of 2% per year to bring the 2013 enrollment figures up to date. Yet, the DEIS itself reported far larger increases in camper enrollment. From 2013 through 201_, The number of campers rose from 108 to 180, an increase of 66%. This fact means that the DEIS growth factor of 2% per year greatly minimized growth in traffic volume. Worse, in different sections of the DEIS, different numbers of total campers were stated, ranging up to 450 total enrollment. Common sense suggests that greater numbers of enrolled campers will produce correspondingly greater increases in generated traffic volume. Thus, the use of the 2% growth factor substantially under reported anticipated increase in traffic volume. C1-5

The FEIS should correct these inaccuracies. Without current information, the Planning Board has only out of date data, "cherry picked" on low attendance days, and manipulated with a misleading growth factor.

Traffic: Accident Reporting

Accident reporting was also deficient. The DEIS used dates from 2007 through 2010, six to nine years old and before the public camp was even in operation. The C1-6

Association's traffic engineer reported that accidents have increased in ensuing years. Standard professional practice requires reporting three consecutive years of accidents. At the time the DEIS was prepared, 2016 data was available, and is certainly available now. The FEIS should provide current data should be submitted.

C1-6 cont'd

Traffic: Directional Capacity

The information concerning directional capacity appears to have been altered from standard practice, to create an appearance that there would be no problem resulting from the operation of a much more intense public day camp. As stated by the Association's traffic engineer, Stephen Schneider, P.E., industry practice is to calculate the direction of traffic from the site based on existing traffic patterns. These numbers are then converted into percentages, indicating how much traffic would be heading north and south from the site. If properly applied, traffic should have been reported as approximately 50% for each direction, north and south. However, the DEIS did not follow this practice.

C1-7

Instead, it arbitrarily asserted that 90% of the traffic would be heading south from the site. This decision contradicted existing traffic patterns, and artificially improved the resulting traffic flow. The reason it is significant is that traffic heading south would make an easy right hand turn out of the premises, while traffic heading north would make a more difficult left hand turn across a lane of on-coming traffic.

The FEIS should correct the directional capacity methodology, and submit a new analysis of the corrected data.

Traffic: Camper drop off points

The current plan has two drop off points for attending campers. However, the plan did not detail the manner in which campers would cross a proposed busy internal road.

C1-8

For safety, the plan should have only one drop off point. Also, it should clearly depict a path so that children to not have to cross the internal road. The FEIS should be supplemented with this material.

Traffic: Trip Generation

Trip generation is the amount of new trips generated to and from the site by the proposed use. In determining trip generation, the DEIS Traffic Impact Study, Exhibit H, P. 21 claimed that the Racquet Club operated at the same level for many years, and that no growth was anticipated. Yet in the body of the DEIS, at P. 6, membership in the club was shown as rising from 35 members in 2013, to 55 members in 2014, to 90 members in 2015, and remaining at 90 members in 2016. Membership grew nearly

C1-9

160%. Also, there is no legal limitation on membership growth. Future growth must also be accurately reported and accounted for in the FEIS.

C1-9 cont'd

Traffic: Intersections

The Association's traffic engineer agreed with the DEIS report that four intersections critical for camp operations were likely to be unable to handle camp traffic. The intersections analyzed were North Sea Mecox Road and Majors Path; North Sea Road and Majors Path; and North Sea Road and Sandy Hollow Road. All had existing serious problems.

In fact, the DEIS anticipated that North Sea Mecox and Majors would fail based on predicted future traffic, even without the added traffic from a large scale public camp. Yet the DEIS failed to analyze any camp traffic impacts or mitigation measures.

Similarly, the intersection of North Sea Road and Majors Path was described as likely to experience increased significant delays, even without a public day camp. With the camp traffic, it was said to be highly likely that long queues would develop. Again, the DEIS did not address the issue or discuss mitigation.

Similar results were indicated for west bound traffic on North Sea Road and North Sea Mecox Road. Data showed that the intersection currently fails under all conditions. The data also showed that the intersection could not handle existing traffic or future traffic. Again, the DEIS did not address this problem or describe available mitigation to alleviate it.

C1-10

The analysis for North Sea Road and Sandy Hollow Road was incomplete because it did not include capacity ratios. These ratios show demand as a percentage of road capacity. The missing data should be supplied in the FEIS.

For the same intersection, the DEIS did contain data which showed that additional traffic from a public day camp alone would stress the intersection to 95% of its capacity. This condition suggests that expected future traffic growth could result in failure. Again, the DEIS simply asserted that effects were benign, and offered no discussion of mitigation. Nor did it mention the fact that growth in the volume of campers cannot be limited

Also, the DEIS contained assertions that field observations of existing intersection conditions were much better than the DEIS reported. This claims suggests that the DEIS did not accurately calibrate the models used to assess intersection capacity. The models should be described in detail in an FEIS.

Finally, the DEIS omitted any description of other traffic generating uses near the proposed public camp site. The FEIS should contain an analysis of other uses which would create future cumulative traffic impacts.

Traffic: Inadequate Sight Distance Danger

Directional sight distance (DSD) is the amount of distance required to safely execute a turn by a vehicle leaving the premises. Right turns require less sight distance, because they are executed into one lane of traffic heading in the direction of the turn. Left turns require more sight distance because the turning vehicle has to cross a lane of traffic coming from the opposite direction. The American Association of State Highway and Transportation Officials (AASHTO), has established standards for safe directional sight distances. Distances are different for trucks and buses than for passenger cars.

Sight distances are inadequate and create a serious safety issue

The Association's traffic engineer, Stephen Schneider, P.E., identified a serious safety issue. The project site has inadequate directional sight distances. Both the proposed north and south driveways have inadequate directional sight distances for buses and trucks to exit the site. Buses and trucks require greater sight distances than cars. This deficiency is caused by the configuration of the property itself in relation to adjacent roads. The applicant's own traffic engineer admitted in the public hearing that the condition cannot be corrected. In both driveways, buses and trucks cannot safely execute either a right or left turn out. This condition creates an imminent danger to children who are passengers. C1-11

The AASHTO sight distance requirements apply to buses generally. There is no basis to distinguish small from large buses. The buses which the public camp intends to use are presumably licensed as such, and more important, carry from 16 to 24 young campers to and from the site. It would be dangerous in the extreme to dismiss the required sight distances in evaluating whether the public camp exits are safe or not. The AASHTO standards demonstrate that they are not.

Right and left turning buses require 505 feet and 560 feet of sight distance, respectively. All turns from both the north and south driveways lack the required sight distances. In other words, buses cannot safely execute turns out of either driveway.

Moreover, the same directional sight distance problem also affects cars. For the northern driveway, cars cannot safely execute either a right or left turn in compliance with AASHTO directional standards. For the southern driveway, cars can only safely make a right turn; they cannot safely make a left turn.

Stopping distance

It is important to understand that directional sight distance is different from stopping distance. Directional sight distance insures that vehicles leaving a site can do so safely. Stopping distance is different. It refers the distance required for other vehicles already on the road to make an emergency stop.

The DEIS incorrectly analyzed stopping distance, not direction sight distance

The DEIS ignored the required AASHTO directional distance requirement and instead substituted and analyzed a stopping distance requirement of 440 feet as the required standard. The use of the stopping distance requirement did not accurately assess AASHTO sight distance requirements.

Annexed hereto as Exhibit "B" is a Traffic Report, prepared by Schneider Engineering, together with a table detailing AASHTO sight distance requirements for cars, buses and trucks. The table shows existing sight distances from both the north and south driveways. It also shows existing distances as *personally* measured by Steve Schneider, P.E. Right and left turning cars require 385 feet and 445 feet of sight distance respectively. The northern driveway lacks required sight distances for cars to make either left or right turns, and is therefore unsafe. The southern driveway has sufficient sight distance for cars to turn right. However, it lacks adequate distance for cars turning left.

C1-11 cont'd

The FEIS should correct the deficient analysis of sight distance requirements. Supplemental information should be submitted which correctly applies required AASHTO directional sight distance requirements. It should also discuss whether mitigation is or is not possible for turns which cannot meet standards. The FEIS should acknowledge that absent mitigation, the obvious risk of accident and serious injury constitutes a serious adverse environmental impact.

Site groundwater flow:

The claim that groundwater would flow around but not into the pond was based on insufficient and unreliable measurements of ground water elevation;

The DEIS provided no information about the types and location of subsurface soils, which is essential to determine the direction and speed ground water flow.

The DEIS concluded that groundwater on site did not flow into Little Fresh Pond. That conclusion was largely based on a comparison of the elevation of the pond surface water with the apparent elevation of groundwater in four monitoring wells. The comparison indicated that the pond's surface water elevation was higher. Based on that information, and without any discussion of topography or the types and locations of soils present on site, the DEIS asserted a grand conclusion that groundwater could not be entering the pond, but rather flowed around it. However, a comparison of pond water and test well elevations alone was grossly inadequate to support the startling conclusion that groundwater flowed around and not into the pond.

C1-12

Pio Lombardo, P.E., the applicant's expert who made the claim, admitted as much. At the end of his report, contained in the DEIS as Appendix D, he candidly stated that there was insufficient data to support his opinion:

"Insufficient data exists to determine the groundwater flow patterns into and out

of Little Fresh Pond."

DEIS, Appendix D, "Discussion and Conclusion," Section 3.1, Page 13,

C1-12 cont'd

The Association's hydrogeologist, John Zbell, of Leggette, Brashears and Graham, Inc., agreed with Lombardo's conclusion. In his own report, he explained in detail why the evidence reported in the DEIS was woefully insufficient to prove the grand conclusion that groundwater magically flowed around but not into the pond, as common sense would suggest.

The DEIS failed to identify soil types which are critical in assessing groundwater flow

Simply stated, the DEIS failed to consider whether the location and types of soils on site affected groundwater flow. It failed to acknowledge or discuss evidence showing that there were tightly compacted soils present on the site. Those soil types are significant because they can affect groundwater direction and flow speed.

The DEIS also failed to provide the well boring logs from the groundwater monitoring wells. Boring logs are a record of the types of soils through which the well was drilled. They disclose a cross section of the soil types in the well, and would have shown the presence of tightly packed soils. The failure to produce the logs is significant because without them, the applicant did not know the composition of the soils even at the well locations. The Association hydrologist, John Zbell, has confirmed that obtaining and preserving well logs is a standard professional practice for hydrogeologists. The absence of well logs is therefore notable and significant, indicating that the data used to support the DEIS conclusion was grossly inadequate.

The DEIS ignored evidence showing the presence of tightly packed soils

C1-13

Because groundwater moves through the subsurface soils toward the pond, a key piece of the puzzle is to understand the location and types of the soils through which it passes. This information is necessary to determine how the soils on site affect the direction and speed of groundwater. Without that information, a simple comparison of the elevation of the pond surface water and the water in the wells was wholly inadequate to support a grand conclusion that groundwater would not flow to the pond.

Significantly, the DEIS contained evidence showing that tightly packed soils were present on site. For instance, it described without comment the appearance of an unexplained mound of water near the septic system which appeared when camp was in session. That "magic mound" was likely caused by the presence of tightly packed soils. Yet no effort was made to determine that fact, and to document the types of subsurface soils in that location or elsewhere.

Also, test pits were dug (separate and apart from the wells) which revealed the presence of silt, a tightly packed soil. This fact is a further indication that there were areas of tightly packed soils elsewhere on the site. Again, the DEIS ignored this evidence and there was no effort to determine the presence and location of tightly packed soils on site, to see if they affected groundwater transport toward the pond.

C1-13 cont'd

A three dimensional depiction of subsurface soils is necessary to determine groundwater flow

In order to accurately determine the movement of groundwater in relation to the pond, the DEIS analysis should have contained a three dimensional rendering of the subsurface soil conditions. Those conditions would be revealed by drilling more wells and maintaining well logs. Drilling and monitoring additional wells would not be cost prohibitive, and would be necessary to accurately determine groundwater flow.

The DEIS relied on too few wells measured only in periods of low water table and days of limited camp use

The number of wells, and the number of tests made of the wells, were also insufficient to establish conclusively the relationship of groundwater and the pond. The Association's hydrologist, John Zbell, stated that the applicant would have to install more wells and piezometers to obtain enough data to accurately establish the elevation of groundwater. The few measurements taken from just four wells was simply too little data on which to base the surprising conclusion that despite topography sloping toward the pond, logically suggesting a path toward the pond, the groundwater took a detour around it.

C1-14

In addition, the timing when measurements were taken was critical. The DEIS reported measurements only during periods of low water table and drought. Accuracy required additional measurements during periods of high water table as well. Obviously, saturated soils would produce a higher elevation of groundwater, which would affect the conclusion as to whether or not there was flow into Little Fresh Pond. Also, the DEIS also only provided measurements during days when there was little camp activity. The failure to take a more representative sample of groundwater elevations rendered suspect the very broad conclusion that groundwater did not flow to the pond.

Tests for nitrogen and phosphorus were improperly filtered which skewed the results.

The DEIS reported measurements of the pollutants, nitrogen and phosphorus. One set detected high levels in groundwater well locations which suggested that that septic discharge *was* moving toward the pond. However, the DEIS also detailed a second set of measurements which disclosed no detectable pollutants. Despite the

C1-15

contradictory results, the DEIS relied on the measurements showing no pollutants.

However, the DEIS also disclosed that the second set of measurements contained suspended particles. Rather than obtaining new samples by using low-flow groundwater sampling procedures, which is the standard professional practice to remove the particles, the applicant instead filtered the samples.

In conducting testing to determine the presence of nitrogen or phosphorus, (as opposed to the presence of heavy metals), filtering samples violates acceptable professional standards. Filtering can (and did) alter the samples by eliminating suspended particles containing these pollutants, leading to a false negative result. Yet the DEIS documented that samples were improperly filtered to determine the presence of nitrogen and phosphorus. This procedure corrupted the result, making it unreliable.

C1-15 cont'd

Combined, these circumstances show that the DEIS was inadequate. The FEIS should provide more well and piezometer readings, groundwater elevation sampling in periods of seasonal high groundwater, soil boring logs showing subsurface conditions and additional soil testing to produce a three dimensional understanding of types and locations of soils on site. It should also re-test for nitrogen and phosphates. The FEIS should include this additional information. If it does not, the Planning Board should require a supplemental EIS so that adequate data is available to determine whether the very bold conclusion that groundwater did not flow to the pond was supportable.

The Planning Board cannot approve dormitories or a dining room which did not lawfully exist under zoning, despite alleged Suffolk County Health Department "grandfathering."

The Planning Board site plan review must adhere to the March 15, 2012, Zoning Board of Appeals decision which settled the question of what uses were lawfully pre-existing on the site. That decision determined those uses to be a membership tennis club with accessory camp for members' children; residential cottages rented seasonally; and a single family house.

The decision further found that the club was operated and maintained by just two owners, who lived in the house on site. The only other employees were tennis instructors. The ZBA also explicitly determined that a dining hall use had been abandoned. The decision was never appealed, and is final and binding as to the uses permitted on site.

C1-16

The DEIS loudly trumpeted the fact that the Suffolk County Department of Health Services ("SCDHS") determined that the site is entitled to a "grandfathered" septic flow of some 9,450 gallons per day. On that basis, the application sought approval of a dining hall and dormitories within re-constructed cottages and the single family house on site. However, those uses were not lawfully existing under zoning. In addition, the legality of the "grandfathered" flow is highly suspect.

First, the uses do not comply with Suffolk County Department of Health Services

"grandfathering" policies detailed in Guidance Memo 20. A copy of the memo is annexed as Exhibit "C." The memo limits grandfathering to pre-existing uses which were previously permitted by SCDHS Department of Wastewater Management or the Department of Housing and Food Control. While the cottages were previously permitted, they were classified as "temporary residences" rented seasonally. There is no evidence that they were ever permitted or used as dormitories.

Temporary residences were assigned an extremely low septic flow rate. It ranged from 150 to 250 gallons per day, depending on the square footage of the cottages. In total, eleven cottages would generate just 150 gallons each per day, or 1,650 gallons per day total. Two larger cottages would generate 225 gallons per day, totaling 450 gallons per day. The single family house would generate 300 gallons per day. Therefore the uses recognized by the ZBA decision, and approved by SCDHS as temporary residences would produce a total of just 2,400 gallons per day.

On June 14, 2011, Jeffrey Butler, P.E., submitted supplementary application materials on behalf of the camp to SCDHS regarding thirteen existing buildings on site. A copy is annexed as Exhibit "D". All buildings were described as "cottages." However, on an attached sheet describing the occupancy of the cottages, the occupancy assigned to each cottage was stated to be one person per 75 gross square feet. That occupancy rate was for dormitories. As a result, the seasonal cottages suddenly had a total occupancy of 124 persons.

Another sheet was submitted which calculated septic loading for the cottages in the same way. Their gallons-per-day rate (gpd) was selected from a category called "Boarding school/school," 75 gallons per day. By labeling the seasonal cottages as dormitories, the total occupancy and septic loading dramatically increased. Labeling the cottages as dormitories was inaccurate, as shown by the 2012 ZBA decision.

C1-16 cont'd

However, SCDHS acceptance of grandfathering cannot change what is legal or illegal under Town of Southampton zoning requirements, as interpreted and decided by the ZBA. The Planning Board can only approve uses which are lawful under the Town of Southampton Zoning Code, or otherwise lawfully pre-existing non-conforming. In this case, the ZBA decision determined the lawfully pre-existing uses on site. It found that the residential cottages and the house were used for seasonal occupancy only. There is no mention of dormitories, nor did the decision legalize pre-existing dormitories. Indeed the description of the tennis club and camp use shows that the house and cottages could not have been dormitories. For it recites that all maintenance and operations were undertaken by two owners who lived on site. There were no other employees residing on site. Likewise, the decision explicitly determined that a dining hall had been legally abandoned.

The applicant cannot apply for site plan approval for either dormitories or a dining hall, regardless of the SCDHS grandfathering decision. The FEIS should provide documentation of the purported legality under zoning of dormitories and a dining hall on site, together with all submissions to SCDHS regarding the grandfathering

determination.

C1-16 cont'd

The noise report contained manipulated and misleading data

The noise report relied on data that appears to have been inaccurate and manipulated to produce lower than actual noise measurements. These facts would support the Planning Board in rejecting the study conclusions. They further suggest that the dramatically enlarged pubic day camp would in fact cause significant adverse impacts which cannot be mitigated.

C1-17

Again, as in other sections of the DEIS, measurements were taken on days near the last day of the camp session. It is logical to conclude that those were likely to be more lightly attended days of the session. That fact would reduce the amount of generated noise.

An employee affidavit discloses deception in the Noise Study

Camp activities were apparently deliberately cut back while measurements were made. The attached Affidavit of Brian Morgado, a former camp employee, confirms that the camp took pains not to conduct noisy activities during times when noise was being measured. Normal activities were canceled, and the noisy whistling train about which neighbors complained vociferously was not run. See, Affidavit, Exhibit “E”.

C1-18

Furthermore the calculation of anticipated impacts from an increased number of attending campers was appears to have been adjusted to lessen measured impacts. In calculating the increase, the report applied a multiplier which purportedly represented the increase in the numbers of attending campers. The factor was: 215/360, representing existing daily campers versus anticipated maximum daily campers. When the multiplier was applied in a formula to calculate the increase in noise, it resulted in a predicted 2.3 dB increase. However, if there were actually seventy (70) daily campers attending, as reported by witnesses and neighbors, the increase would have been significantly higher, approximately 7 dB, a very substantial increase in noise impacts.

C1-19

The DEIS appears to have obscured the fact that there were never 215 daily campers in attendance. Instead, the number appears to have represented the total summer enrollment.

The Brian Morgado Affidavit also confirms that camp management was willing to deceive in the reporting of noise impacts. Morgado reported that he was instructed by the camp director to follow him in a second bus, as the two repeatedly drove the empty buses around the perimeter of the camp a number of times to give the appearance that they were dropping off a greater number of campers than were actually in attendance. This action demonstrates the willingness of the camp management to mis-state camp conditions in an effort to obtain approval of an oversized public camp. In itself, it is grounds for denial of the application.

C1-20

The Morgado Affidavit sheds further light on efforts to conceal measured noise impacts from camp activities. In the Affidavit, he explains that on the days when testing was undertaken, the camp shut down noisy group activities. For example, the staff was informed that the train would not be in operation because it was not working. However, Morgado readily discovered that that excuse was false. Another employee who worked on the train showed him that it was operable. He advised Morgado that it had been removed from service to reduce reported noise.

Morgado was a group leader. On the days that noise was measured, he was told that most of the noisy group activities would be canceled. Instead, the camp conducted one loud pool party, called a "Fan Fair," at the end of the day, in a somewhat more isolated location. The change was made to prevent the detection of the real overall noise generation. See, Affidavit Exhibit "E."

C1-20 cont'd

Ambient noise levels appear to have been exaggerated.

In reviewing the applicant's noise report, the Association's expert noted that the ambient noise level appeared to be notably high for a suburban area. Ambient noise was reported at 58 dB(A). However, the Association's noise expert stated that his firm typically found much lower values in the range of 40 dB(A) in similar suburban locations. The difference is quite substantial. A noise study submitted by the applicant in 2011 confirms that observation.

In the applicant's earlier 2011 study, the reported ambient noise levels were startlingly lower. Noting that ambient noise consisted of wind, leaves rustling, and traffic on Majors Path, measurements reflected that relatively quiet setting. Ambient noise measurements ranged from 46 dB(A) to 48 dB(A). The DEIS made no reference to the earlier noise report.

Since the decibel scale increases geometrically, not linearly, an increase from 46 dB(A) to 58 dB(A) represents an increase of roughly 11 to 12 decibels. The Board should clearly note that a 10 decibel higher difference would result in a doubling of the loudness of ambient noise. That is a significant difference, which would have likely resulted in a wholesale change in the conclusion. Again, reporting higher ambient noise levels had the effect of lowering the reported noise impacts.

C1-21

The DEIS Noise Study lacked supporting data, which must be provided in an FEIS.

In order to respond to the noise report contained in the DEIS, substantial additional documentation is required. This information should be included in the FEIS to be submitted by the applicant. Comments on the applicant's noise study are contained in a report prepared by the Association's own noise expert, Noise Control Engineering, LLC. A copy is attached to this letter as Exhibit "F."

C1-22

In measuring the source of noise, the distance at which measurements were taken is critical. In reporting noise, sound and distance must be calculated together, as a specification, sound/distance. The applicant's report did not provide this information and is therefore incomplete.

Also, the report failed to include such common sense data as the time of day measurements were made, the activities which were occurring during the measurement, and accurate photographs of the activity. Also, typically, a sound report would provide graphs and/or a summary of all measurements taken. The applicant's report omitted the above information, which should be included in the applicant's follow up submission of an FEIS.

More information is required to fully evaluate the sound modeling used to produce the report. The measurement of source noise can be inputted in two different ways. Source noise can be measured using either "A weighted" or "octave band" values. Both calculations of the sound inputs should be provided in the follow-up FEIS.

The Association's noise report also questioned the accuracy of the source noise measurements because they were taken within the last four days, and on the last day of camp, when attendance was likely to be low. This is a problem that repeatedly occurred elsewhere throughout the DEIS in its assessment of other potential impacts. The FEIS should include data collected during times when camp has been in full session.

C1-22 cont'd

The noise study also evaluated source noise using an averaging measurement. However, noise averaging alone is insufficient to assess noise impacts on neighbors. The data that was totaled and used to calculate the average should also have been included. The reason is that noise averages will include periods of peak noise, which will be perceived as loud. It is important to understand how often activities have periods of loud noise. Also, those periods may well exceed local noise limits, a fact is obscured by the use of an average figure alone. The minute by minute data that was used to calculate the noise average measurements should be provided in the forthcoming FEIS.

An average measurement of ambient noise undoubtedly included periods of high and low ambient noise. It is important to evaluate the periods of low noise, to compare the lowest ambient noise levels with the highest levels of source noise produced by the camp. Using an atypically high measurement of ambient noise would have the effect of reducing the measured impact of camp noise. Again, the additional data should be supplied in the FEIS.

The noise measurement of the new basketball court just 30 feet from adjacent property lines appears to be unreliable. The applicant's report indicated that it would produce noise just at or over the Town noise limit. The report did not detail the number of children playing when measurements were made. Also, the back-up data of individual noise measurements was not provided.

In contrast, the Association's computations show a significant increase in sound

levels, which would be magnified by the fact that the court is an entirely new source of noise. Given that fact, the missing information is especially important.

The applicant's report omitted any sound assessment relating to the renovations and additions to existing structures. Mechanical systems add to noise levels and should be assessed. Also, there should be an assessment of bus traffic, morning drop off and afternoon pick up, as well as idling noise emissions. This additional assessment should be included in the FEIS.

Submitted photographs did not confirm the numbers of campers purportedly involved in the activities as to which noise is reported. For instance, photos of the pool showed it to be almost empty. Also, only six campers were shown participating in the parachute activity, although the noise report indicated that it measured noise with 14 campers participating. Similarly the photos did not document 12 children playing soccer, 25 campers playing tennis, or 7 campers plying basketball. Again, the photos suggest an effort to report low noise readings by exaggerating the number of campers involved when measurements were taken. The FEIS should provide accurate information documented by photographs of the number of campers involved when noise measurements were made.

In sum, the applicant's Noise Study provided inadequate supporting documentation which should be supplemented in the FEIS.

C1-22 cont'd

Conclusion

All of the DEIS deficiencies and omissions summarized in this letter can and should be corrected. The applicant's FEIS should incorporate all required revisions.

Even after the submission of an FEIS, the Planning Board can mandate further information as necessary to render a decision. Additional well sampling and comprehensive mapping of on-site soils profiles should be required to determine groundwater flow. The Board can and should require a supplemental FEIS as necessary to obtain additional important information and data. Extended time is available to obtain a complete record, if, for example, some of the work were required to be obtained in the summer, when groundwater levels are high.

The Board should seriously consider whether the record discloses that the applicant intended to manipulate or distort submitted testing or data. If so, that conduct can be the basis for denial of the application, and/or a finding that the application will cause significant adverse impacts that cannot be mitigated.

In sum, the Planning Board should exercise its authority to insure that it has reliable and complete information to verifiably establish the critical issue of where and how groundwater flows in relation to Little Fresh Pond, and to determine that a greatly expanded public camp will or will not cause significant adverse impacts.

C1-23

Thank you for your consideration of these issues.

Very Truly Yours,



Jeffrey L. Bragman

Enclosures
cc: Clare Vail, Planner
Carl Benincasa

EXHIBIT “A”

ZONING BOARD OF APPEALS
TOWN OF SOUTHAMPTON

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In the Matter of the Application of
LITTLE FRESH POND ASSOC. (John Barona, Pres.),
NORTH SEA NEIGHBORS (Foster Maer, Vice Pres.),
LAKE MISSAPOGUE ASSOC. (Benjamin Chaleff, Pres.)[1] **DECISION**
Regarding Premises Located At
665 Majors Path
Southampton, New York
SCTM #900-97-3-17.1

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FINDINGS AND DETERMINATIONS

Based upon the application, documents contained in the Board's file, and testimony and evidence received at the public hearings held on October 20, 2011, and December 1, 2011, the Zoning Board of Appeals finds and determines as follows:

ISSUE

Is the proposed renovation and expansion of the subject premises to a "day camp" a change in use requiring a variance from this Board, or is it simply a continuation of the pre-existing nonconforming "tennis club and/or tennis camp" use, as found by the Chief Building Inspector?[2]

BACKGROUND

The property in question is identified on the Suffolk County Tax Map as #900-97-3-17.1, is approximately 752,677 square feet (or about 17.279 acres) in lot area, and is located on the westerly side of Majors Path at #665, approximately 500 feet south of Little Fresh Pond Road in the hamlet of North Sea, Town of Southampton. The parcel is located in the Residence (R-20) Zoning District and thus, because it exceeds 20,000 square feet, is a conforming parcel with respect to size. Regarding use, the property currently benefits from:

(i) Pre-Existing Certificate of Occupancy No. C018937, dated December 2, 1998, for "A tennis camp with the following structures: twelve cottages, one, two story house, a basketball court, two decks between cottages 9 and 10, pump house and a shed/shop building and one caretakers office. Other structures approved by the following certificates: A017306 – Kitchen and dining hall, A017604 – Garden

[1] Initially the North Sea Citizens' Advisory Committee also joined applicants herein seeking to appeal the Chief Building Inspector's August 19, 2011, determination however, by letter dated October 19, 2011, said application was withdrawn.

[2] The Chief Building Inspector's August 19, 2011, determination adopts, in large part, the August 4, 2011, correspondence from Wayne Bruyn, Esq., to the Chief Building Inspector and, more specifically, the "Summary" of assumptions found at pages 6-7 therein.

shed, A017602 – Ten tennis courts and A017601 – Cabin with patio and clubhouse with deck";

(ii) Certificate of Compliance No. A017604, dated December 2, 1998, for a garden shed;

(iii) Certificate of Compliance No. A017602, dated December 1, 1998, for "Ten (10) tennis courts per BZA decision 9667";

(iv) Certificate of Compliance No. A017601, dated December 1, 1998, for a "Cabin with patio and new clubhouse with deck";

(v) Certificate of Compliance No. A017603, dated December 1, 1998, for a "Kitchen and dining hall"; and

(vi) Pre-Existing Certificate of Occupancy No. 5121, dated April 27, 1967, for a "1 ½ story house."

THE CHIEF BUILDING INSPECTOR'S DETERMINATION

By letter dated August 19, 2011, (the "Determination"), the Chief Building Inspector agreed with the assumptions set forth in the August 4, 2011, letter request by Southampton Day Camp Realty, LLC ("SDCR") to the Chief Building Inspector as it relates to SDCR's use of its property located at 665 Majors Path in the hamlet of North Sea (the "subject premises"). Because the Determination adopts the assumptions within SDCR's August 4, 2011 letter, a review of this correspondence is appropriate.

Seeking to permit the "renovation and expansion of the existing tennis camp," Wayne D. Bruyn, Esq., counsel for SDCR, wrote to the Chief Building Inspector on August 4, 2011, for a determination as to whether particular variances were necessary in order to achieve SDCR's stated goal of operating a summer camp at the premises (the "Letter"). After a review of the historical surveys associated with the property, the Letter goes on to discuss the use of the property. Asserting that the property has been continuously used as a seasonal camp providing a variety of recreation activities, including tennis, basketball, field sports, riding, and boating and swimming in Little Fresh Pond, since prior to the inception of zoning within the Town of Southampton, the Letter does not address any possible abandonment issues.

Instead, the Letter starts from the premise that the property benefits from a Certificate of Occupancy dated December 2, 1998, for, among other uses, a "tennis camp" as well as "ten tennis courts." Recognizing that the Southampton Town Zoning Code does not define or list a "tennis camp," and recognizing that those uses not listed in the Southampton Town Zoning Code Residence Districts and Business Districts Table of Use Regulations are deemed prohibited,[3] the Letter asserts that this "day camp" or "sports instructional camp" use, including the operation of

[3] See Town Code §§330-10 and 330-33, the Residence Districts Table of Use Regulations and the Business Districts Table of Use Regulations, respectively, which state at the top of each page, "All unlisted uses are prohibited in all districts."

tennis courts, is considered a prohibited use and thus, is a nonconforming use in this R-20 Zoning District.

From there, the Letter performs an analysis of the relevant provisions of the Standard Industrial Classification ("SIC") Code, a Code incorporated by reference into the Town's Zoning Code.[4] Historically, the SIC Code has been used by the Building Inspector, as well as this Board, to assist in narrowing or identifying uses, and determining whether said uses are compatible within a particular zoning district. Here, because the Southampton Town Zoning Code does not identify, define, or list any standards for a "tennis camp," since such a use is not listed, the Letter reviews SIC classifications in an effort to identify one in which a day camp or sports instructional camp would "fit," so to speak. In doing so, the Letter notes that while "camping grounds" are listed as a special exception use in this R-20 Zoning District, the Town's definition, at Town Code §330-5, limits such uses to "recreational camping in tents, automotive camping units or trailers or house trailers," a use not contemplated by SDCR. To that end, the SIC classification for camping grounds, identified under Industry No. 7033, is equally inapplicable.

Under a related but separate SIC designation of 7032, with the title "Sporting and Recreational Camps," which does include "boys' and girls' camps," and which might otherwise "fit" the description of SDCR's proposed use, the Letter explains that the 7032 designation actually precludes establishments primarily engaged in operating sports instructional camps, such as a tennis camp. Rather, the Letter asserts that this "day camp" or "tennis camp" designation would fall under the 7999 identifier, that is, "Amusement and Recreation Services, Not Elsewhere Classified." Within this list of applicable uses is "day camps," as well as the operation of non-membership outdoor and indoor tennis courts.[5] Thus, with this in mind, the Letter asserts that, because it has been the practice of the Building Department to treat uses listed under the same SIC Industry No. or identifier as the same or interchangeable uses for purposes of the Zoning Law, and because "the operation of a tennis camp and day camp are considered to be the same or interchangeable uses under the Zoning Law, the continued operation of a day camp or sports instructional camp, including the operation of tennis courts (to wit: tennis camp) on the subject property will not be considered to be a change in the nonconforming use requiring a variance"[6] under the applicable provisions of the Town Code. In short, the Letter asserts that because day camps and sports instructional camps, including the operation of tennis courts, are all listed under the SIC Code 7999 category, such operations are considered the same or interchangeable uses as a matter of law, and thus, the modification of such interchangeable uses does not require a variance.

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[4] See Footnote #1 of Southampton Town Code §330-33, the Business Districts Table of Use Regulations, which provides, " 'SIC' refers to the 1972 Standard Industrial Classification Manual as supplemented in 1977. Said manual and supplement are incorporated by reference as part of this chapter."

[5] Parenthetically, the Letter notes that there is a Special Exception standard in Town Code §330-162.12, which purports to control "campgrounds, summer camps, day camps or health camps," but, upon closer review, reveals that none of the standards listed therein define a "summer camp" or a "day camp," and instead appears to deal primarily with transient camping grounds.

[6] See Letter dated August 4, 2011, from Wayne D. Bruyn, Esq. to the Southampton Town Chief Building Inspector, at page 5.

With the use issue aside, the Letter goes on to address several other "assumptions," seeking confirmation as to whether (i) the total floor area of the buildings and structures devoted to the use at the time the Certificates of Occupancy were issued in 1998 will be used to establish the base line total floor area for renovation purposes, (ii) the twelve cottages on the property may continue to be used as seasonal overnight accommodations for camp staff, (iii) the repair, replacement, and relocation of the buildings and structures on the property as depicted on SDCR's Renovation Plan does not constitute an increase in the degree of nonconformity, (iv) the repair, replacement, and relocation of the sports courts, including the replacement of the sports courts with other sports courts, that is, replacing a tennis court for a swimming pool, or a basketball court, or a playground, as depicted on SDCR's Renovation Plan, does not constitute an increase in the degree of nonconformity or a change requiring a variance, (v) the replacement and relocation of the sports courts with a grassed recreational field, where the area of the grassed field is included in the total area of the existing sports courts, as depicted on SDCR's Renovation Plan, does not constitute an increase in the degree of nonconformity or a change requiring a variance, (vi) in all other respects, SDCR's Renovation Plan constitutes a continuation of the existing camp use and does not require a variance, and (vii) due to the changes in architecture and the relocation of certain building and structures on the property, SDCR's Renovation Plan shall be subject to site plan review.

Having agreed with the assumptions outlined on page seven of the Letter, the Chief Building Inspector found that no variances were necessary in order for SDCR to carry out its plan for the subject premises. It is from this determination that applicants appeal.

SEQRA

An appeal from the determination of the Chief Building Inspector is a Type II action pursuant to 6 NYCRR Part 617.5(c)(31) of the State Environmental Quality Review Act ("SEQRA"), and the relevant provisions of the Southampton Town Code. Indeed, the regulations provide, in pertinent part, that "interpreting an existing code, rule or regulation" is not subject to review since such an action has been "determined not to have a significant impact on the environment."

HEARING

In sum, the following testimony and evidence was submitted at the hearing before the ZBA:

James S. Henry, Esq., of the Northern Environmental Law Center, testified on behalf of three civic associations, the applicants herein. Mr. Henry testified that applicants seek a determination from this Board finding that the Chief Building Inspector violated both the Southampton Town Code as well as New York State Town Law when he issued his Determination. Indeed, instead of authorizing the proposed uses, Mr. Henry testified that the Chief Building Inspector should have directed the recipient of said Determination, SDCR, to seek variances from this Board, before its project could move forward or continue.

Specifically, Mr. Henry argued that SDCR's reasoning, adopted by the Chief Building Inspector, is flawed. Indeed, Mr. Henry testified that the use of the subject premises by SDCR's predecessor in title, the North Sea Racquet Club, does not fall under SIC 7999 but rather, is more accurately reflected under SIC 7997. SIC 7997, by contrast, includes tennis clubs with paying membership-based operations and, as attested to by several neighbors and former members, the North Sea Racquet Club was a paying, membership-based tennis organization. To that end, any instructional programs offered by the club, to children or otherwise, were ancillary to its primary use as a membership-based club. With a different SIC identity, argued Mr. Henry, SDCR may not benefit from any "interchangeable" use argument. In any event, Mr. Henry testified that using the SIC Code to define "interchangeable" uses for zoning purposes has no basis in law and would produce arbitrary results, pointing to the example that, under SIC 7999, in addition to day camps, uses such as shooting ranges, bowling alleys, circuses, and rodeos would be permitted without the need for a variance.

Instead, Mr. Henry testified that Southampton Town Code §330-117 and §330-167 dictate that a variance is necessary where, as here, there is a proposal to change a prior nonconforming use to a new nonconforming use. He further stated that its predecessor in title, the North Sea Racquet Club, formerly served approximately 40 daily tennis club members, predominantly adults, employed only a few tennis instructors, and was run by two of its owners, who lived on-site and took care of maintenance and scheduling. By contrast, Mr. Henry stated that SDCR proposes to build a large, new day camp for 400 campers, employing nearly 100 full time staff members and generating frequent bus and car tips, turning "a slow-paced, low-budget tennis club for a few dozen adults in the midst of a quiet residential neighborhood"[7] into something quite different. Ultimately, argued Mr. Henry, the express intent of the zoning law would be undermined by perpetuating, rather than eradicating, a nonconforming use within the Town.

Further, Mr. Henry stated that a variance is required since the use of the structure identified as the "Ranch House," once used as a Dining Hall, has long been abandoned, having been changed to its current conforming use as a residence since at least as early as 1990. In addition, Mr. Henry claimed that any other nonconforming uses of the North Sea Racquet Club for baseball, football, or riding have also been abandoned, with the only activity at the subject premises limited to tennis instruction and the seasonal rental of residential cottages. Finally, Mr. Henry testified that a variance is required in order to address the increase in square footage, or the footprint, of the nonconforming structures on the property.

In response to these arguments, Wayne D. Bruyn, Esq., of O'Shea, Marcincuk & Bruyn, LLP, testified on behalf of the property owner herein, SDCR. Mr. Bruyn testified that, at the outset, applicants have no standing to be heard before this Board. Indeed, Mr. Bruyn asserted that applicants have not submitted any information indicating that they are aggrieved by the Chief Building Inspector's Determination, or that they have satisfied the criteria outlined in relevant case law to sustain an action by an organization. Based on this alone, Mr. Bruyn argued that applicants' application must be dismissed by this Board for lack of jurisdiction.

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[7] See letter dated October 20, 2011, from James S. Henry, Esq. on behalf of applicants, to the Zoning Board of Appeals, at page 2.

As it relates to the Building Inspector's Determination, Mr. Bruyn testified that a predecessor in title, New Horizons Camp, Inc., ("New Horizons") applied and received the most recent, updated Certificate of Occupancy and Compliance for the subject premises in December of 1998, after an application to this Board for the addition of two additional tennis courts on the property.[8] Mr. Bruyn, citing the application and decision, notes that the ZBA found, "the premises operated as a tennis club and/or tennis camp," providing "tennis services, including lessons, court time, and memberships to local school and civic groups." Thereafter, Mr. Bruyn explained that a subsequent predecessor in title, Chris Jefferies of MDP Southampton Racquet Club, Inc., ("Southampton Racquet Club"), first engaged Cliff Drysdale Tennis Management ("CDT") from 2006 to 2008, and later engaged tennis professional Diego Vallone in 2009, to operate the camp and the Club. According to Mr. Bruyn, the property was operated and managed as a tennis camp and club from May through September of these years, providing "opportunities for both adults and children to play tennis and participate in lessons, clinics, matches and/or tournaments," accepting memberships and allowing the general public to use the courts. Thus, Mr. Bruyn asserted that Southampton Racquet Club continuously operated the tennis camp and tennis club until 2010, when the property was sold to Mr. Bruyn's client, SDCR herein.

Addressing the SIC Code discussions, and more specifically, the Building Inspector's finding that uses listed under the same SIC category are "interchangeable," Mr. Bruyn pointed out that applicants' allegations suggesting that the practice could lead to unreasonable or arbitrary results – allowing a shooting range, bowling alley or circus to operate on the property – is misplaced. Indeed, Mr. Bruyn argued that, while listed under the same 7999 SIC category, a shooting range, bowling alley, or circus, are addressed within Southampton Town Code's use tables, obviating the need to resort to the SIC Code for clarification. Thus, the Building Inspector could not make such a leap since those uses are treated separate and distinctly within the Town Code, making guidance from the SIC Code unnecessary. Along those same lines, Mr. Bruyn argued that applicants' claim that the subject premises operated as a "membership-based tennis club," is also misplaced, asserting that a membership club is restricted to its members and guests, and is clearly defined in the Zoning Code, permitting only beach clubs and yacht clubs in certain zones. All other membership clubs, such as a golf club, are prohibited uses allowed only under Planned Development District standards. To that end, Mr. Bruyn asserted that the 1998 Certificate of Occupancy, which indicates a "tennis camp" use rather than a membership based tennis club use, would have been challenged or revoked had the use been other than a tennis camp at the time of its issuance. Thus, Mr. Bruyn argued that because SDCR's proposed use of the property as a day camp is substantially the same as the existing use of the property as a tennis camp, no variance is required.

As it relates to the issue of the possible abandonment of the pre-existing nonconforming use of the subject premises, Mr. Bruyn argued that, in the first instance, the applicants bear the burden of proving any such abandonment, which they have not done. Indeed, Mr. Bruyn testified that applicants have not proven that the entire tennis camp use has been completely discontinued or abandoned for a continuous three year period, as required by the applicable Town Code provision. Instead, Mr. Bruyn claims that applicants attest, in various affidavits, that a tennis camp and related activities did actually continuously occur on the site. To the extent that

[8] See Zoning Board of Appeals Decision No. 9667, dated June 8, 1995, submitted as part of the record herein.

applicants claim the dining hall use was abandoned, Mr. Bruyn argued that, even if this were the case, the fact that the dining hall may not have been used for the service of food does not prevent the service of food elsewhere on the property, nor does it direct the complete cessation of the tennis camp use.

Finally, Mr. Bruyn argued that, while the Town Code prohibits the extension or enlargement of a nonconforming use, it does not prohibit its alteration. Here, Mr. Bruyn asserted that SDCR seeks to renovate the property without any expansion of the total floor area or activity area, and without any increase in the degree of nonconformity of the buildings and structures thereon. Specifically, Mr. Bruyn testified that there is approximately 11,998 square feet of floor area devoted to the buildings on the property, approximately 4,035 square feet devoted to the decks and patios, and approximately 59,213 square feet devoted to the sports courts on the property; the proposed renovation plans do not exceed any of these totals. For all of these reasons, Mr. Bruyn argued the Chief Building Inspector's Determination should be upheld, with no variance relief necessary from this Board.

The following individuals either appeared or submitted letters in opposition to the Chief Building Inspector's Determination and, more specifically, SDCR's proposed plan for the subject premises: Joseph Jannsen of The Nature Conservancy, Bruce and Sophie Nadell, Robert W. Goldfarb, Celeste Frank, Robert Arcs, Nina R. Kennedy, James R. Kennedy, John Barona, Lucille K. Dunne, Mary and Rob Kane, Dorothea A. Donaldson, Nettie Potapchuk, Larissa Potapchuk, Walter Potapchuk, Diane L. White, Nadya Potapchuk, Barbara Marsh, Lindsay Freda, Heather Frayne, Jill and Stuart Gleiber, Steve Abramson, Edna Teich, Ivan Bart, Foster Mayer, Charlotte Wagster, Joan Barra, Lucille Colon, Jimmy Silber, Elizabeth Suse, Robert Roessle, Tom Shea, Mina White, Stephanie Oppenheim, Diane Bennett, Rosemary Peck, Grant Greenberg, Dave Saland, Wally Teish, Stuart Summit, Norena Baird, Frances Genovese, Elaine Kahl, April Gonzalez, Jeremy Samuelson, Jimmy Stuber, and Frank Palmer. These letters and comments are maintained as part of this record.

This Board is in receipt of a letter from the Suffolk County Planning Commission dated October 29, 2011, indicating that this Board's review of the Building Inspector's Determination is a matter for "Local Determination," since there are "no apparent significant county wide or inter-community impacts." This Board is also in receipt of a letter from Frederick Havemeyer, Secretary/Treasurer of the Southampton Town Trustees, dated May 27, 2011, but received November 23, 2011, asking that "every consideration be given to minimizing the environmental impact of this very large proposed project." Specifically, Mr. Havemeyer asks that (i) the neck of the property that leads to Little Fresh Pond be made into a conservation easement and be maintained as a large non-disturbance buffer in an effort to protect the pond from harmful runoff, and (ii) the site plan be developed in such a way so that the grading and location of the septic systems are designed to ensure that nothing detrimental to the environment leaves the property. These letters too, are maintained as part of this record.

DISCUSSION

A. Standard of Review

At the outset, this Board notes that the standard of review to be applied is that of *de novo*, or anew. Indeed, despite counsel's assertions otherwise,[9] there is no measure of deference or discretion that must be given to the Building Inspector's determination. New York State Town Law §267-b(1) provides:

> The board of appeals may reverse or affirm, wholly or partly, or may modify the order, requirement, decision, interpretation or determination appealed from and shall make such order, requirement, decision, interpretation or determination as in its option ought to have been made in the matter by the administrative official charged with the enforcement of such ordinance or local law *and to that end shall have all the powers of the administrative official from whose order, requirement, decision, interpretation or determination the appeal is taken.* (emphasis added).

Thus, this Board has jurisdiction to interpret zoning regulations upon an appeal from the construction of such regulations by an enforcement official,[10] that is, the Chief Building Inspector and, in doing so, this Board is bound to apply a *de novo* standard of review.[11] Stated another way, the issue before this Board is the same issue contemplated by the Chief Building Inspector, that is, whether SDCR's proposal constitutes a change of use requiring a variance from this Board. In making this determination, this Board, as a matter of law, does not have to give any deference to the Building Inspector's previous Determination but instead, must "rule on the 'narrow issue' before it,"[12] since "the issue of conformity with zoning regulations is within the primary jurisdiction of the town zoning board."[13]

B. Standing

This Board recognizes, and it is well-settled, that an appeal may be taken only by someone who is "aggrieved" or by an "officer, department, board or bureau" of the Town.[14] It is also well-settled that the burden of establishing standing to raise a claim is on the party seeking

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[9] See November 3, 2011, Memorandum in Support of Building Inspector's Determination, with subheadings noting that the Building Inspector's Determination had a "reasonable and rational basis"; see also testimony of Wayne D. Bruyn, Esq., at page 51 of October 20, 2011, public hearing transcript.

[10] See JEAN E. MAESS, J.D., ET AL., N.Y. JUR., 2D, BUILDINGS §359, p. 523 (2007).

[11] See Toys "R" Us v. Silva, 89 N.Y.3d 411, 423, 654 N.Y.S.2d 100, 107 (1996)(In reaching its determination, the Board of Standards and Appeals had de novo power and was not bound by the findings of the Department of Buildings).

[12] See BBJ Associates, LLC v. Zoning Board of Appeals of the Town of Kent, 65 A.D.3d 154,159, 881 N.Y.S.2d 496, 500 (2d Dept. 2009)(citations omitted).

[13] See Thurman v. Holahan, 123 A.D.2d 687, 507 N.Y.S.2d 52 (2d Dept. 1986); see also Jordan's Partners v. Goehringer, 204 A.D.2d 453, 611 N.Y.S.2d 626 (2d Dept. 1994)(A Zoning Board of Appeals has the primary jurisdiction of interpreting the applicable zoning ordinance).

[14] Town Law §267-a(4). See also Terry Rice, *Practice Commentaries*, MCKINNEY'S CONSOLIDATED LAWS OF NEW YORK, TOWN LAW, Book 61, §267-a, p.259 (2004).

review.[15] Thus, applicants bear the burden of establishing standing, or aggrievement, to bring this appeal. Here, we believe applicants Little Fresh Pond Association ("LFPA") and North Sea Neighbors ("NSN"), have met this burden.

Generally, standing to challenge an administrative action turns on a showing that the action will have a harmful effect on the challenger, and that the interest to be asserted is within the zone of interest protected by the statute.[16] Standing by an association or organization involves a further variation, that is: (i) the association or organization must show that one or more of its members would have standing to sue, (ii) the association or organization must demonstrate that the interests it asserts are germane to its purpose so as to satisfy the court that it is an appropriate representative of those interests, and (iii) it must be evident that neither the asserted claim nor the appropriate relief requires the participation of the individual members."[17]

Addressing this first criteria, that is, that one or more members of the association or organization would have standing to sue, as long recognized by the courts, this Board too recognizes that a nearby property owner may have standing to challenge a proposed action since aggrievement is inferred from proximity;[18] "proximity alone permits an inference that the challenger possesses an interest different from other members of the community."[19] Here, LFPA and NSN are entitled to such inference. Indeed, a review of the testimony and evidence submitted at the hearings on this matter reveals that adjacent property owners Foster Maer, at 717 Majors Path, James Kennedy, at 721 Majors Path, and Celeste Frank, at 735 Majors Path, all members of NSN, allege that SDCR's proposed plan will interfere with their use and enjoyment of their property, cause noise and traffic problems, and threaten the environmental soundness and health of Little Fresh Pond.[20] These allegations constitute injury-in-fact and, given their status as adjacent property owners, it is "obvious that many of the alleged injuries would affect [these property owners] in a manner wholly distinct from the public at large."[21]

Similarly, nearby property owner Rosemary Peck, who resides at 246 Little Fresh Pond Road, and a member of LFPA, also alleged that SDCR's proposed plan will interfere with the use and enjoyment of her property, will invite pollution to the pond, both noise and

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[15] See Society of the Plastics Industry, Inc. v. County of Suffolk, 77 N.Y.2d 761, 570 N.Y.S.2d 778 (1991).

[16] See Gernatt Asphalt Products, Inc. v. Town of Sardinia, 87 N.Y.2d 668, 687, 642 N.Y.S.2d 164, 176 (1996) (citation omitted).

[17] See Society of Plastics v. County of Suffolk, supra, 77 N.Y.2d at 775, 570 N.Y.S.2d at 786.

[18] See Gernatt Asphalt Products, Inc. v. Town of Sardinia, supra.

[19] Id.

[20] See (i) September 26, 2011, authorization from Foster Maer, on behalf of NSN, to allow James S. Henry, Esq., to represent the organization in this proceeding, (ii) October 5, 2011 letter from Celeste Frank to the ZBA, (iii) October 20, 2011 letter from Celeste Frank to the ZBA, (iv) October 20, 2011, "Affirmation" of Foster Maer, (v) October 20, 2011 hearing testimony of Celeste Frank, Foster Maer, and James Kennedy, (vi) October 26, 2011 letter from James Kennedy to the ZBA, and (vii) December 1, 2011 hearing testimony of Foster Maer.

[21] See Committee to Preserve Brighton Beach and Manhattan Beach v. Planning Commission of the City of New York, 259 A.D.2d 26, 32, 695 N.Y.S.2d 7, 11 (1st Dept. 1999)(Organization representing cooperative apartment building overlooking a public park and a not-for-profit corporation dedicated to preserving, beautifying, and improving city neighborhoods had standing to challenge construction of privately owned recreational center at park, where it demonstrated that one of its individual members had standing to sue); see also Hartford/North Bailey Homeowners Association v. Zoning Board of Appeals of the Town of Amherst, 63 A.D.3d 1721, 881 N.Y.S.2d 265 (4th Dept. 2009)(homeowners association had standing to sue where association established that at least one member would have standing to sue).

environmental, and will threaten the sanctuary the pond offers to deer, birds and turtles in the area.[22] Here too, given her status as a nearby property owner, Ms. Peck's harm is inferred, with her allegations "minimally sufficient" to confer standing.[23]

And yet, even in light of these facts, this Board notes that LFPA and NSN would still have standing without this "proximity presumption." Indeed, as the Court of Appeals recently found, "a person who can prove that he or she uses and enjoys a natural resource more than most other members of the public has standing" to challenge the governmental action that threatens that resource.[24] Applying that rule here, there can be no doubt that LFPA and NSN have standing to challenge an action alleged to threaten Little Fresh Pond and its surrounding environs. Here, like the Save the Pine Bush petitioners, applicants allege that they use Little Fresh Pond for recreation and reprieve, and to observe and enjoy the unique habitat found there; their use is alleged as repeated, not rare or isolated.[25] To that end, there has been no dispute that Little Fresh Pond Association members and North Sea Neighbors members are people "who frequently visit and enjoy"[26] the pond. For these reasons, applicants' direct injury, that is, injury to the association members' "aesthetic and environmental well-being," is sufficient to confer standing.[27]

Returning to the remaining inquiry, that is, the zone-of-interest requirement, there can be no question that LFPA's interest and NSN's interest in protecting the natural resources of Little Fresh Pond, as well as preventing traffic problems and preserving the use and enjoyment of their property, are at the core of the interests protected by the zoning statute. Indeed, Town Code §330-3, which declares the purposes of the Town's Zoning Code, states, at subsections (b), (c), (g), (h), (k), (l), and (m) respectively: "to protect the established character and the social and economic well-being of both public and private property," "to promote, in public interest, the utilization of land for the purposes for which it is most appropriate," "to secure safety from fire, panic, flood, storm and other dangers; to provide adequate light, air and convenience of access; and to prevent environmental pollution," "to prevent overcrowding of land or buildings and to avoid undue concentration of population," "to lessen and, where possible, to prevent traffic congestion on public streets and highways," "to eliminate nonconforming uses gradually," and "to conserve and reasonably protect the natural scenic beauty and cultural and historic resources of the Town and its environs." Any one of these purposes would satisfy the zone-of-interest threshold; all of them make it apparent that the interests of LFPA and NSN fall squarely within the zone-of-interest the statute is intended to protect.

Finally, both LFPA and NSN have shown that the interests they assert, that is, the protection of Little Fresh Pond as well as the quiet use and enjoyment of their property, are

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[22] See October 20, 2011, hearing testimony of Rosemary Peck.

[23] See Druyan v. Village Board of Trustees of the Village of Cayuga Heights, 33 Misc.3d 1203(A), 938 N.Y.S.2d 226 (Sup. Ct. Tompkins County, Sept. 14, 2011)(petitioners allegations that they will "experience a diminished opportunity to observe the deer that live in or migrate in and out of Cayuga Heights" were minimally sufficient to establish standing).

[24] See Save the Pine Bush, Inc. v. Common Council of the City of Albany, 13 N.Y.3d 297, 301, 890 N.Y.S.2d 405, 406 (2009).

[25] Id., 13 N.Y.3d at 305, 890 N.Y.S.2d at 409.

[26] Id.

[27] Id.

sufficiently germane to the purposes of each association.[28] To that end, it is evident that participation of the individual members is not required to assert these claims or afford applicants complete relief therefrom.

For these reasons, this Board finds that LFPA and NSN have demonstrated standing sufficient to allow this appeal pursuant to Town Law §267-a(4).[29] Because the record does not reflect evidence that applicant The Lake Missapogue Association has satisfied this burden, this Board does not find that said organization has standing to pursue the appeal of the Building Inspector's Determination at issue herein.

C. The ZBA's 1995 Decision

Much of the discussion regarding the use of the subject premises has been predicated upon this Board's June 8, 1995 decision, identified as Decision No. 9667 (the "ZBA Decision"). Thus, a short review of this decision is appropriate.

On or about June of 1995, New Horizons, a predecessor in title to SDCR herein, sought an interpretation from the Zoning Board of Appeals as to whether eight existing tennis courts on the property were entitled to pre-existing nonconforming status or whether, in the alternative, New Horizons needed a variance from the Zoning Board to legalize the existing eight tennis courts, and allow the construction of two additional tennis courts on the property. While much of the discussion in the Decision of the Board focuses on the Zoning Code's so-called "50% expansion" rule,[30] the Decision, notably, describes the use of the property as "a tennis club and/or tennis camp," adding that New Horizons "provides tennis services, including tennis lessons, court time, and memberships to local schools and civic groups." Without trying to re-

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[28] See Memorandum in Support of Building Inspector's Determination dated November 3, 2011, at Exhibit F; see also document entitled "Reply to Applicant's Brief," received by the ZBA on November 21, 2011, from James Henry, Esq., at page 3, noting, "[s]ince 1985, LFPA has collected water samples to monitor water quality, and it has undertaken many other activities to safeguard the quality of the community around the pond"; see also October 20, 2011, and December 1, 2011, letters to the ZBA from the Little Fresh Pond Association; see also October 20, 2011, hearing testimony of Grant Greenberg; see also affidavit of Robert Goldfarb, part of document entitled "Compendium of Evidence," dated January 17, 201[2], describing in detail the efforts taken by LFPA over the past 30 years to preserve the quality of the pond.

[29] See Long Island Pine Barrens Society, Inc. v. Suffolk County Legislature, 31 Misc.3d 1208(A), 929 N.Y.S.2d 200 (Sup. Ct. Suffolk County, March 30, 2011)(Long Island Pine Barrens Society, Inc. had organizational standing where Court of Appeals, by *Save the Pine Bush, Inc. v. Common Council of City of Albany*, extended standing to the organizational plaintiff because its members were alleged to have sustained an injury to their "aesthetic and environmental well being"); see also Clinton v. Summers, 144 A.D.2d 145, 534 N.Y.S.2d 473 (3d Dept. 1988)(Association had standing where it established that its members either own property or regularly utilize Lake George for recreational purposes; membership was open to all residents and users, and Association's purpose was to preserve the environmental quality of the lake); see also Tuxedo Conservation and Taxpayers Association v. Town Board of the Town of Tuxedo, 69 A.D.2d 320, 418 N.Y.S.2d 638 (2d Dept. 1979)(Association had standing where aggrieved persons lived within a radius of 100 to 1,500 feet from subject area, and all were adversely affected by matters such as noise, water, air pollution, traffic density, and the project would "wreak havoc" on the Comprehensive Master Plan of 1972 if the decision was permitted to stand undisturbed).

[30] See Southampton Town Code §330-167(B)(1)(a), which provides, in relevant part, "[i]n the case of a nonconforming use, such enlargement or extension shall not exceed, in all, 50% of the floor area of such building or structure actually devoted to such nonconforming use on the effective date of this use having first become nonconforming."

visit or "look behind" the thinking or mindset of the 1995 ZBA, this Board notes that the activities identified, that is, tennis lessons, court time, and membership opportunities, mimic predominantly club-based activities rather than "camp" based activities. To that end, we find the affidavits supporting New Horizons' ZBA request less than instructive since one affidavit, that of Jeffrey Kronemeyer, describes the use on the property as that of a "sports camp and sports facility," while another affidavit, that of Robert Kronemeyer, describes the use on the property as that of "a camp and tennis club," or "a camp and recreational club." It is from here that this Board resumes the analysis.

D. Abandonment

It is settled law that the burden of proving abandonment or discontinuance of a nonconforming use rests with the party or parties opposing said use.[31] Here, applicants have not proven such abandonment. Southampton Town Code §330-118(A) addresses abandonment, or discontinuance, of a nonconforming use and states, in pertinent part, at subsection (2):

> In cases where such nonconforming use is of a building or structure designed for such use, when it has been voluntarily discontinued for a period of 12 consecutive months; and, in cases where such nonconforming use is of a building or structure designed for such use, when it has not in fact been actually used for a continuous period of three years.

This Board is not convinced, nor have applicants proven, that SDCR, or its predecessors in title, voluntarily discontinued the use at the subject premises for a period of twelve consecutive months. Voluntary abandonment in law depends upon the concurrence of two factors: (1) an intent to abandon or relinquish a use; and (2) some overt act, or some failure to act, which carries the implication that the owner neither claims nor retains any interest in the subject matter of the abandonment.[32] Here, there is proof of neither. Indeed, there is no proof or evidence in the record that SDCR or its predecessors ever intended to abandon vested rights in the property.[33] There is no overt act by SDCR, or its predecessors, which might imply that either were no longer desirous of maintaining the "tennis club and/or tennis camp" use as discussed in

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[31] See Marzella v. Munroe, 69 N.Y.2d 967, 516 N.Y.S.2d 647 (1987)(finding that there was no evidence before the ZBA that the entire nonconforming use had been abandoned); see also People v. Simpson, 5 Misc.3d 1029(A), 799 N.Y.S.2d 163 (District Court, Suffolk County, Dec. 16, 2004)(finding that a fair reading of the Court of Appeal's *Marzella* decision indicates that the People bear the burden of proof on the issue of abandonment).

[32] See Salkin, Patricia E., NEW YORK ZONING LAW AND PRACTICE §10:42 (4th ed. 2010); see also Toys "R" Us v. Silva, supra, 89 N.Y.2d at 421, 654 N.Y.S.2d at 105; see also City of Binghamton v. Gartell, 275 A.D. 457, 90 N.Y.S.2d 556 (3d Dept. 1949).

[33] See Savetsky v. Board of Zoning Appeals of the Town of Southampton, 5 A.D.3d 779, 774 N.Y.S.2d 188 (2d Dept. 2004)(reinstating ZBA's decision and finding that there was evidence in the record that supported the Board's conclusion that the nonconforming use of the subject property had not been voluntarily abandoned); see also 202 Developers, Inc. v. Town of Haverstraw, 175 A.D.2d 473, 572 N.Y.S.2d 517 (3d Dept. 1991)(finding that the record was insufficiently developed to allow for any determination regarding whether plaintiff intended to abandon vested rights in the subject premises).

ZBA Decision No. 9667.[34] Given these facts, the "voluntary" threshold of the statute cannot be satisfied to prove abandonment.

This Board also finds that the subject premises has been "actually used for a continuous period of three years,"[35] and rejects an abandonment argument pursuant to those terms as well. Indeed, "abandonment does not occur unless there has been a complete cessation of the nonconforming use."[36] Here, since applicants bear the burden of proving any "cessation of use," it was incumbent upon them to produce evidence or identify a three year period for which they assert an abandonment; applicants failed to do this. Indeed, a review of the record reveals that, throughout the proceedings, applicants never asserted or identified any specific three year period for which they claimed the "tennis club and/or tennis camp" use was discontinued. Instead, the record contains only conclusory statements couched in hearsay or speculation. To that end, a review of applicants' own submissions belies a finding of abandonment, or that the subject premises was "not actually used," when they asserted: "right now . . . the only noise now coming from the tennis club has been a tennis ball bouncing on a tennis court well over 300 feet away;"[37] "I can tell you that I have been there and it was operated strictly as tennis lessons and tennis instructions for the past ten years;"[38] "[w]e periodically played tennis at the club on Major's Path for a period of approximately ten years, until the property was abandoned some 2 years ago;"[39] "[i]n fact, [people at the hearing] testified that the place was totally abandoned for a couple of years;"[40] "[t]he parcel . . . has been used in the past as a tennis club and children's camp, with ten courts accommodating 40 people at a time until it was abandoned in 2009."[41]

That these timeframes do not amount to a complete cessation of use is emphasized when considering the fact that, historically, this Board has held that the running of an abandonment period is tolled upon the filing of an application with a municipal agency such as the Town.[42] This has been based upon the premise that, to hold otherwise, could not only prove fatal to an applicant that had no control over the situation, but perhaps might even encourage, in some instances, administrative delay in order to stop or thwart a particular project.[43] Thus, under these circumstances, the five month time frame between SDCR's initial application to this Board on March 14, 2011, and the date SDCR later withdrew the application on August 24, 2011, after a public hearing, does not count towards the abandonment tally. In any event, despite this recent

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[34] *Cf.* Highway Oil Co., Inc. v. Zoning Board of Appeals of the City of Fulton, 55 A.D.2d 821, 390 N.Y.S.2d 298 (4th Dept. 1976)(finding that requisite intent to abandon was present where gasoline station was discontinued for 90 days and was boarded-up and enclosed by a chain link fence).

[35] See Southampton Town Code §330-118(A)(2).

[36] See Toys "R" Us v. Silva, supra, 89 N.Y.2d at 419, 654 N.Y.S.2d at 104 (citations omitted).

[37] See "Affirmation" of Foster Maer, dated October 20, 2011.

[38] See October 20, 2011, hearing testimony of Bruce Nadell.

[39] See October 20, 2011, hearing testimony of Sophie Nadell, as well as October 24, 2011 letter from Bruce and Sophie Nadell to the Zoning Board of Appeals.

[40] See November 28, 2011, letter from Bruce Nadell to ZBA Chairman Herbert Phillips.

[41] See December 1, 2011, letter from John A. Barona to the Zoning Board of Appeals.

[42] See Savetsky v. Board of Zoning Appeals of the Town of Southampton, supra, at note 33.

[43] See 149 Fifth Avenue Corp. v. Chin, 305 A.D.2d 194, 759 N.Y.S.2d 455 (1st Dept. 2003)(holding that the nonconforming use of a billboard was discontinued for period while building was undergoing legally required façade inspections and repairs); see also Sadler v. Zoning Board of Appeals of the Town of Union Vale, 240 A.D.2d 505, 658 N.Y.S.2d 127 (2d Dept. 1997)(finding that abandonment did not occur where landowner failed to procure or renew required health permit).

interruption, applicants have failed to prove the "tennis club and/or tennis camp" use on the property has been abandoned pursuant to Town Code §330-118(A)(2).

This Board is not persuaded that the abandonment of the "dining hall" on the subject premises, also identified as the "Ranch House" throughout the proceedings, is determinative of the issue herein since the dining hall use, while clearly abandoned, was an accessory use only and thus, not controlling or instructive to the overall analysis.

E. The Use of the Subject Premises

While the elimination of nonconforming uses is a stated goal of the Town's Zoning Code,[44] this can usually take a considerable period of time. Indeed, if the process works, then the use gradually becomes less and less viable and more and more deteriorated, creating a condition of blight in the more restricted neighborhood in which it is located.[45] Instead of improving the neighborhood through the elimination of the existing nonconforming use, the contrary result can sometimes be achieved.[46] Recognizing this, the Southampton Town Code adopts an intermediate position, permitting a change from one nonconforming use to another nonconforming use, if this Board finds that such change will be beneficial to the general neighborhood.[47] Contrary to the Building Inspector's Determination, we believe the facts and circumstances presented herein require SDCR to come back to this Board to seek a variance pursuant to Town Code §330-167(B)(3) for a change from one nonconforming use to another nonconforming use, that is, from the pre-existing nonconforming use of a "tennis club and/or tennis camp," to the proposed nonconforming use of a "day camp."

As discussed in some detail above, the Southampton Town Code incorporates by reference the SIC Code, a classification system that has been used by both the Building Inspector and this Board to assist in narrowing or identifying uses, and determining whether said uses are compatible within a particular zoning district. Because it is incorporated by reference, it is incumbent upon this Board to consider and apply the SIC Code and the terms therein. Though applicants disagree and find fault with the Town's use of the Code for land use purposes,[48] it is not unusual for a municipality to adopt a classification system to help categorize or measure uses within a particular zoning district.[49] Here, the Town's classification system is the SIC Code.

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[44] See Southampton Town Code §330-3(I).

[45] See 4 RATHKOPF'S THE LAW OF ZONING AND PLANNING, §73:8 (4th ed. 2011).

[46] Id.

[47] See Southampton Town Code §330-167(B)(3).

[48] See James Henry, Esq.'s October 20, 2011 submission at pages 3, and 7-11, November 21, 2011 submission at pages 5-8, and January 13, 2012 submission at pages 1-2.

[49] See Tausch v. Parker, 217 N.Y.S.2d 953 (Sup. Ct., Westchester County, 1961)(proposed general or retail stationary store was in "same classification" as post office within zoning ordinance provision which permitted the board of appeals to grant a change from existing nonconforming use to another use of same or higher classification); see also Beiner v. Incorporated Village of Thomaston, 98 A.D.2d 785, 470 N.Y.S.2d 16 (2d Dept. 1983)(finding that any existing nonconforming use may be continued or changed to a use of a similar or higher classification provided all other regulations governing the new use are complied with); see also Ganim v. Village of New York Mills, 75 Misc.2d 653, 347 N.Y.S.2d 372 (Sup. Ct. 1973)(holding that a nonconforming use may not be deemed changed if the new use falls within the same division of the use classification); *cf.* Campbell v. Rose, 221 A.D.2d 527, 528, 634 N.Y.S.2d 137, 138 (2d Dept. 1995)(holding, "*in the absence of an ordinance to the contrary*, a property owner has no right to substitute a new nonconforming use for an existing nonconforming use despite the generic similarity of

The Certificate of Occupancy for the subject premises is for a "tennis camp;" this Board's 1995 Decision describes the use as a "tennis club and/or tennis camp." SDCR proposes a "day camp." Because the Town Code does not define any of these uses, a review of the applicable provisions of the SIC Code is necessary. Two categories of the SIC Code have been identified as applicable to the issue herein – category 7997 and category 7999.

Category 7997, entitled "Membership Sports and Recreation Clubs" describes uses listed thereunder as "sports and recreation clubs which are restricted to use by members and their guests. Country, golf, tennis and yacht clubs are included in this industry." Beneath this description includes the compatible use of a membership tennis club. Category 7999, in comparison, entitled "Amusement and Recreation Services, Not Elsewhere Classified," describes the uses listed thereunder as "establishments primarily engaged in the operation of sports, amusement, and recreation services, not elsewhere classified, such as bathing beaches, swimming pools, riding academies and schools, carnival operation, exposition operation, game parlors, horse shows, picnic grounds operation, rental of rowboats and canoes, and shooting galleries." Beneath this description includes the compatible uses of a day camp, as well as non-membership tennis clubs and the operation of non-membership outdoor tennis courts. Because day camps, sports instructional camps, and the operation of tennis courts all fall under this SIC 7999 category, SDCR asks this Board to find that the uses are all compatible with one another and thus, the same or interchangeable as it relates to the continuation of the pre-existing nonconforming use. This Board cannot do that.

Initially, it is worth noting that, based upon the record, the pre-existing nonconforming use on the subject premises does not fit squarely within SIC Code 7997 or 7999. For example, SIC Code 7997 speaks to membership tennis clubs, while the evidence in the record reveals that non-member guests were also allowed to use the tennis courts on the subject premises, though they might not have gotten preferred court times. And SIC Code 7999 speaks to non-membership tennis clubs, though based upon the record there can be no doubt that memberships were offered, and probably the more common basis for people recreating there. Despite these variations, we believe that based upon the record, the pre-existing nonconforming use of the subject premises was more akin to a membership-based tennis club under SIC 7997.

SDCR concedes, as it must, that this Board previously found that its predecessor in title provided "tennis services, including lessons, court time, and memberships to local school and civic groups," and that it was a membership based tennis club.[50] Indeed, any children's programs appear to be small, intermittent, accessory uses to the tennis club use – likely provided to the children of club members. In fact, SDCR's predecessor, Southampton Racquet Club – signaling a club use in its name alone – offered a "full range of tennis programs and memberships for children and adults," promising that the staff was dedicated to providing "challenging tennis for players of all levels."[51] Of the thirteen activities offered, only two involved programs for children, and both were tennis related activities. Affidavits and testimony

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the uses")(emphasis added)(citations omitted); *cf. also* Garcia v. Holze, 94 A.D.2d 759, 462 N.Y.S.2d 700 (2d Dept. 1983)(finding, "ordinarily, in the absence of an ordinance to the contrary, a property owner has no right to substitute a new nonconforming use for an existing nonconforming use despite its generic similarities").

[50] See "Reply Memorandum in Support of Building Inspector's Determination," dated January 17, 2012, at page 28.

[51] See submission of James Henry, Esq., dated January 17, 201[2], at Exhibit 1.

of witnesses throughout the hearing process, including, but not limited to, Elizabeth Van Patten, Carole Pecore, Bruce Nadell, Foster Maer, and Robert Goldfarb, all attest to the use of the property as a tennis club, with any children's programs only ancillary in nature.

We find persuasive the analysis that the property, in its existing state and previously, is designed and/or arranged for use as a tennis club, and not a day camp.[52] Indeed, the property contains ten tennis courts, with the only non-tennis athletic structure a half-court basketball court; there is only one club house adjacent to the tennis courts, with a large deck overlooking the courts, and all walkways lead to and from the club house and the tennis courts. Because Town Code §330-4(F) instructs, in pertinent part, that the word "use" shall mean any purpose for which a lot "is arranged, intended, or designed to be used," we find the review of these drawings instructive.

In contrast, the evidence submitted by SDCR as to the former camp use is lacking, submitting affidavits that indicate that children had "opportunities" to play tennis, or noting that children "could" participate in other non-tennis activities; all prospective, rather than reflective statements, and all still acknowledging that the entire time, a tennis club for adults was operating on the premises.[53] Thus, it seems clear that any previous tennis camp use on the subject premises was merely ancillary, or accessory, to the tennis club use, making SDCR's proposed day camp use, under SIC 7999, and the pre-existing nonconforming membership tennis club use, under SIC 7997, incompatible, or non-interchangeable uses pursuant to the SIC Code.

F. Conclusion

Therefore, this Board finds that the proposed renovation and expansion of the subject premises from a "tennis club and/or tennis camp" to a "day camp" is a change from one nonconforming use to another nonconforming use since these uses are not compatible, or interchangeable, pursuant to the SIC Code; SDCR must seek a variance from this Board pursuant to Southampton Town Code §330-167(B)(3) for its proposed "day camp" use.

All other "assumptions" within the Building Inspector's Determination will be addressed if and when SDCR seeks a variance pursuant to Town Code §330-167(B)(3) since these issues will all factor into the analysis of whether the day camp use is "beneficial to the general neighborhood."

Dated: March 15, 2012

David M. Reilly

[52] See Submission of James Henry, Esq., dated January 17, 201[2], at page 3.
[53] See Affidavit of Harold Krzyzewksi, dated November 2, 2011; affidavit of David Saland, dated October 14, 2011; and affidavit of Don Henderson, dated January 11, 2012.

EXHIBIT “B”

Schneider Engineering, PLLC
Civil Engineering: Traffic • Municipal • Accident Investigations
Steven Schneider, P.E.
Principal

C2

December 7, 2016

Mr. Jeffrey Bragman, Esq.
15 Railroad Avenue, Suite 1
East Hampton, New York 11937

Re: **Traffic Impact Study Review**
Southampton Country Day Camp

Dear Mr. Bragman:

Schneider Engineering, PLLC has conducted a review of the "Traffic Impact Study for Proposed Southampton Country Day Camp," revised September 2016, prepared by Dunn Engineering Associates, PC for the Southampton Day Camp Realty, LLC. Our latest review revealed the following:

The Traffic Impact Study (TIS) appears to have been conducted and prepared in keeping with the general traffic engineering standards and practices. However, the following issues remain:

General

The traffic study uses the term "camp" to describe both the existing and proposed use. It is often difficult to distinguish which use is being discussed. The terms used in the DEIS and TIS should distinguish between the tennis club, the tennis club accessory camp or a separate day camp use. Each specific use, of course, can greatly affect trips generated to the site, which in turn, affects the impact that traffic will have on the site. This could lead to inaccurate current trip generation counts, possibly even higher than they actually are. Then, when considering the future counts, it may not seem as much of a difference, thereby lowering the future impact. Therefore, the current counts should be clearly shown and not left too vague for analysis purposes.

C2-1

Throughout the report, there are inconsistent numbers of campers and staffers that would be on the site. The report keeps jumping around; it should document the final numbers used for these parameters.

C2-2

In their Study Approach, on page 8, the report indicates that manual intersection turning movement counts were taken during the weekday between 8 AM and 10 AM. That does not include the period before 8 AM when staff arrives. Even though there will probably be

C2-3

fewer staff arrivals than campers at that time, the roadway traffic peak may be higher. Therefore, we feel that earlier accounts should be taken as well. C2-3 cont'd

The DEIS refers to camp "enrollment" of 280 campers. This number may not represent the actual daily number of campers, but rather the total number of campers over a season. It is not clear if there were 280 campers present every day. The actual number of daily campers may be significantly less and, if used in determining the future generated trips, would deem the projected the future trips inaccurate. Further information documenting the actual number of daily campers during the study period should be submitted for further review.

The DEIS should also provide specific, accurate counts for the tennis club members, based on verifiable membership and other documentation. C2-4

It is unclear where the campers walk to when they are dropped off at either of the two drop-off areas. For both drop-offs the campers would have to cross a busy internal roadway to get to their final destination to start their program. This could be very hazardous, from a traffic safety standpoint. There should be one drop-off area established where the children do not have to walk across any internal roadway to get to their destination. That does not seem to be the case here and should be addressed. C2-5

It is unclear whether our previously submitted initial comments on the DEIS were addressed. The latest DEIS suggests that they were not. It notes, on page 2, that the Revisions addressed the "analysis specified in the Scoping Document prepared by the Town in 2015." Therefore, many of our previously submitted comments may not have been answered. To the extent that they are included in this memorandum, we believe that supplemental information should be required. C2-6

<u>Roadway Characteristics</u>

The TIS states that the site will have two driveways on Major's Path at completion. The site plan indicates that there will be a total of three driveways (TIS page 11). The traffic counts indicate that the existing driveways on T Road serve two-way traffic. Since all access points on T road serve two-way traffic, the site clearly has three driveways. This fact should be corrected. C2-7

<u>Traffic Volumes</u>

It is standard practice for Traffic Engineers to take traffic volume counts for one full week. The DEIS report is insufficient, because it only includes data for three days. Also, these C2-8

counts were taken in 2013 and out-of-date. Instead of using current counts, the DEIS deals with this data insufficiency by applying a 2% growth factor for 2 years, through 2015. However, that growth factor seems calculated to minimize growth. It contradicts the fact that the DEIS reports very large increases in the number of campers coming to the site after the camp first started in 2013, and during the last 3 years, when the applicant has operated it as a public camp. Updated volume counts should have been taken in the summer of 2016 with the latest number of campers in place. Their updated report was prepared in September.

The 2% growth factor should be revised to take into account the large growth which the public camp use has experienced. In addition, the TIS should have discussed the number of campers that were present during that specific 3 day count. The dates seem to fall on the last day of the regular camp session and the "post camp" session which were likely low attendance days. The DEIS must also present an accurate discussion distinguishing the amount of tennis club members using the club and the amount of tennis club members children who participated in the accessory camp for members only. That is the only way to understand what the baseline use was, so that it can be compared to the faster growth of the public camp over the last three years.

C2-8 cont'd

Also, the DEIS contains an inaccuracy which must be formally corrected. The northbound Weekday a.m. peak hour volume is 227 vehicles, not 193 (TIS page 14). This total should be corrected.

C2-9

Accident Records

- Accident analysis normally covers the three most recently available year-long data sets. The original analysis was performed for the period between 4/1/2007 and 3/31/2010, a period of three years. The second study included the period of 6/10/2012 to 9/30/2014, a period of 26 months. The DEIS/ TIS should be revised to include a full three year period accident analysis and the most current data available.
- If the last available data was from 9/30/2014, the beginning of that analysis period should be 10/1/2011 in order to provide a consistent and comparable result. It should be noted that the accident occurrence pattern has changed (TIS page 16) for the worse. The accident analysis in the DEIS/TIS should cover 36 contiguous months. With the report dated September 2016, a more up-to-date three-year accident analysis time period, was almost certainly available.

C2-10

Site Trip Generation Analysis

- The TIS states that the Southampton Racquet Club has operated at the same level for "many years" and no growth in the existing facility is anticipated (TIS page 21). This statement is in direct conflict with statements in the DEIS stating that membership has grown in recent years and may continue to grow (DEIS page iii). The DEIS/ TIS should provide historic membership and enrollment data that clearly identifies the growth trend and perform a quantitative analysis to determine future projected growth. On page 21 of the TIS, it indicates an anticipated increase in children from 215 in 2015 to 390 in the near future. That is an 81% increase in children expected at the site. During that same time period, the staff would be increasing by 46%. This is truly a tremendous increase in the expected number of persons on site. Obviously, the use creating this increase is not the Tennis Club, or its accessory camp for members, but the new public day camp, which is a proposed new use. The DEIS should distinguish the membership and accessory camp use from the new public children's camp so that the growth can be compared to an accurate baseline.

C2-11

Directional Distribution Analyses

The TIS used the directional distribution of the population of the current camp in its final analysis to determine what the future directional distribution should be. It is standard traffic engineering practice to derive directional distribution of future trips that will be generated to a site, from the current distribution of all traffic in front of the site. The report indicated that current distribution was examined, but the study chose to rely on the current distribution of site traffic.

Reviewing their distribution in Figure 4, it presumes 80% of the traffic entering and exiting the two northerly driveways will be coming from, and going to, the south. According to Figure 8, the actual distribution in front of the driveways, are approximately 50% each way, north and south. With them using the 80% distribution, their analysis had most cars exiting with a right turn from the driveway, the easier movement Using the distribution for all existing traffic that is currently there, will increase the left turn movements by 150%. This will become critical to the site's traffic safety issues (to be discussed later in this report), to be considered when taking into account the sight distance. Even the applicants engineer tried to address this major issue, which they feel, as we do, is an issue. The DEIS states that its authors had reviewed current distribution of traffic, but then elected instead to use a different proportion. The DEIS and the study should use the accepted engineering methodology to revise their distribution more accurately (using the 50/50 split, not the 80/20 split).

C2-12

Intersection Capacity Analysis/ Capacity Analysis Results

Intersection performance is primarily measured by how much delay is experienced by each vehicle. This is presented as a letter score from A to F with each representing a range of delay values in seconds. While the letter scores are an indication of intersection operation, one must examine the actual changes in time delay to fully evaluate an impact. It is important to recognize that the results of intersection capacity analysis are given in delay time *per vehicle* and that any added delay applies to *every* vehicle using the intersection, not just the newly added traffic. If adding 10 new vehicles to an intersection results in a delay increase of 5 seconds per vehicle that delay applies to all existing vehicles as well.

In addition to added delay, there are other technical measures that reflect intersection conditions; most commonly the ratio of available capacity to the demand (v/c ratio) and queue length. The first, v/c, is essentially a percentage value indicating how close the movement or intersection is to handling the maximum amount of traffic while queue length is an estimate of how long the line of waiting vehicles will become. When vehicular demand is near, at, or greater than an intersection's capacity, long lines of vehicles can build rapidly and take a long time to dissipate.

C2-13

The DEIS/ TIS should identify, within the text of the TIS, what the current v/c ratio and queue lengths are and how they will be impacted by the proposed condition.

The TIS states that the results of the capacity analysis are minimal with a fairly benign change from LOS B to LOS C. This statement does not accurately reflect the impacts:

- Table B - The results indicate that presently, the westbound approach of North Sea Mecox and Major's Path has a poor LOS E and is close to failure during the PM peak hour. This worsens to a LOS F in the 2017 “No Build” condition. The traffic added by the camp in the 2017 Build condition further worsens the problem. While the problem isn't entirely caused by the existing camp, it must be recognized that it contributes to the problem. Expansion of the camp will certainly have an impact at this location. The DEIS/ TIS should directly address this issue and how it will be impacted by the proposed condition.

- Table C - The results indicate that there is a serious congestion issue at North Sea Road and Major's Path during the PM peak hour where the traffic on the westbound approach is reported to experience 4 ½ minute delays in the existing condition. In just two years, the delay increases to almost 6 minutes in the No Build condition. The delay increases another 40 seconds due to the additional site generated traffic in the 2017 Build condition. It is highly probably that long queues will develop as a result. The DEIS/ TIS should directly address this issue and how it will be impacted by the proposed condition.

- Table D - The results presented for North Sea Road and North Sea Mecox Road indicate that the westbound approach experiences significant delays and

operational problems in both the AM and PM peak periods; in fact, it fails under all conditions. The AM Build condition shows that the site traffic adds 10 seconds of delay while the results of the PM peak period analysis indicates 42 minutes of delay which is obviously impossible. In reality, it indicates that the intersection cannot handle the current or future traffic. The DEIS/ TIS should directly address this issue and how it will be impacted by the proposed condition.

- Table H - The table does not identify the volume to capacity (v/c) ratio for any movements or the overall signalized intersection of North Sea Road and Sandy Hollow Road. Examination of the capacity analysis results reports shows that the eastbound left turn is at about 90% capacity in the 2017 "No Build" condition and will be at more than 95% of its capacity as a result of the additional site traffic associated with the proposed camp. This increased impact must be analyzed in the TIS .

C2-13

The results clearly indicate that there are serious problems on the existing roadway network, which the DEIS does not identify or analyze. The revised TIS discusses field observations indicating that the actual conditions are much better than the analysis results indicate. The level of disparity between the analysis results and observations is significant and indicates that the models were not adequately calibrated. It is felt that new observations should be made, when the camp is in session, and documented.

The DEIS indicated that there is still considerable queuing in the existing conditions. Additional traffic will worsen the condition unless mitigation measures are considered.

The TIS does not address v/c ratios in the text.

The TIS recognizes the traffic problems but denies that the added traffic contributes significantly. The issue still remains that there are serious existing traffic issues and it is only logical that any added traffic will exacerbate the issue.

In addition, the study did not examine whether there are any new generating uses which can be anticipated near this facility since their last look at the Town files in 2015.

Finally, the TIS does not present or analyze any traffic mitigation measures.

<u>Access Examination</u>

- Both the applicant's engineer and we agree that there is a definite sight distance issue. The TIS tries to address the issue, but fails. This issue is the most important to the safe development of this site.
- The site distance for a passenger vehicle turning left from a stop is 445 feet for 40 MPH (AASHTO). The report used 440 feet.
- Trucks and buses require more sight distance than passenger vehicles. Based on AASHTO, site distance for left turning buses is approximately 560 feet, not 445 feet (AASHTO).
- For right turning passenger vehicles and buses the sight distances are 385 feet and 505 feet at 40 MPH, respectively (AASHTO). Again, not meeting standards.
- The report was as much as 240 feet short of the Directional Sight Distance (DSD) because it did not consider buses, only cars, exiting the site. This error was not corrected even though the study obviously acknowledged that there was a problem given the relocation of a driveway to lessen the problem.
- The DEIS/ TIS should analyze the proposed DSD and identify if it satisfies all requirements and if it does not, how it would be mitigated. If DSD requirements are not met stop signs on Major's Path may be required.

Despite the proposal to relocate two driveways to improve conditions, several of the proposed conditions still do not meet minimum requirements. The TIS does not propose any mitigation such as all way stop signs.

C2-14

Should you have any questions, please do not hesitate to contact us.

Sincerely yours,

Steven Schneider, P.E.

File: 16-013T

Southampton Country Day Camp

AASHTO Recommended Intersection Sight Distance

Northern Exit	Required (40 MPH*)		Actual	Proposed	Result (Actual v Req'd.)	
	Auto	Truck/ Bus			Auto	Truck/ Bus
Right Turn (Looking North/ Left)**	385 '	505 '	335 '	320 '	-50 '	-170 '
Left Turn (Looking South/ Right)***	445 '	560 '	390 '	370 '	-55 '	-170 '

Southern Exit	Required (40 MPH*)		Actual	Proposed	Result (Actual v Req'd.)	
	Auto	Truck/ Bus			Auto	Truck/ Bus
Right Turn (Looking North/ Left)**	385 '	505 '	458 '	435 '	73 '	-47 '
Left Turn (Looking South/ Right)***	445 '	560 '	434 '	455 '	-11 '	-126 '

* Design Speed

** Case B2 - Right Turn from a Stop

*** Case B1 - Left Turn from a Stop



Figure 1 - Camp Exit Sight Distance
(40 MPH Design Speed)



Figure 2 - Racquet Club Entrance/ Exit Sight Distance
(40 MPH Design Speed)

Schneider Engineering, PLLC

EXHIBIT “C”

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES

JAMES L. TOMARKEN, MD, MPH, MBA, MSW
COMMISSIONER

November 22, 2005

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
GENERAL GUIDANCE MEMORANDUM # 20
PROCEDURE FOR GRANDFATHERING SEWAGE FLOWS
FOR OTHER THAN SINGLE FAMILY RESIDENCES

Authority

The Suffolk County Sanitary Code sets forth requirements for approval of water supply and sewage disposal systems. The statutory authority for these guidelines can be found in Article 6, Section 760-602, 603 and 609 of the Suffolk County Sanitary Code.

Purpose

Typically, applications submitted to this office must meet the density requirements set forth in Article 6 of the Suffolk County Sanitary Code. Situations arise when applicants wish to propose new projects on properties that are, or have been, previously developed and which presently exceed the density limits of Article 6. The purpose of this guideline is to assist staff in determining when sewage flows, attributed to developed properties, may be grandfathered for density purposes.

Guidance

This procedure may be divided into two main categories: Projects that have a record of a Health Department approval, and projects that do not.

1. *Projects on Properties with a Health Department Approval*

Sewage flows may be grandfathered for projects that are located on properties that have received the benefit of a Department approval, either by Wastewater Management or through the Department's housing or food control unit. This includes seating listed on old applications where the food service was accepted by the Department whether or not previous wastewater review was completed. In order to qualify for grandfathering, the original structure and /or structures must be in a condition that can be occupied at the time of submission of the proposed application to this office. The volume of sewage flow grandfathered for a given site may be computed by applying the current flow rate factor(s) to the previously approved use or uses. For buildings that have been totally or partially demolished, grandfathering claims must be referred to the Board of Review.

◆DIVISION OF ENVIRONMENTAL QUALITY◆OFFICE OF WASTEWATER MANAGEMENT◆360 YAPHANK AVENUE, SUITE 2C◆YAPHANK NY 11980◆
PHONE: (631) 852-5700 FAX: (631) 852-5755

2. *Projects on Properties without a Health Department Approval*

For these situations, sewage flows may **not** be grandfathered for properties that are developed unless a variance is obtained from the Department's Board of Review. An exception to this procedure may include situations involving a change-in-use in buildings that were constructed prior to 1984 and where the proposed use will utilize, for density purposes, a flow rate factor of 0.03 gpd/sq.ft. Staff may process such applications without requiring a variance from the Board.

Examples of some projects that may be grandfathered without a variance include the following:

- Change-in-use from a dry retail store to a take-out food establishment or a hair/nail salon.

- Change-in-use from an office (medical or non-medical), or other use, to a dry retail store, or other type of facility that will utilize a design flow rate factor of 0.03 gpd/sq.ft of gross floor area.

Please note, however, that a building on a parcel that is separately assessed, as shown on the 1981 tax maps, and which is allowed a maximum combined flow (sanitary & kitchen) of 300 gpd, may not automatically be grandfathered if the project total design flow (sanitary & kitchen) exceeds this value.

Sewage Disposal Facilities

In all situations, existing sewage disposal facilities must be evaluated and, if necessary, be upgraded in accordance with the Department's construction standards in effect at the time. Alternately, if an applicant wishes to utilize the existing disposal system(s), then he must demonstrate that all components conform to current standards and function properly by submitting a certification (form WWM-084).

Effective

This document is for guidance purposes only and becomes effective for applications received after the date of this memorandum. This document should apply in most cases, but it is not a standard and is not meant to substitute for the discretion and common sense of the reviewing engineer.

Issued by: _____ Date:_____

Walter J. Hilbert, P.E.
Office of Wastewater Management

EXHIBIT “D”

JEFFREY T. BUTLER, P.E.,P.C.

206 LINCOLN STREET
RIVERHEAD, NEW YORK 11901
631-208-8850
LICENSED PROFESSIONAL ENGINEER
MEMBER NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

June 14, 2011

Jennifer Niemczyk
Suffolk County Department of Health Services
360 Yaphank Avenue
Suite 2C
Yaphank, New York 11980

RECEIVED
JUN 17 2011
SUFF. CO. HEALTH SERVICES
OFFICE OF WASTEWATER

Re: C09-11-0009

Dear Jennifer:

Attached please find the following with respect to this application and your Notice of Incomplete dated May 4, 2011:

- Completed Short Environmental Form
- Certificate of Authorization
- Water Calculations for water supply system
- SCWA Expansion Agreement
- Certificate of Occupancy for Camp
- Temporary Residence Permit for Camp
- Floor plans, area calculations, occupancy load and flow calculation for each building
- Revised plans and details for site
- Survey of complete site

Please note that the existing flow calculation was determined by using Guidance Memorandum # 20, however no component was added in for day campers due to the fact that no reference could be found for the amount allowed on site. In addition, please note that the flow rates in gallons per day, both existing and proposed, are for seasonal use. In fact this application is for a seasonal day camp being used 5 days a week from late June to late August.

Thank you in advance for your attention to this application. Please call me with any questions or concerns.

Sincerely,

Jeffrey T. Butler, P.E.

SOUTHAMPTON COUNTRY DAY CAMP EXISTING DORMITORY OCCUPANCY CALCULATION AND FLOW RATE

EXISTING DORMITORY BUILDINGS AND OCCUPANCY

BUILDING	GROSS AREA	*OCCUPANCY AT 1/50 SQ. FT. GROSS
Cottage 1	671	13
Cottage 2	949	18
Cottage 3	511	10
Cottage 4	354	7
Cottage 5	354	7
Cottage 6	597	11
Cottage 7	417	8
Cottage 8	448	8
Cottage 9	485	9
Cottage 10	480	9
Cottage 11	577	11
Cottage 12	596	11
Cottage 13	147	2
		124 OCCUPANTS

**DORMITORY HOUSING RATE = 75 GPD/BED

EXISTING FLOW (FROM COTTAGES) = 124 OCCUPANTS X 75 GPD = 9,300 GPD

EXISTING SINGLE FAMILY DWELLING FLOW = 300 GPD

***TOTAL EXISTING FLOW = 9,600 GPD**

(*DOES NOT INCLUDE DAY CAMP COMPONENT)

*FROM BUILDING CODE OF NEW YORK STATE, TABLE 1004.1.2

**FROM TABLE 1-PROJECT DENSITY LOADING RATES-SCDHS 12/1/09



SCDHS - 'Standards for Approval of Plans & Construction for Sewage Disposal Systems for other Than Single Family Residences

RECEIVED
JUN 17 2011
SUFFOLK CO. HEALTH SERVI
OFFICE OF WASTEWATER I

TABLE 1 - PROJECT DENSITY LOADING RATES & DESIGN SEWAGE FLOW RATES

(Based upon gross floor area in square feet (sf) unless otherwise noted)

Structure Use	Density Load	Kitchen/Gray Load	Hydraulic Load
FOOD SERVICE			
Bar (in restaurant)	10 gpd/seat	5 gpd/seat	15 gpd/seat
Bar, Tavern, Disco (no fixed seating)	10 gpd/occupant[1]	5 gpd/occupant[1]	15 gpd/occupant[1]
Bar (outdoor/seasonal)	5 gpd/seat	2.5 gpd/seat	7.5 gpd/seat
Cafeteria (open to public)	See Primary use + 5 gpd/seat	2.5 gpd/seat	Primary use + 7.5 gpd/seat
Cafeteria/Continental Breakfast (not open to public)	See Primary Use	2.5 gpd/seat	Primary use + 2.5 gpd/seat
Snack Bar	See Primary Use	0.12 gpd/sf	Primary use + 0.12 gpd/sf
Juice Bar	See Primary Use	2.5 gpd/seat	Primary use + 2.5 gpd/seat
Catering Hall	5 gpd/seat	2.5 gpd/seat	7.5 gpd/seat
Outside Patio Dining	5 gpd/seat	10 gpd/seat	15 gpd/seat
Restaurant (full service or single services > 16 seats[2])	10 gpd/seat	20 gpd/seat	30 gpd/seat
Wet store w/ food (Deli/take-out with max 16 seats single service[2])	0.03 gpd/sf	0.12 gpd/sf	0.15 gpd/sf
Convenience store/Market/Farm Stand	0.03 gpd/sf	0.02 gpd/sf	0.05 gpd/sf
Commercial Bakery	0.04 gpd/sf	0.02 gpd/sf	0.06 gpd/sf
Wine/Beer Tasting (in a winery/brewery only)	5 gpd/occ	2.5 gpd/occ	7.5 gpd/occ
GENERAL INDUSTRIAL			
General Industrial[3]	0.04 gpd/sf	Industrial process water[4]	0.04 gpd/sf
Greenhouse	0.03 gpd/sf	N/A	0.03 gpd/sf
MEDICAL			
Drug Rehabilitation	75 gpd/bed	See note [5]	75 gpd/bed
Mental Health Residence	75 gpd/bed	See note [5]	75 gpd/bed
Hospital	300 gpd/bed	See note [5]	300 gpd/bed
Nursing Home	150 gpd/bed	See note [5]	150 gpd/bed
Assisted Living	110 gpd/bed	See note [5]	110 gpd/bed
Medical office space	0.10 gpd/sf	N/A	0.10 gpd/sf
Dialysis Center	0.10 gpd/sf	Dialysis process water[4]	0.10 gpd/sf
Veterinary[6]	0.10 gpd/sf + 10 gpd/animal boarding	N/A	0.10 gpd/sf + 10 gpd/animal boarding

MUNICIPAL SERVICES			
Library, firehouse, precinct, museum, art gallery (w/ meeting rooms)	0.03 gpd/sf + 5 gpd/occupant[1] for meeting rooms	2.5 gpd/occupant[1]	0.03 gpd/sf + 5 gpd/occupant[1] + 2.5 gpd/occupant[1]
Library, firehouse, precinct, museum, art gallery (w/o meeting rooms)	0.03 gpd/sf	2.5 gpd/occupant[1]	0.03 gpd/sf + 2.5 gpd/occupant[1]
OFFICE			
Non-medical office space	0.06 gpd/sf		0.06 gpd/sf
RECREATION			
Bath house/comfort station	5 gpd/occupant[1]	5 gpd/shower/occupant[1] + Food service[7]	5 gpd/occupant[1] + 5 gpd/shower/occupant + Food service[7]
Bowling alley/tennis court/racquetball	100 gpd/court or alley	Food service[7]	100 gpd/court or alley+ Food service[7]
Miniature golf	15 gpd/parking space	Food service[7]	15 gpd/parking space + Food service[7]
Ice/roller Skating Rink	15 gpd/skater[1] + 5 gpd/specator[1]	Food service[7]	15 gpd/skater[1] + 5 gpd/specator[1] + Food service[7]
Recreation	15 gpd/parking space	Food service[7]	15 gpd/parking space + Food service[7]
Spa/Fitness Center/ Karate/Dance/etc. (w/ showers & amenities)	0.1 gpd/sf	0.2 gpd/sf + Food service[7]	0.3 gpd/sf + Food service[7]
Spa/Fitness Center/ Karate/Dance/etc. (w/o showers & amenities)	0.1 gpd/sf	Food service[7]	0.1 gpd/sf + Food service[7]
Marina	10 gpd/boat slip	Food service[7]	10 gpd/boat slip + Food service[7]
OTB	5 gpd/person	Food service[7]	5 gpd/person + Food service[7]
Theater	3 gpd/seat	Food service[7]	3 gpd/seat + Food service[7]
Horse Farm[6]	0.04 gpd/sf + 10 gpd/stall		0.04 gpd/sf + 10 gpd/stall
Camp Ground	10 gpd/camper	5 gpd/shower/camper	10 gpd/camper + 5 gpd/shower/camper
Billiard Hall	5 gpd/occ	2.5 gpd/occ	7.5 gpd/occ
RESIDENTIAL			
Single Family Residence	300 gpd		300 gpd
Two Family Residence	600 gpd		600 gpd
Rooming house	75 gpd/bed		75 gpd/bed

Motel/Hotel unit up to 400 sq.ft. gross floor area w/o kitchenette (w/kitchenette see Housing Unit)	100 gpd/unit		100 gpd/unit
Motel/Hotel unit > 400 sq.ft. gross floor area w/o kitchenette (w/kitchenette see Housing Unit)	150 gpd/unit		150 gpd/unit
Housing Unit[8] up to 600 sq.ft. gross floor area	150 gpd/unit		150 gpd/unit
Housing Unit[8] between 601-1200 sq.ft. gross floor area	225 gpd/unit		225 gpd/unit
Housing Unit[8] > 1200 sq.ft. gross floor area	300 gpd/unit		300 gpd/unit
PRC unit up to 600 sq.ft. gross floor area	100 gpd/unit		100 gpd/unit
PRC unit between 600-1600 sq.ft. gross floor area	150 gpd/unit		150 gpd/unit
PRC unit between 1600-2000 sq.ft. gross floor area	225 gpd/unit		225 gpd/unit
PRC unit > 2000 sq.ft. gross floor area	300 gpd/unit		300 gpd/unit
RETAIL			
Dry store	0.03 gpd/sf		0.03 gpd/sf
Wet store w/o Food (Hair salon, nail salon, pet shop w/o animal boarding, etc.)	0.03 gpd/sf	0.07 gpd/sf	0.1 gpd/sf
Car Dealership	0.03 gpd/sf for showroom/offices + 0.04 gpd/sf for maintenance/storage areas		0.03 gpd/sf for showroom/offices + 0.04 gpd/sf for maintenance/storage areas
Massage/Tanning	0.03 gpd/sf		0.03 gpd/sf
Tattoo Parlor	0.03 gpd/sf		0.03 gpd/sf
SCHOOL			
Boarding school/ Dormitory	75 gpd/capita[1]	2.5 gpd/capita[1]	77.5 gpd/capita[1]
Day School	5 gpd/capita[1]	2.5 gpd/capita[1]	7.5 gpd/capita[1]
MISCELLANEOUS			
Car Wash	0.04 gpd/sf	Car wash process water[4]	0.04 gpd/sf
Laundromat	0.03 gpd/sf	Laundromat process water[4]	0.03 gpd/sf

Funeral Home	0.05 gpd/sf	Funeral Home process water[4]	0.05 gpd/sf
House of Worship (w/ meeting rooms)	1.5 gpd/seat + 5 gpd/occupant[1] for meeting rooms	2.5 gpd/occupant[1]	1.5 gpd/seat + 5 gpd/occupant[1] + 2.5 gpd/occupant[1]
House of Worship (w/o meeting rooms)	1.5 gpd/seat	2.5 gpd/occupant[1]	1.5 gpd/seat + 2.5 gpd/occupant[1]
Public Storage[9]	0.04 gpd/sf		0.04 gpd/sf
Animal boarding[6]	0.03 gpd/sf + 10 gpd/animal		0.03 gpd/sf + 10 gpd/animal
Winery/Brewery	0.04 gpd/sf	Winery/Brewery process water[4]	0.04 gpd/sf

[1] Occupancy ratings can be determined using New York State Uniform Fire Prevention and Building Code as a guide.
[2] Single Service means disposable plates, silverware & cups. Takeout seating is for waiting patrons and is not convertible to full seating or for density credit at full service restaurants.
[3] General industrial buildings may contain up to 15% related office space without applying a proportionate office density loading or flow rating to the space. If office space exceeds 15% of gross floor area, then a proportionate office density loading or flow rating must be applied to the entire office space.
[4] Process waters require a separate permit and disposal facilities – Consult Department.
[5] A grease trap shall be provided for this installation which is sized at 20 gpd/bed.
[6] A separate sewage disposal system shall be provided for wastewater generated from animal boarding, horse stalls, or kennel areas.
[7] Food (kitchen) flow is added according to the type of food service in the establishment.
[8] Motel/Hotel with Kitchenettes, Cottages, Apartments, Condominiums, Mobile Homes, Trailers, or Co-Ops.
[9] Public storage density and/or design flow may be reduced if restrictive covenants are recorded on the parcel.

Note: **The above table is subject to amendment from time to time as data becomes available to the Department. The table will be republished as an addendum to these standards if and when revised.**

New York State Uniform Fire Prevention & Building Code

SECTION 1004
OCCUPANT LOAD

1004.1 Design occupant load. In determining means of egress requirements, the number of occupants for whom means of egress facilities shall be provided shall be established by the largest number computed in accordance with Sections 1004.1.1 through 1004.1.3.

1004.1.1 Actual number. The actual number of occupants for whom each occupied space, floor or building is designed.

1004.1.2 Number by Table 1004.1.2. The number of occupants computed at the rate of one occupant per unit of area as prescribed in Table 1004.1.2.

TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

OCCUPANCY	FLOOR AREA IN SQ FT PER OCCUPANT
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal Baggage claim Baggage handling Concourse Waiting areas	 20 gross 300 gross 100 gross 15 gross
Assembly Gaming floors (keno, slots, etc.)	 11 gross
Assembly with fixed seats	See Section 1004.7
Assembly without fixed seats Concentrated (chairs only—not fixed) Standing space Unconcentrated (tables and chairs)	 7 net 5 net 15 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	100 gross
Courtrooms—other than fixed seating areas	40 net
Dormitories	50 gross
Educational Classroom area Shops and other vocational room areas	 20 net 50 net
Exercise rooms	50 gross

H-5 Fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Institutional areas Inpatient treatment areas Outpatient areas Sleeping areas	 240 gross 100 gross 120 gross
Kitchens, commercial	200 gross
Library Reading rooms Stack area	 50 net 100 gross
Locker rooms	50 gross
Mercantile Areas on other floors Basement and grade floor areas Storage, stock, shipping areas	 60 gross 30 gross 300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks, swimming pools Rink and pool Decks	 50 gross 15 gross
Stages and platforms	15 net
Accessory storage areas, mechanical equipment room	300 gross
Warehouses	500 gross

For SI: 1 square foot = 0.0929 m^2.

1004.1.3 Number by combination. Where occupants from accessory spaces egress through a primary area, the calculated occupant load for the primary space shall include the total occupant load of the primary space plus the number of occupants egressing through it from the accessory space.

1004.2 Increased occupant load. The occupant load permitted in any building or portion thereof is permitted to be increased from that number established for the occupancies in Table 1004.1.2 provided that all other requirements of the code are also met based on such modified number and the occupant load shall not exceed one occupant per 5 square feet (0.47 m^2) of occupiable floor space. Where required by the code enforcement official, an approved aisle, seating or fixed equipment diagram substantiating any increase in occupant load shall be submitted. Where required by the code enforcement official, such diagram shall be posted.

EXHIBIT “E”

AFFIDAVIT

STATE OF NEW YORK)
)ss.:
COUNTY OF SUFFOLK)

BRIAN MORGADO, residing at 33 Gooseberry Road, Mastic Beach, New York 11951, being duly sworn hereby deposes and states the following:

1. I am 25 years old, and a former of employee of the Southampton Country Day Camp, located adjacent to Little Fresh Pond in Southampton, N.Y.

2. I worked at the camp from May, 2015 through Mid-September, 2015. During that time, Tom Coffey was the camp Director there.

3. Before the season began, I performed maintenance work. Mr. Coffey promised to pay me separately for that work. During camp session, I drove a bus, and was a group leader. Mr. Coffey promised to pay for that work in addition to my maintenance duties.

4. I was present on the camp grounds in August when Tom Coffey advised me that the camp was conducting noise testing in connection with required approvals for the camp. He also stated that he wanted to create the appearance that there were more campers present than were actually in attendance.

5. To create the impression that we were delivering more campers, and to bolster their plan to over-estimate the number of campers, Mr. Coffey asked me to get into an empty bus, and to follow him as he drove around the inner road which circled the camp. I did so, and we both drove around in empty buses for six or seven circuits.

6. On the same day, when I acted as group leader, there were other changes made to ordinary camp routine. When we went to meet the train that usually circulated through the camp, I was advised that it was not working.

7. Because I had worked maintenance, I was friendly with the maintenance workers. I met one, and asked what was wrong with the train. He advised me that the train was operable, but was not in use that day, because the management wanted the camp to be quieter than usual because of noise monitoring. He further stated that the train was too loud to use while the testing was on going. He actually started the train to show me it was in working order.

8. Other loud activities were also canceled that day, and instead we waited until the end of the day to schedule a very loud pool "Fan Fair" party, at an interior location where noise was less likely to be heard.

9. My relationship with the camp ended on unfriendly terms. Originally, I was hired at a certain pay to do "light maintenance". After Mr. Coffey determined that I had additional skills in construction, he had me take on heavier maintenance work. I asked for a pay raise to compensate for the additional job responsibilities. Mr. Coffey stated that after speaking to the CEO, they agreed that I would receive an increase in pay to cover the additional work that I was performing. However, I was never compensated as promised.

10. I am submitting this Affidavit in connection with the on-going Town review of the camp's application. I want to set the record straight about this behavior which I realized was unethical and misleading.

Dated: Mastic Beach, New York
March 6, 2017

Brian Morgado

Sworn to before me on this 6th day of March, 2017.

Notary Public

STEVEN B PESCETTI
Notary Public - State of New York
NO. 01PE61000
Qualified in Suffolk County
My Commission Expires 10/2019

EXHIBIT “F”

Noise Control
Engineering, LLC

799 MIDDLESEX TNPK.
BILLERICA MA 01821-3445
PHONE: 978-670-5339
FAX: 978-667-7047
E-mail: nonoise@noise-control.com

C3

JOB MEMO

TO:	**Celeste Frank, President**
COMPANY	Little Fresh Pond Association, LLC
FROM:	Michael Bahtiarian, INCE Bd. Cert. {mikeb@noise-control.com}
DATE:	February 23, 2017
SUBJECT:	**Peer Review: Southampton Tennis Club & Camp Noise Study**
CC:	Foster Maer

INTRODUCTION

Noise Control Engineering, LLC (NCE) has been retained by the Little Fresh Pond Association, LLC, Southampton, New York to perform a peer review of a noise study prepared by VHB Engineering, Surveying, and Landscape Architecture, P.C. (VHB) of the proposed changes at the Southampton Day Camp located at 665 Majors Path in Southampton, New York. As part of this peer review, NCE has reviewed the Town of Southampton's noise ordinance (Reference 1), the New York State Department of Environmental Conservation (NYSDEC) noise policy (Reference 2) and most importantly the VHB noise study (Reference 3).

CRITICAL COMMENTS

NCE has critically reviewed the Reference 3 noise study and provides the following seven comments below. The comments are provided in no particular order.

1. NCE has reviewed the stand-alone noise study[1] (Reference 3) which includes two appendices. The report is missing what NCE would classify as usual supporting data and information for this type of study and what is usually found in similar studies of this nature. These items are as follows:
    - Specific conditions during existing noise measurements:
        - Specific time of day and duration of the measurements
        - Description of the activity during the measurements
        - Photographs of the activity (see also comment 2)
        - Graphs and or a summary of all sound pressure level data (see comment 3)
    - Specific inputs to the acoustic (Cadna/A) noise model:
        - Source sound levels in octave bands
        - Source sound level modeling details, including source types (area or point)

C3-1

[1] NCE understands this was extracted by VHB from there DEIS Report, dated April 2016 and revised September 2016.

- Acoustic spreading assumptions
- Acoustic ground absorption assumptions
- Wind and meteorological assumptions

C3-1 cont'd

2. Section 3.3 of the VHB noise study notes that sound level measurements were performed on August 14, 2013 (4 years ago) and August 18, 2015. NCE accessed the Southampton Camp and Club website (reference 4) and understands from this public information that the last day of camp is on/around August 18 of each year. NCE questions whether data from the last day of camp (as done in 2015) or 4 days before the last day of camp (as done in 2013) provides representative peak activity noise levels.

C3-2

3. Table 3 of the VHB noise study provides existing (source) sound pressure level measurement results. For each of six events (five camp activities and ambient) one value of sound pressure level (SPL) using the L_{EQ} metric in A-weighted decibels (dB(A)) was provided. These values are meant to represent the (energy) average SPL during the measurement period. However, the actual minute-by-minute sound pressure levels are likely to be significantly higher and lower than the L_{EQ} values presented in the report. The NYSDEC guideline specially states that, "*These maximum and minimum SPLs should be given in the noise analysis. The time interval over which the Leq is measured should always be given.*"[1] None of this information is supplied. Most importantly, if the maximum SPL for the noted activity (particularly at the basketball court) is even 1 dB higher than the L_{EQ}, the noise study would show an excess to the Town of Southampton noise regulations.

C3-3

4. Table 3 of the noise study also provides a documentation of measured existing ambient SPL. The table states that the ambient L_{EQ} is 58 dB(A). Comment #3 above applies to the ambient conditions as well as the operational SPL data, but to be conservative, the lowest value is of interest for ambient conditions. The ambient SPL of 58 dB(A) is high for such a suburban (nearly rural) area that is found in Southampton, NY. Measurements by our firm for daytime suburban/rural areas give SPL values as low as 40 dB(A) during the day. Further, NCE believes that if a lower ambient SPL were used, the computations would be markedly different. While the use of the ambient SPL within this study is not specifically described in the report, NCE believes it is used as a background SPL within the acoustical model. This would mathematically limit any sound projection to nothing lower than the ambient SPL and therefore, this would greatly reduce the sound level increases given in Table 4.

C3-4

5. NCE has concerns regarding the accuracy and reporting of the "With-Action" sound pressure levels given in Table 4 and Appendix B. With the information available in Reference 3 and other materials from Little Fresh Pond Associates, it appears that the new basketball court is potentially less than 30 feet from the property lines from a few of the northern abutters, particularly 717 Majors Path. Using the distance of 30 feet from the proposed basketball activity, the projected sound level is just over the 65 dB(A) limit. Our

C3-5

[1] Reference 2, Section V (page 7). Further, this requirement is also made by VHB in the subject noise study in Section 2.1 (page 5).

own computations show that there is a significant increase in sound level as well due to the fact that there is the introduction of a "new source" of sound (i.e. the new basketball court). C3-5 cont'd

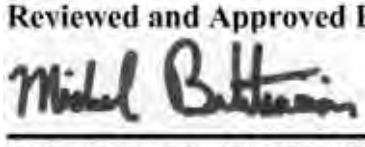
6. The VHB evaluation has failed to include other potential noise producing modifications to the Southampton Camp property. Section 1 of the VHB noise study states there will be renovations and replacement of cottages, changing sheds, a welcome center and an extension to the dining hall. To be complete, any new mechanical systems should be included in the noise study. There is also a statement regarding change in vehicular circulation and increase in passenger buses from a quantity of 16 to 22 vehicles. While the sound of these vehicles on the local roads are not part of the noise impact, sound from idling buses during the morning drop-off and afternoon pick-up periods should have also been included in the study. C3-6

7. Appendix A provides photographs of the noise measurement locations. Figures 1 and 2 show no campers taking part in any activities. The activity level at the pool is not distinguishable from the Figure 3. In fact, the pool looks relatively empty. Figure 4 shows about six campers taking part in the parachute activity. Table 3 provides specific numbers of campers as follows: 12 campers playing soccer, 25 campers playing tennis, 7 campers playing basketball and 14 campers playing the parachute game. This level of activity is <u>not</u> substantiated through these photographs. C3-7

SUMMARY

It is NCE's professional opinion that the VHB noise study does <u>not</u> completely and properly assess the Southampton Day Camp noise impact. The report is brief on supporting details with respect to the measured data and noise modeling inputs. For the measured SPL, the report failed to document the time of day, duration and specific activity levels. Also, the measured data appears to be within the last four days of the Camp's season. Further, this report only offers average (L_{EQ}) data, but as noted by NYSDEC noise impact guidelines it should have included minimum and maximum noise levels. NCE believes the ambient sound pressure level is too high given the context. The with-action sound levels may be under reported for the northern abutters due to accurate location of the sources relative to the property line and the excessive ambient may overestimate the existing noise predictions. Lastly, other modifications at the camp have not been included.

Reviewed and Approved By:



Michael Bahtiarian, INCE Bd. Cert.
Board Certified Acoustical Engineer by the Institute of Noise Control Engineering (www.inceusa.org)

REFERENCES

1. Town of Southampton, NY Noise Ordinance, dated March 11, 2008.
2. New York State Department of Environmental Conservation (NYSDEC), Program Policy, "Assessing and Mitigating Noise Impacts", Issued, October 6, 2000, revised February 2, 2001.
3. VHB Engineering, Surveying and Landscape Architecture, P.C. Noise Impact Assessment, "Noise Study for Southampton, Tennis Club and Camp, dated February 8, 2017.
4. http://www.southamptoncc.com/future-families/dates-fees/, accessed by NCE on February 22, 2017.

C4

North Sea Citizens Advisory Committee
Town of Southampton
164 Fish Cove Road & • 18 Pine Tree Road Southampton, New York 11968

631-283-5978 or 631-283-3566

Lucille Dunne
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Ann Reisman
*Frank Palmer***
Mary E. Topping
Judith White

*denotes Seasonal Member
**denotes ex-officio member

December 6, 2016

Chairman Dennis Finnerty and Planning Board
Southampton Planning Board Members
Southampton Town Hall
116 Hampton Road
Southampton, NY 11968

Dear Planning Board Members

At the North Sea CAC Meeting of Tuesday November 8, 2016, a discussion regarding the EIS for Southampton Tennis and Camp Property at 665 Major's Path North Sea. This property is well known to the community because the usage has been questioned since 2011.. The CAC firmly believes that the change of use is a beyond the scope of the prior use as a tennis club and that it will impact the surrounding neighborhood.

The CAC would like to see the planning board limit the use of the property to the previous owner's level of use as a tennis club. This would avoid the further development of the property in density. The expansion of parking to approximately 120 spaces is just one indication that there is an expansion of use. Further changes have been made without any authorizations in place to have dormitory style housing where small family cottages were rented. There has been no formal inspections to address the many changes. The law states that to change the use of the property to Day Camp from Tennis Camp, the Day Camp must be ***more beneficial*** to the general neighborhood than the Tennis Camp. C4-1

We voted unanimously to suggest this to the Planning Board that EIS for this expansion of a pre-existing non-conforming use not be approved because of the impact on the surrounding residential area including noise, sanitation, water quality of Little Fresh Pond, traffic, parking, and quality of life issues for the surrounding residences.

Following the discussion, a motion was made, accepted and voted upon. A unanimous vote to oppose this proposal for the change of one non-conforming use.

Sincerely,

Lucy Dunne
Co-Chairperson, North Sea CAC

JAN 24 2017

Robert S. DeLuca
PRESIDENT

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GROUP FOR THE EAST END

C5

January 26, 2017

Chairman Dennis Finnerty &
Members of the Planning Board
Town of Southampton
116 Hampton Road
Southampton, NY 11968

Re: Draft Environmental Impact Statement – Southampton Country Day Camp (SCTM# 900-97-3-17.1)

Dear Chairman Finnerty and Members of the Planning Board:

On behalf of Group for the East End, please accept the following comments and recommendations related to the Draft Environmental Impact Statement (DEIS) prepared for the Southampton Country Day Camp proposal.

Position Statement: Group for the East End does not support the proposal as described throughout the DEIS. The proposed action, a change in one non-conforming use to another non-conforming use, illustrates an intensification of use on a site that's located in a "Critical Area of environmental concern (Town Code 157-10.B(3))" a residentially-zoned neighborhood and located adjacent to wetlands and the surface waters of Little Fresh Pond. We do not believe that the proposed Action sufficiently mitigates the potential for environmental impact in the areas described above. We also strongly suggest additional analysis and discussion in order to determine appropriate environmental mitigation should this proposal, or an alternative move forward. C5-1

Please read below for additional specific comments and recommendations.

Suffolk County Department of Health Services "Grandfathered Flow"

Group for the East End has long argued against the Suffolk County Department of Health's regulations that permit the use of "grandfathered flow," which ultimately promotes additional density and the use of conventional or standard septic systems to handle excessive amounts of wastewater above and beyond a parcel's capabilities. The subject site's population density equivalent is set at 5,184 GPD, while the anticipated project is described to generate 6,800 GPD of sanitary waste (p. 12, DEIS). However, it's noted that, "the subject property is allowed a "grandfathered" flow of 9,450 GPD."

It should be noted that there is a 32% proposed increase in wastewater generation beyond the site's population density equivalent. Importantly, nowhere in the DEIS does it state that the camp will not expand in the future or doesn't have the capacity to expand in the future. Therefore, it could be expected that the site will produce additional GPDs up to the "grandfathered" flow at some point in the future. If it in fact did, this would represent a roughly 82% increase in wastewater generation above the site's population density equivalent. The DEIS should fully discuss and address this issue. C5-2

P.O. Box 1792
Southold, NY 11971
631.765.6450

P.O. Box 569
Bridgehampton, NY 11932
631.537.1400

GroupfortheEastEnd.org

C5-2 cont'd

The utilization of "grandfathered" flow is worrisome given what we now understand regarding the detrimental impacts that excess nitrogen has on our ground and surface water quality. Substantial scientific data available from Stony Brook University, the Suffolk County Department of Health Services, the US Geologic Survey and the NYS Department of Environmental Conservation (based on water quality modeling and field testing done across the region) clearly demonstrates that wastewater is impacting groundwater which in turn, directly impacts surface water quality (Suffolk County Comprehensive Water Resources Management Plan). Additionally, Suffolk County recognizes the antiquatedness of this policy and is currently addressing the County's codes (http://www.newsday.com/long-island/suffolk/outdated-standards-allow-businesses-to-pollute-in-suffolk-1.12757153).

***Section 4.5 Alternative Sanitary Technology* of the DEIS – Insufficient Analysis**

Importantly, the DEIS incorrectly states that the Suffolk County Department of Health Services has not found any alternative (advanced) wastewater treatment systems to be acceptable for use. It also falsely states that the, "design and performance characteristics of any such systems cannot be accurately predicted" (p. 177). The Lead Agency as well as the applicant should contact the SCDHS to discuss a number of these systems that are currently being approved. This information should be included within the DEIS.

In light of the above outlined issues, we wish to point out that the section of the current DEIS dealing with the issue of alternative wastewater treatment does not provide any analysis that would allow the Town to responsibly evaluate just how a treatment plant (or multiple advance treatment systems) may or may not be able to mitigate the project's wastewater impacts. This is essential to the Planning Board's ability to make its most informed decision.

If such an assessment is not provided, the Town can only evaluate the applicant's statement about wastewater treatment plants as the applicant's opinion and not use this opinion as a basis for determining practicable environmental mitigation requirements.

Based on our prior assessment of hundreds of development applications over the last 40 years, we believe that at a minimum, an accurate assessment of the project's wastewater impacts, should include the following information and that such information be provided in the context of the DEIS for public inspection and not relegated to discussions between the SCDHS and the applicant.

C5-3

- A discussion and analysis focusing on nitrogen loading.
    - How many pounds of nitrogen (on an annual basis) will the project generate if an advanced wastewater treatment system is employed?
    - How much total nitrogen will be reduced by one or more wastewater management alternatives.
    - How might this impact groundwater quality and eventually surface water quality in nearby Little Fresh Pond?

- An analysis with sufficient detail to provide a comparative assessment between the nitrogen impacts of the existing standard sanitary systems versus those associated with an advanced wastewater treatment plant/system.

- This analysis should provide the following comparatives:
  - Site's Article 6 Population Density GPD vs. Existing GPD vs. Anticipated GPD vs. Maximum Permitted GPD

C5-3 cont'd

Water Quality Little Fresh Pond - Mitigation Measures

In August 2015, the Suffolk County Department of Health Services issued a statement that the dangerous cyanobacteria (also known as blue-green algae) was present at Little Fresh Pond. The blooms accompanied with the Pond's listing on the New York State Department of Conservation's Proposed Final 2016 Section 303(d) list as for waterbodies for which may require a TMDL (phosphorus) calls attention the declining state of water quality in Little Fresh Pond.

It is our recommendation that should the proposal move forward, mitigation measures should be required to protect ground and surface water quality. **The Planning Board, as Lead Agency, has the authority to require mitigation measures not specifically required by other involved agencies. In this case, there is ample evidence illustrating the need to provide mitigation to protect ground and surface waters. If the project is approved as proposed, advanced wastewater treatment technology will act as a mitigation measure.**

C5-4

In addition to the use of advanced wastewater technology, we strongly support a well-defined and enforceable monitoring, reporting and compliance schedule. This should also be reflected in the SEQRA Finding Statement and overseen by the Town (in conjunction with the SCDHS) to assure that the desired mitigation is actually being achieved.

Recently, the Town of Southold Planning Board, acting as Lead Agency, required the use of advanced wastewater treatment technology, via the SEQRA Findings Statement for a large-scale project called *The Heritage at Cutchogue*.

Uncertainties Surrounding Groundwater Flow and Impacts to Little Fresh Pond

The Little Fresh Pond Association entered into the record a Memorandum, titled, *Review of Draft Environmental Impact Statement Southampton Day Camp Realty, LLC* (May 20, 2016). The memo concludes that, "Additional investigation should be conducted to evaluate the relationship between Pond surface water and groundwater beneath the Pond, as outlined in our comments on Section 3.2.1.2, Pages 39 and 42 – Groundwater Flow" (p. 8). The memo clearly demonstrates that insufficient data exists to determine the groundwater flow into Little Fresh Pond. This information is contrary to what is reported within the DEIS.

C5-5

Group for the East End strongly recommends that the Planning Board require the applicant to address the above-mentioned memo and provide additional information, analysis and field data in order to determine groundwater flow surrounding Little Fresh Pond. This information is critically needed to determine the appropriate form of environmental mitigation in particular relation to the impact of wastewater.

Uncertainties Surrounding Traffic Impacts

The Little Fresh Pond Association entered into the record an independent analysis of the traffic data that was provided within the DEIS. The report, prepared by Schneider Engineering, PLLC (May 20, 2106) spells out major issues and information gaps regarding potential traffic impacts. We respectfully request that the Planning Board require the applicant to address each of the issues and requests for additional information in order to appropriately understand the potential traffic impacts. C5-6

Impacts of Change in Non-Conforming Use to Another Non-Conforming Use

Group for the East End respectfully disagrees that the proposed change in the non-conforming use to another non-conforming use will not adversely affect the general neighborhood. The land use pattern surrounding the property is predominantly single-family residential uses and undeveloped open space. The increase in traffic, campers, overnight staff, sanitary wastewater and noise will have some degree of impact. C5-7

Additionally, the applicant consistently notes throughout the DEIS that an increase in camper enrollment is expected to occur with or without the proposed action. The DEIS should include a discussion of the limits to future enrollment. In addition, the DEIS should include information regarding camp's past enrollment history dating back several years. This information will help to determine how existing and proposed camps may differ and how a change may impact the general neighborhood. C5-8

Conclusion

The proposed project represents a significant change and intensification of use of the site. It is clear that many questions remain regarding impacts to water quality in Little Fresh Pond as well as those to traffic impacts, which speak directly to the applicant's ability to demonstrate whether a change in a non-conforming use to another non-conforming use is appropriate and would not adversely impact the neighborhood. In order for the Planning Board, acting as Lead Agency, to make a responsible decision regarding the merits of the proposal, additional information should be required and analyzed in the areas outlined above.

Group for the East End firmly supports serious consideration to the use of alternative wastewater management technology in order to mitigate the impacts of wastewater stemming from the use of "grandfathered flow." Given the state of water quality throughout the East End and the pointed efforts to prioritize nitrogen reduction into our ground and surface waters, large-scale projects such as this one should be required to mitigate the impacts of nitrogen utilizing the best available technology.

Thank you for taking the time to review my comments. Please contact me at your convenience should you have any questions or comments. I can be reached at (631) 765-6450 ext. 211 or at jhartnagel@eastendenvironment.org.

Sincerely,

Jenn Hartnagel

Sr. Environmental Advocate

Cc: Walter Dawydiak, Director, Division of Environmental Quality
The Honorable Steve Bellone, Suffolk County Executive
The Honorable Bridget Flemming, Suffolk County Legislator

C6

January 26, 2017

TO: Southampton Town Planning Board

FROM: Larry Penny, Enviromeasurements, LLC

JAN 26 2017

SUBJECT: Southampton Day Camp DEIS

Thank you for giving me the opportunity to address the Southampton Day Camp application and DEIS before you.

I have the following problems with the DEIS and proposal as presented written and presented:

-The proposed expansion including as many as 50 overnighters can't help but have an impact on the waters of Little Fresh Pond which are already going downhill. The pond is simply too small to accommodate the increase in waste water generation anticipated and 24-hour campground occupation that will result should this project be approved. C6-1

-One Lombardo study (for the opposition) site's the deleterious impact of the camp's wastewater on the pond, while a second more recent study by the same consultant (for the developer) says that the wastewater and other water entering underground from the camps operation will flow under or around the pond and will not enter it. While the study presents limited hydrographic evidence based on heights of water in nearby observation wells compared to those of the pond's actual water column, such measurements have to be made over a much longer period of time, during rainfall events and during prolonged dry spells in order to come to such a conclusion. C6-2

-The ponds bottom water at the potential interface with the adjacent Magothy groundwater and its directional flow has to be sampled repeatedly in order to come to arrive at such radical conclusion of no impact anticipated. C6-3

-The pond's biota which will suffer from an expansion of the day to day summer activities at the critical time when fish, algae, aquatic plants and plankton are reproducing and growing will suffer even more greatly than now. Why not a thorough study of the pond's biota, it fauna, flora and invasive organisms (e.g., C6-4

C6 B

cyanobacteria) before the Planning Board adjudicates the plan before it? There has never been such a study undertaken with the exception of one cursory one made by Southampton Town more than 15 years ago.

-The pond-side fauna and flora is not etched in stone. Species come and species go. What are the keystone species? What species have been making inroads? Are there any New York State endangered and threatened plant and fauna to be found since the N.Y. State Heritage Program's last reconnaissance which is far from recent

C6-4 cont'd

-How does a camp practically ban its occupants from water activities in Little Fresh Pond over the long term? Swimming is not recommended according to the New York State's DEC evaluation of the pond's waters.

C6-5

-The DEIS should include a close examination of the two freshwater wetlands adjoining the pond, one on either side of the camp property, crucial information about which the DEIS is silent.

-Recent pH values are higher than they should be for unsullied freshwater ponds on eastern Long Island. Rainwater and groundwater in general have lower pH's. What is driving up the alkalinity?

C6-6

-What is the source of phosphorous found in sampling studies? Is it increasing over time?

C6-7

Sincerely,

Larry Penny

My company is presently studying all of the freshwaters owned by the Southampton Town Trustees as per a resolution with that organization, a copy of which is attached to this memorandum.

C7

TO: MR. FINNERTY, CHAIRMAN, SOUTHAMPTON TOWN PLANNING BOARD

FROM: LARRY PENNY, ENVIROMEASUREMENTS, LLC

RE: COMMENTS ON THE SOUTHAMPTON DAY CAMP DEIS (second set)

DATE: MARCH 7, 2017

Dear Mr. Finnerty

Attached are my comments regarding the Southampton Day Camp DEIS status. Please distribute to the other members of the Planning Board, which you chair. These are in addition to a previous set which I submitted during your Board's first hearing held in 2016.

Thank you

Larry Penny
3662 Noyac Road
Sag Harbor, N.Y. 11963

RECEIVED
MAR - 7 2017
TOS PLANNING DIVISION

Cc: Jimmy Silber, Little Fresh Pond Association; Jeff Bragman, Esq.

CC PB

COMMENTS ON THE DEIS FOR THE SOUTHAMPTON DAY CAMP EXPANSION

ON LITTLE FRESH POND, HAMLET OF NORTH SEA, SOUTHAMPTON, NEW YORK

Here are my comments on the proposed expansion and reordering of the existing Southampton Day Camp on the shores of Little Fresh Pond, North Sea in Southampton Town.

1) The consultants for the Day Camp contend that even though the camp's site is situated immediately down-gradient from the highest elevation of the groundwater divide in and that Little Fresh Pond is immediately down-gradient of the camp site, that some how [almost miraculously?] the camp's contribution to the ground waters in terms of various waste products, including human waste, will not enter the pond's underflow. Such contention, based on a few jerry-rig measurements of the elevations of the pond's water level and the top of the glacial aquifer in which the pond sits in carried out in 2015. Such finding flies in the face of all prior knowledge concerning aquifer feeds to ponds which sit atop them, a finding, which, indeed, is counter to the prior contention put forward by Lombardo Associates acting on behalf of the Little Fresh Pond Association in 2012.

There are at least 20 groundwater ponds in Southampton Town, many of which derive their pond water chiefly from four sources—inflowing streams, groundwater, precipitation and runoff. Little Fresh Pond is not stream fed, it derives its water from only three of those four sources. There are certain ponds that are separated from the underlying groundwater by impermeable barriers such as many of those in Montauk, which sit atop clay. These almost invariably dry up at one point during the year and are called vernal ponds. Little Fresh Pond is a permanent groundwater pond and has never gone dry during the 350-year history of Southampton Town.

C7-1

Such ponds on Long Island lose water by evaporation and drops in the water table during droughty periods. They lose on average a half an inch per day during the warm summer months, of 45 inches, almost four feet, between June 1 and September 1. Yet in normal years, this difference in elevation is compensated for by ground water feed and precipitation, directly and via runoff, which combination can amount to 10 to 20 inches of added water during that same summer period. During last summer, which was relatively droughty, the elevation of Little Fresh Pond dropped only a few inches. Thus groundwater feed kept the level near normal during those three months. To say that the pond will not be affected by an expanded camp with expanded enrollment and expanded on-site residences is poppy-cock, to say the least.

2) The status of Little Fresh Pond has been well-documented by the New York State DEC by way of its "WAVES" CLASP sampling regime and other sampling programs, such as those conducted by Southampton Town in 1989 and 1992. The pond as four rare aquatic plants, small waterwort, cutleaf watermilfoil, fineleafed pondweed and little floating bladderwort. According to the DEC the pond is "impaired" as are so many other local ponds in need of special protections to keep them from becoming runaway-polluted, i.e., dystrophic, which is the case for Lake Agawam in Southampton Village and Mill Pond in Water Mill. The chief pollutant over the years is phosphorous, a chemical found in detergents, fertilizers, and the like. NYS DEC's advised uses are as paludal habitat for fish and aquatic plants, fishing and limited swimming, but not for general recreation (see Appendix 1 chart). The pond has both blue-green algae as well as the exotic fanwort, *Cabomba* (lately taking over many local ponds, including Trout Pond in Noyac). In other words, the pond is at its tipping point. Obviously, the proposed expansion of camp uses immediately upgradient of the pond itself if permitted will drive the pond toward dystrophia. C7-2

3) There are two freshwater wetlands, one on either side of the camp site, neither of of which has been addressed by the DEIS other than to mention them. What is their function? Do they contain any rare plants? Are they acidic or basic, etc., etc., ? How will these wetlands be impacted by the intended camp expansion? C7-3

4) In the 2015 DEIS revision did the consultants actually reexamine the pond-side plant and wildlilfe species? No. Things change from year to year. As far as can be seen from a reading of all of DEISs submissions, the fish species (perhaps, the most important wildlife species of all) and amphibians (frogs, etc.) present have not been elucidated. For example, is the pond used by leopard frogs, gray tree frogs, spring peepers and wood frogs, to name a few species, for breeding? C7-4

5) In the past extreme noise levels emanating from camp activities have been reported by parties in opposition to the planned expansion. Noise levels should greatly increase over current levels should the camp owner's requests be granted. If there are nocturnally active species such as owls and whippoorwills, how are they affected by such noises? How are diurnal birds affected? Will the breeding success of area wood thrushes, robins, bluebirds, woodpeckers, red-winged blackbirds and other local birds that breed in the area be impacted? The month of June, when the camp gets underway, is the most important time for local bird breeding and territorial singing by males. Daytime noises can become a major distraction during this time. Are there any plans to attenuate such ambient noise levels? C7-5

6) Increased traffic, both daytime and nighttime have yet to be adequately addressed. With as many as 50 camp counselors overnighting in the peak of the summer tourist and fun season, nighttime traffic should increase considerably, or will the counselors be prohibited from carousing and galavanting about after work hours. C7-6

7) North Sea has grown considerably since the camp as a racquet club first got underway. Large active recreational camps in quiet residential areas next to formerly, but still viable ponds and wetlands cannot help but bring assorted damaging environmental impacts over the long run. The DEIS may be sufficiently based for turning down such an expansive application which it accompanies, but it is greatly insufficient for judging the untowardly environmental impacts which will follow if it is deemed complete and the camp's proposed activities and furnishings are expanded as requested. C7-7

Please see attachments, as well.

Sincerely

Larry Penny
3662 Noyac Road
Sag Harbor, N.Y. 11963
631-725-4521

Delivered on this date, March 7, 2017

WATER QUALITY IMPACTS ON LITTLE FRESH POND ASSOCIATED WITH THE PROPOSED SOUTHAMPTON COUNTRY DAY CAMP SOUTHAMPTON, NY

FINAL REPORT – OCTOBER 25, 2012



October 25, 2012

Submitted to:

Little Fresh Pond Association
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Southampton, NY 11968

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EXECUTIVE SUMMARY

This Report presents a description of Little Fresh Pond, Southampton NY, its watershed and its water quality condition along with a methodology for assessing the impacts of development on the Pond's water quality and development mitigation techniques. The Report reviews the proposed improvements at the Southampton Country Day Camp (SCDC) site, owned by Southampton Day Camp Realty and comments on the potential impacts of that development on the Pond's water quality and mitigation measures.

Little Fresh Pond is an eutrophic Pond and is listed on the New York State Department of Environmental Conservation's (NYSDEC) 303(d) list of impaired waters due to phosphorus.

The Pond has

- 19.3 acre surface area
- Depth - average of 3 meters
- Watershed area of 553 acres
- Retention time of the pond is approximately 0.4 years
- No major tributaries and no named outlets – which means groundwater feeds the Pond and Pond waters "discharge" via groundwater
- Class B water quality designation which supports uses of:
  - ✓ Contact recreation - swimming and bathing
  - ✓ non-contact recreation:
    - Boating and fishing
    - Aquatic life
    - Aesthetics

Based upon a review of US Geological Survey Reports on groundwater flow in the North and South Forks of Long Island and their generalized groundwater elevation maps and associated watershed boundaries, and the groundwater travel time map prepared as part of groundwater modeling performed for the Suffolk County Department of Health Services (SCDHS) for its 2010 draft Comprehensive Water Resources Management Report, **the SCDC site wastewater discharge will likely flow into Little Fresh Pond.** The SCDC site and Little Fresh Pond is at a subwatershed divide and localized groundwater flow direction is expected to be best represented by the SCDHS map. Consequently we are of the opinion, based upon senior hydrogeologist analysis, that the SCDC site is within the 2 – 5 year groundwater travel time to the Pond. Groundwater in the Little Fresh Pond area then flows into Peconic Bay.

Phosphorus is the primary nutrient of concern in Little Fresh Pond as it is usually the controlling nutrient of water quality in freshwater bodies. Nitrogen is the controlling nutrient in saline waters of Peconic Bay and its embayments.

Little Fresh Pond's water quality has been classified as impaired by the New York State Department of Environmental Conservation (NYSDEC) due to phosphorus concentrations and is on the 303d list of Impaired waters as required by the federal Clean Water Act. The Pond's water quality has been in violation of the phosphorus standard of 0.020 mg/l for at least seven (7) years, which indicates that current and historical practices are the cause of degraded Pond

water quality. The Pond is classified as eutrophic, which is undesirable and can constrain or prevent its use, and at extreme levels, can have negative health impacts.

Based upon a simplistic analysis of maximum phosphorus discharges that could be allowed to maintain the water quality standards for Little Fresh Pond is approximately 7 residential properties with full time use (referred to as equivalent dwelling units (EDUs)), using the assumption that there is little to no long term removal of phosphorus by local soils. This number will increase based upon the degree to which there is soils phosphorus removal. It should be noted as well that there are other phosphorus sources that would reduce the maximum allowable development. Based upon this analysis one can conclude that the Pond's water quality is very sensitive to development. It is noted that the SCDC development using conventional septic systems is greater than 7 EDUs and thereby it alone would consume the Pond's capacity for development. As discussed below, wastewater treatment system upgrades should be required to and can mitigate this impact.

The Little Fresh Pond water quality data clearly shows that the Pond is eutrophic without any new development and will get worse with any additional discharges. Consequently we recommend that all new development and property upgrades in the area discharging to the Pond have a no net phosphorus and nitrogen, due to adverse impacts on the water quality of Peconic Bay, discharge. This is achieved by using Best Available Treatment (BAT) wastewater treatment technology and providing offsets for the amount of phosphorus and nitrogen discharged. Offsets can be achieved by connecting nearby properties to a BAT treatment system, which could be done seasonally so that the treatment system would not need to be expanded as it would be used for nearby properties when the a seasonal facility is closed, and/or installing BAT treatment systems on properties draining to the Pond. When a new development and/or property upgrade has offsets that are greater than the discharged quantities, the development/property upgrade is then part of the solution to restoring the water quality of Little Fresh Pond.

Wastewater sizing of the SCDC was examined and inconsistencies were noted between the proposed sizing criteria and Suffolk County Department of Health Services (SCDHS) design criteria, which we expect that SCDHS will address.

1. PROJECT BACKGROUND

1.1 Introduction and Project Scope

The Little Fresh Pond Association has retained Lombardo Associates, Inc. (LAI) to summarize the water quality conditions in Little Fresh Pond in Southampton, NY and to provide a framework for assessing the water quality impacts on Little Fresh Pond of proposed developments within the Little Fresh Pond watershed and applying the methodology to the proposed improvements at the Southampton Country Day Camp (SCDC), owned by Southampton Day Camp Realty. This report presents the results of LAI's services in this regard.

1.2 Background

1.2.1 Lake Description

According to the 2011 Citizens Statewide Lake Assessment Program (CSLAP) Summary of Little Fresh Pond, Little Fresh Pond is a

- 19.3 acre pond located approximately 2 miles south of the North Sea Harbor inlet to Little Peconic Bay.
- Depth - average of 3 meters
- Sounding depth of 6 meters
- Watershed area is 553 acres
- Retention time of the pond is approximately 0.4 years
- With no major tributaries and no named outlets
- Class B water quality designation

The Class B designation covers the following uses:

- Contact recreation - swimming and bathing
- non-contact recreation:
  - Boating and fishing
  - Aquatic life
  - Aesthetics

Figure 1-1 is a Google Earth photo of the Little Pond area with expanded views on Figures 1-2 and 1-3.

Presented below are the following figures on the groundwater and surface characteristics of the Little Fresh Pond area.

Figure	Description
1-4	Groundwater Travel Times
1-5	Groundwater Elevations
1-6	Depth to Groundwater
1-7	Surface Topography and Surface Watersheds

FIGURE 1-1: LITTLE FRESH POND AREA AERIAL PHOTOGRAPH

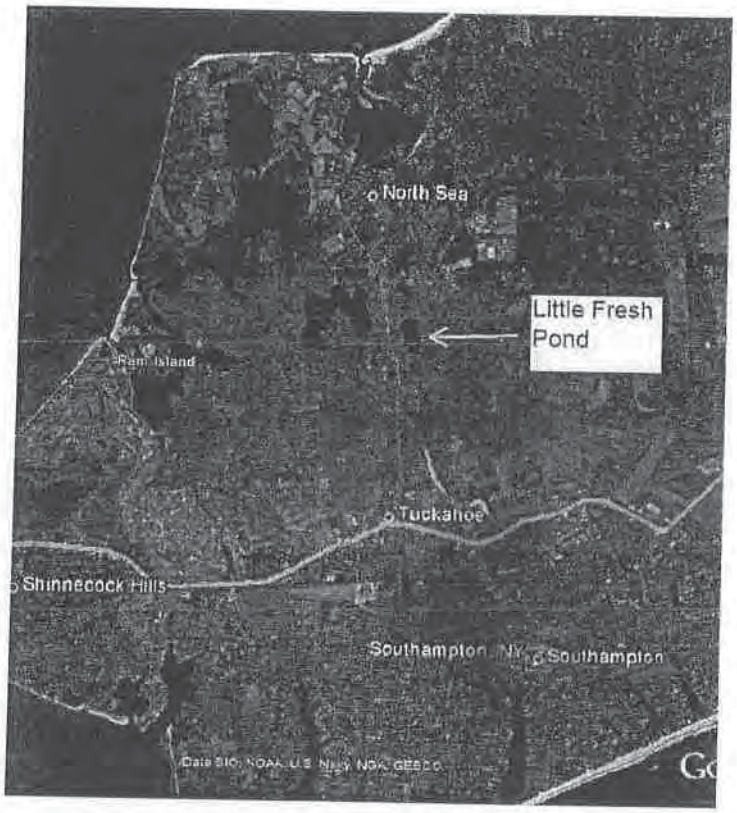
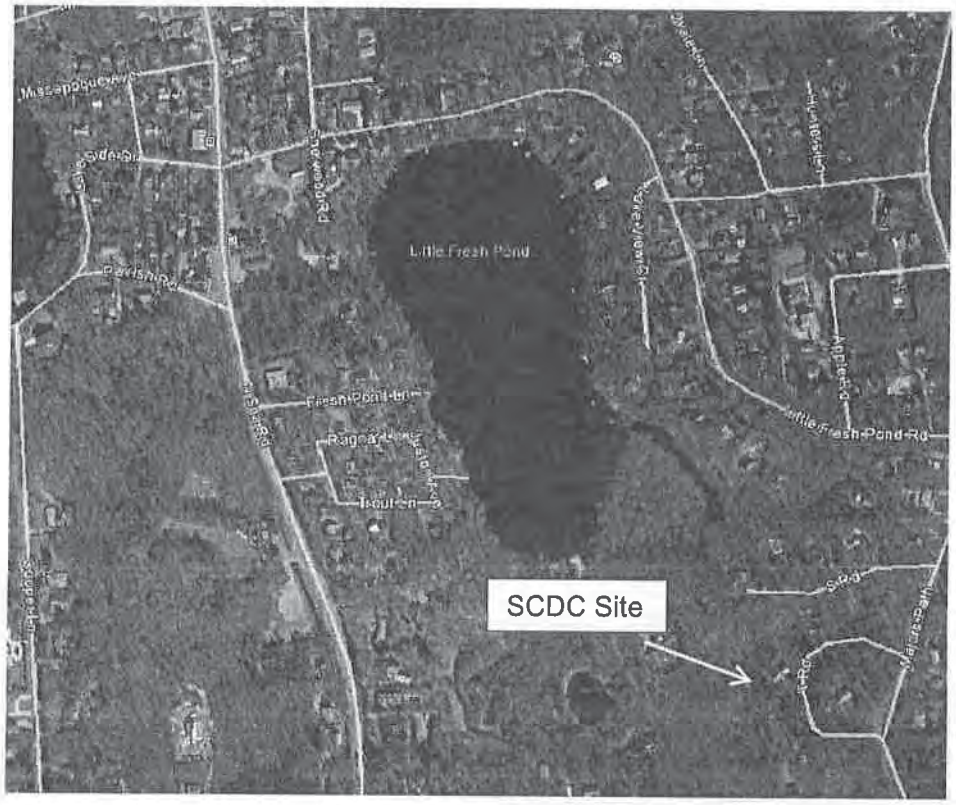


FIGURE 1-2: LITTLE FRESH POND GENERAL AREA GOOGLE AERIAL PHOTOGRAPH



FIGURE 1-3: LITTLE FRESH POND GOOGLE AERIAL PHOTOGRAPH



1.2.2 Background

The Citizens Statewide Lake Assessment Program (CSLAP) has been sampling Little Fresh Pond since 1989.

The Southampton Country Day Camp (SCDC) site is located southeast of Little Fresh Pond as illustrated on Figure 1-4, which also illustrates the location of existing homes/building in the mapped area. Based upon the Figure 1-4 map, groundwater in the SCDS property area flows towards Little Fresh Pond.

Little Fresh Pond lies within a sub-watershed of the Peconic Bay, see Figures 1-5 and 1-6, and therefore groundwater flows to Peconic Bay. The Figure 1-4 SCDHS groundwater travel time map indicates that groundwater flow in the immediate area of the Pond flows into the Pond and the SCDC site is within the 2 – 5 year groundwater travel time to the Pond. In our senior hydrogeologist's opinion, this is consistent with information in the US Geological Survey Reports (1998 and 1999).

P.W. Grosser Consulting prepared an August 26, 2011 letter report that examined the following issues and made the following statements determinations:

- Nitrogen loading was examined. Phosphorus loading was not examined.
- Drainage area stated as 118 acre, whereas CSLAP report states 553 acres
- Pond and wetlands are 25 acres. CSLAP Report states Pond is 19.3 acres
- A water balance was performed as follows

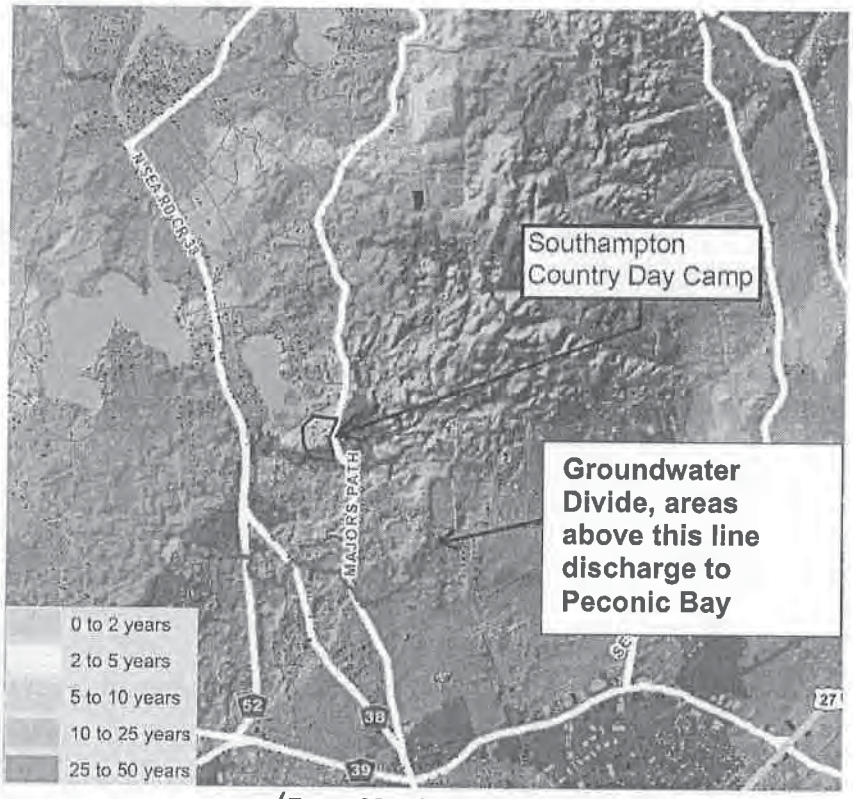
- Rain on Pond – estimated at 44 inches/yr = 30 million gallons/(MG)/yr
- 10% of precipitation on watershed area travels to Pond – estimated at 14 MG/yr
- Evaporation is 34 inches/yr = 23 MG/yr
- Outflow calculated as difference between above rain + inflow – evaporation = 21 MG/yr

The report claims that recharge water from Little Fresh Pond diverts groundwater flow around the Pond and consequently divert groundwater flow from the proposed SCDC development in a westerly direction. The SCDHS groundwater travel time maps and USGS Reports do not support this conclusion.

Also, according to the USGS (1998) 50% of rainfall becomes groundwater recharge in the South Fork of Suffolk County, not the 10% stated by Grosser. Also, per USGS (1998), the movement of groundwater is controlled by the distribution of hydraulic properties within the freshwater flow system and the hydraulic gradient – from areas of higher hydraulic head to lower hydraulic head. The water balance approach is not used to determine groundwater flow direction as groundwater flow direction is dictated by hydraulic gradients predominately for the study area who soils are fairly uniform.

In our opinion, the Figure 1-6 SCDHS groundwater flow travel times is the best available computer modeling of groundwater flow as the model was calibrated and the results widely used in Suffolk County. The SCDHS groundwater flow travel times indicate that groundwater around the Pond flows toward the Pond and that wastewater discharges to the ground at the SCDC site would reach Little Fresh Pond within 2 – 5 years.

FIGURE 1-4: LITTLE FRESH POND GROUNDWATER TRAVEL TIMES



(Town of Southampton, 2011)

FIGURE 1-5: LITTLE FRESH POND AREA GROUNDWATER ELEVATIONS (USGS, 1998)

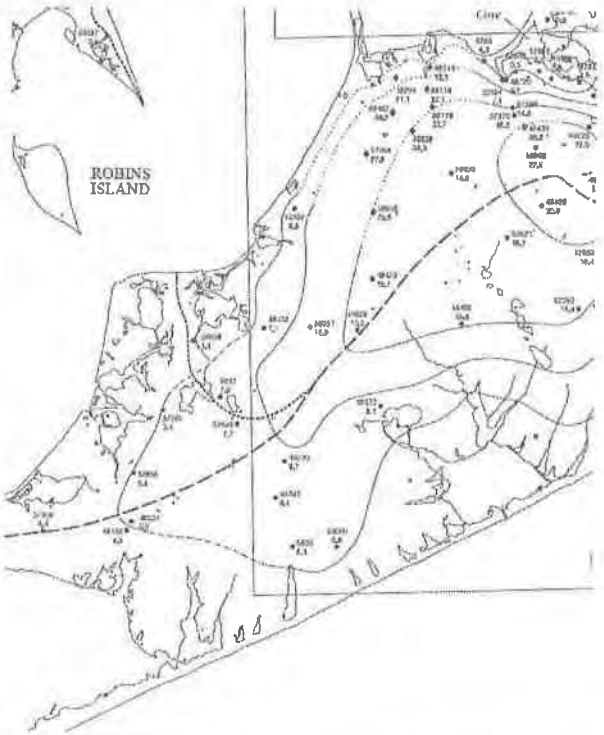
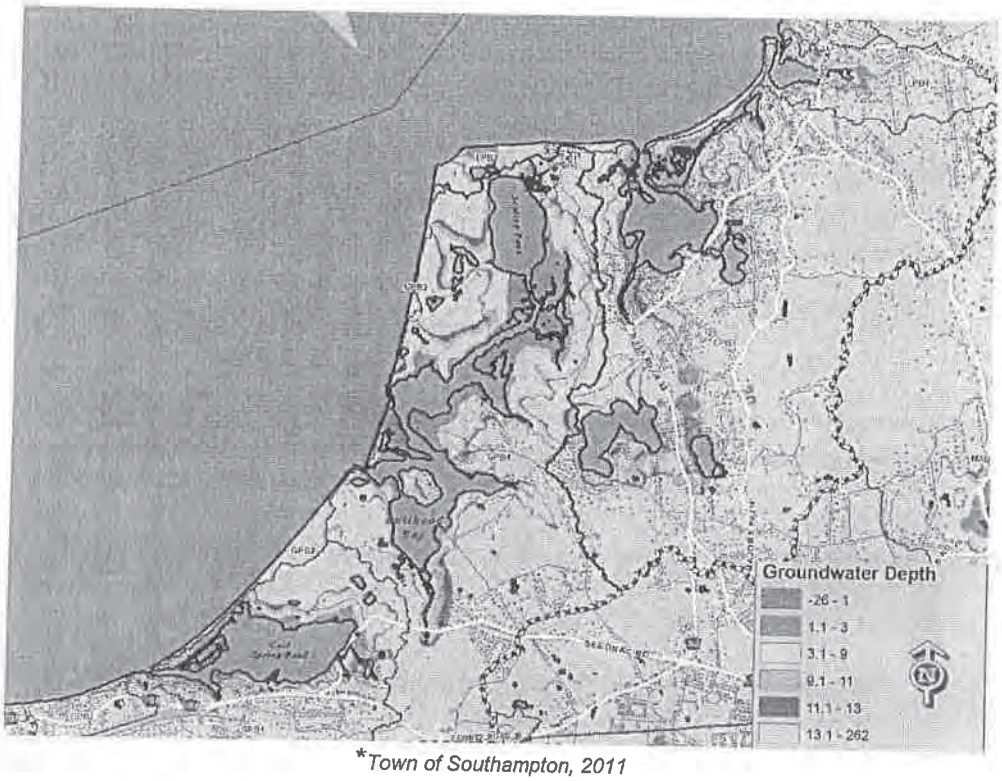
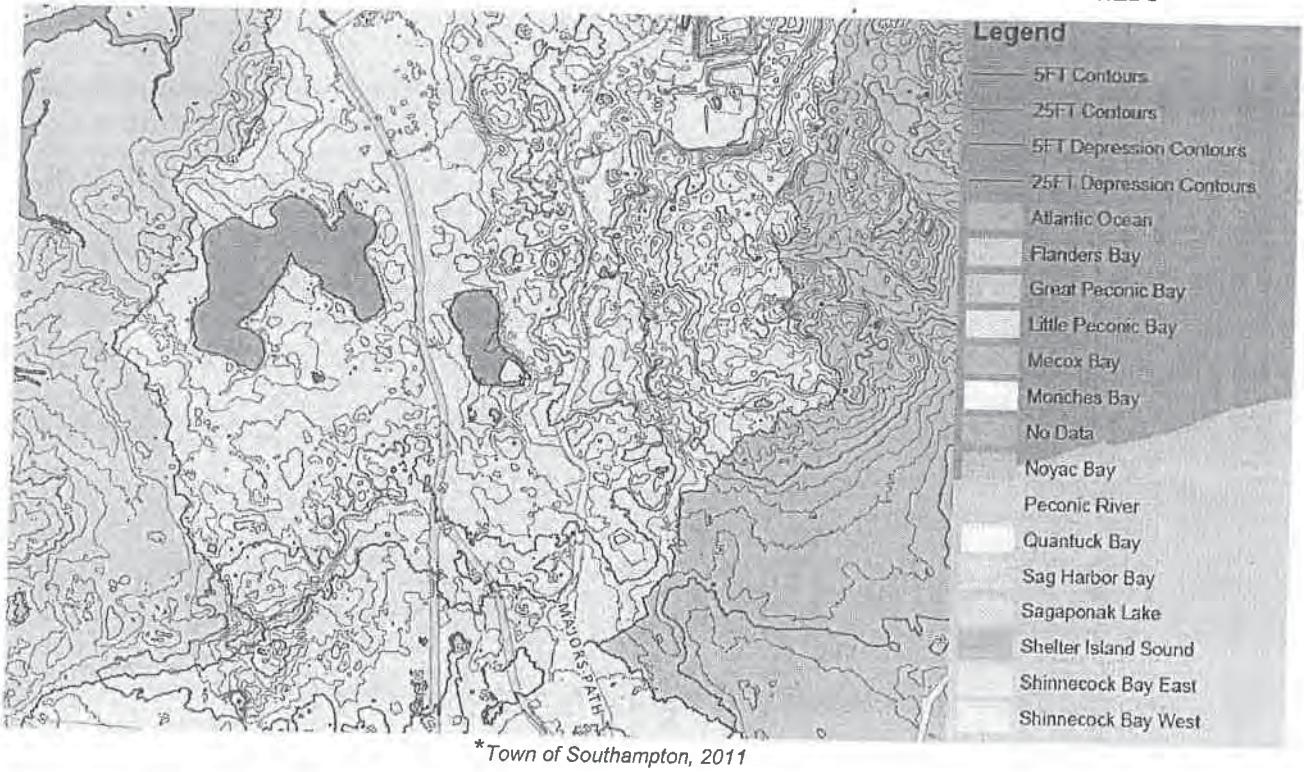


FIGURE 1-6: LITTLE FRESH POND AREA DEPTH TO GROUNDWATER*



*Town of Southampton, 2011

FIGURE 1-7: LITTLE FRESH POND SURFACE TOPOGRAPHY AND SURFACE WATERSHEDS*



*Town of Southampton, 2011

2. Little Fresh Pond Water Quality Status Review

2.1 CSLAP Sampling Results

According to CSLAP reports, sampling was conducted on Little Fresh Pond over the following time periods:

- 1989 – 1994
- 1997
- 2002 – 2011

Little Fresh Pond was not sampled by the NYSDEC as part of any of the major regional or statewide monitoring programs. None of the unnamed ephemeral tributaries, nor the outlet of the lake have been monitored through the NYSDEC Rotating Intensive Basins (RIBS) program or the state stream macroinvertebrate monitoring program. The lake has not been sampled by DEC fisheries staff in support of fish stocking activities or any other statewide monitoring programs.

2.2 Water Quality Status and Nutrient Loadings

According to CSLAP Reports, Little Fresh Pond is classified as a eutrophic lake, meaning that the algal population is highly productive. Eutrophic waters have nutrient levels at high enough levels that enable the growth of significant amounts of algae/phytoplankton at such levels that uses of water can be impaired.

This designation is a function of the following water quality parameters, and comparison to standards:

Water Quality Parameter	CSLAP Standard
• Total Phosphorus (TP)	0.020 mg/l
• Water Clarity (Secchi Disk)	1.2 meters
• Chlorophyll-a (phytoplankton biomass surrogate)	no standard
• Phycocyanin (blue-green algae biomass surrogate)	no standard

New York has established the Table 2-1 criteria for Lake Trophic Status in its New York State Clean Lakes Assessment Document, http://www.dec.ny.gov/docs/water_pdf/305blakes10.pdf,

Table 2-1: Assessment Criteria for NY Lake Trophic Status

Assessment Criteria for Lake Trophic Status

Parameter	Oligotrophic	Mesotrophic	Eutrophic
Transparency (m)	> 5	2 - 5	< 2
Total Phosphorus (µg/l)	< 10	10 - 20	> 20
Chlorophyll *a* (µg/l)	< 2	2 - 8	> 8

The water quality standard for phosphorus in freshwater ponds is the most important standard, in LAI's opinion, as phosphorus is typically the controlling nutrient. What this means is that phosphorus generally controls algae growth and water quality conditions. Water Clarity readings are the depth at which the Secchi Disk can be seen from the surface.

Chlorophyll-a is a measure of algae/phytoplankton biomass. High chlorophyll-a levels are indicative of algal blooms. Phycocyanin is an accessory pigment to chlorophyll and is often found in cyanobacteria, which is a highly undesirable algae. Cyanobacteria can fix nitrogen, which means they can obtain their required nitrogen for growth from the atmosphere. Some cyanobacteria produce toxins. Cyanobacteria reproduce explosively under certain conditions and if the cyanobacteria involved produce toxins, the water will be harmful to species drinking or in contact with the water.

The 2009 and 2010 CSLAP Reports concluded that small changes in phosphorus inputs to Little Fresh Pond may trigger large changes in algal levels. This conclusion is supported by the Figure 2-1 Pond's average phosphorus levels being above the 0.02-mg/L threshold for the past 7 years. Figures 2-2, and 2-3 present the clarity and chlorophyll-a data from July 1989 through September 2011. Figure 2-4 presents the phycocyanin data collected between September 2009 and September 2011.

FIGURE 2-1: TOTAL PHOSPHORUS DATA, JULY 1989 – SEPTEMBER 2011

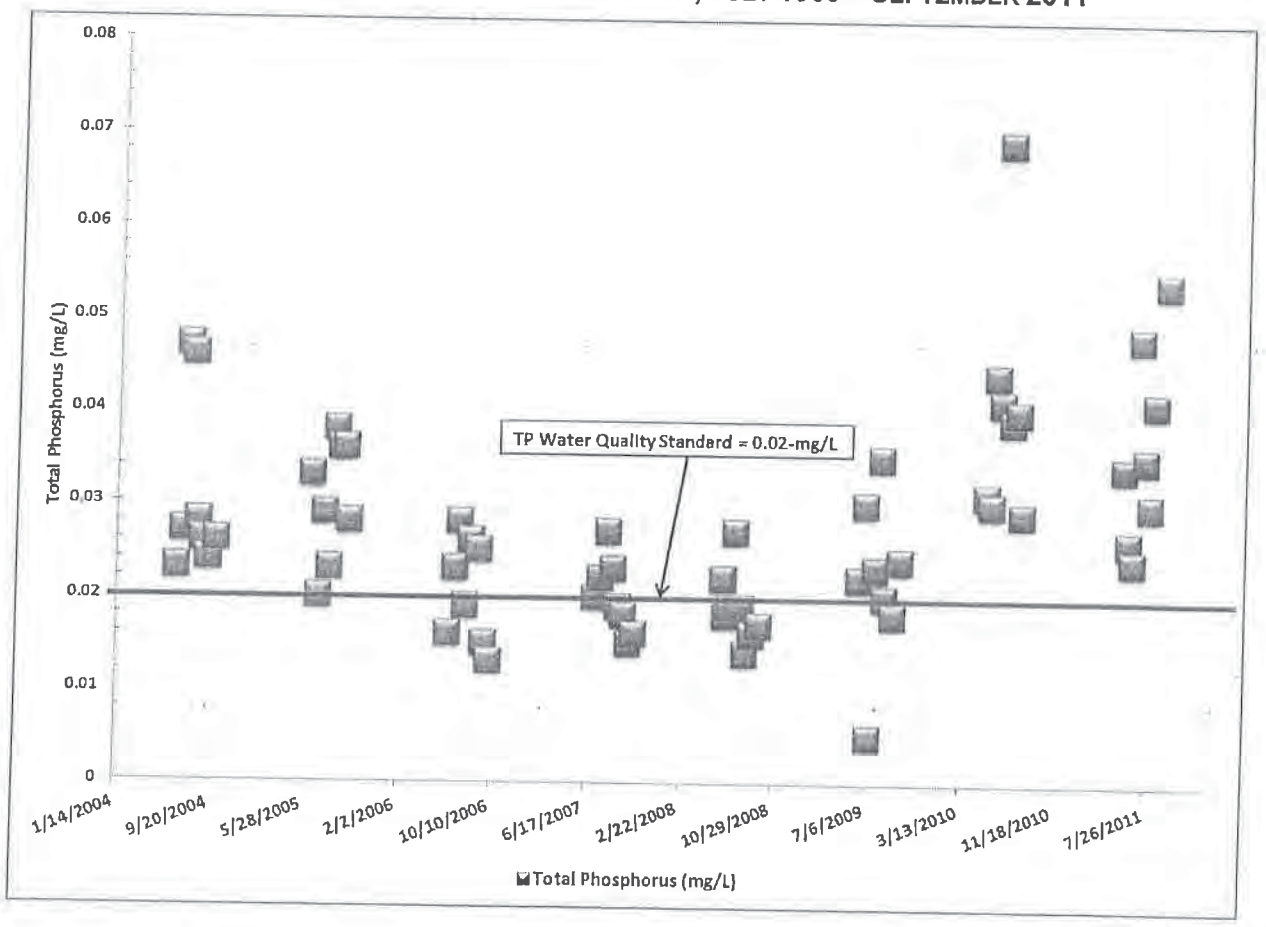


FIGURE 2-2: WATER CLARITY DATA, JULY 1989 – SEPTEMBER 2011

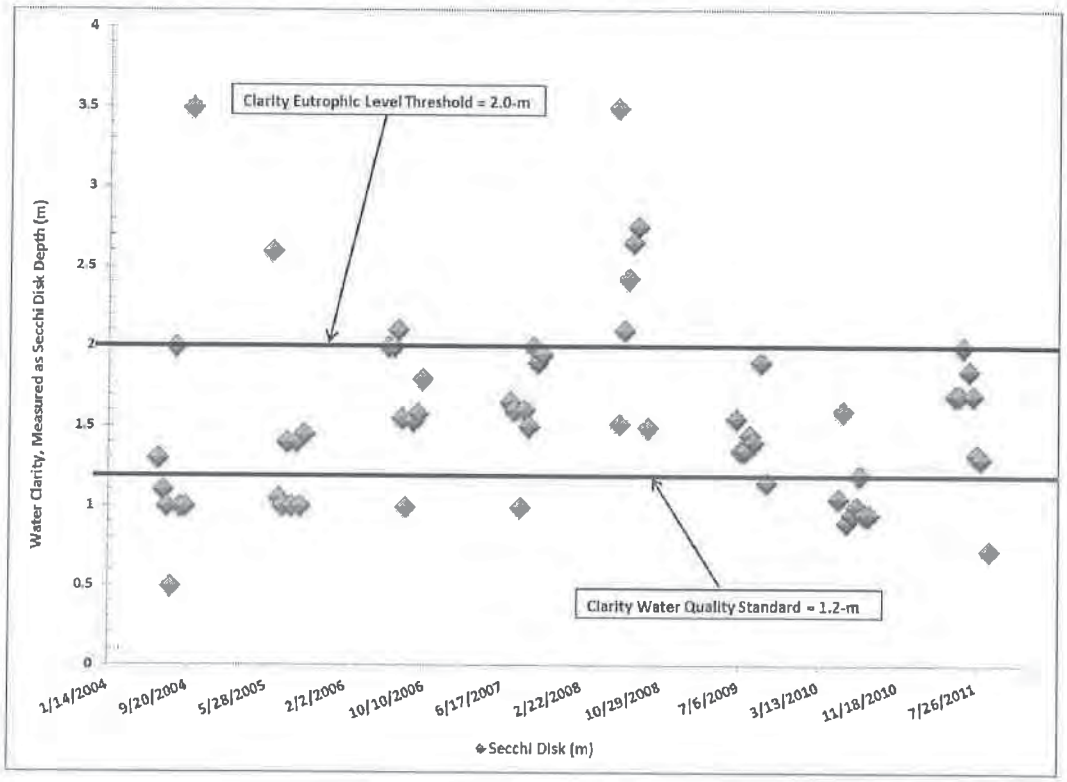


FIGURE 2-3: CHLOROPHYLL-A DATA, JULY 1989 – SEPTEMBER 2011

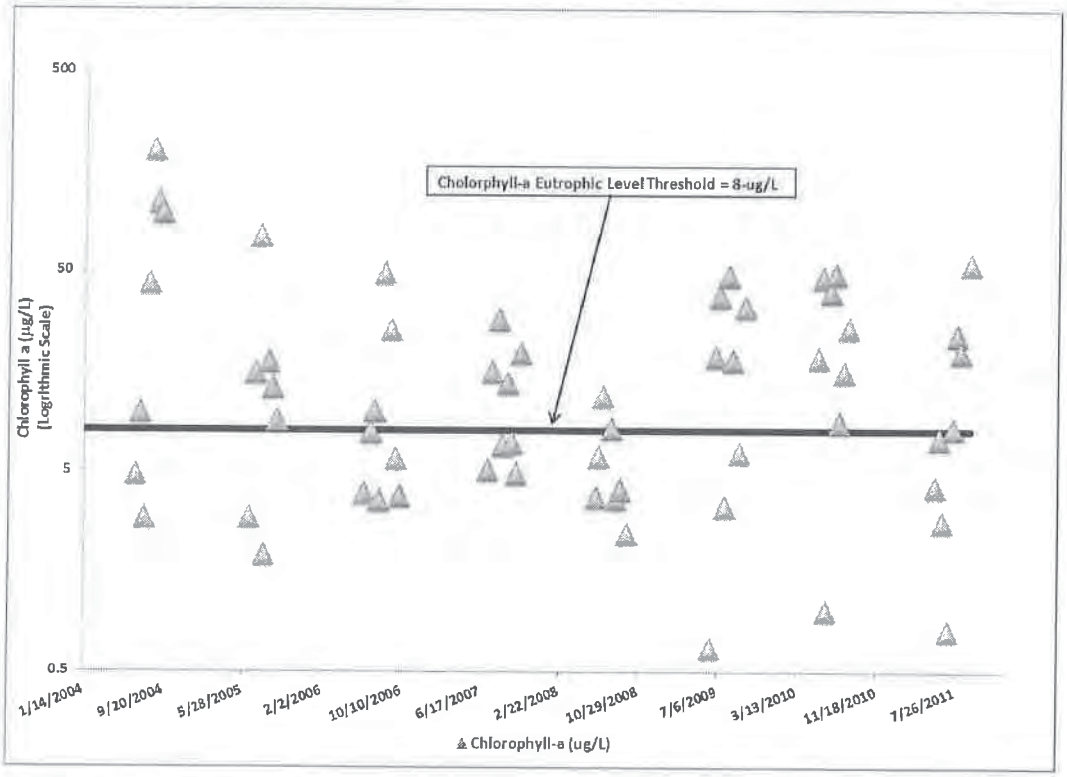
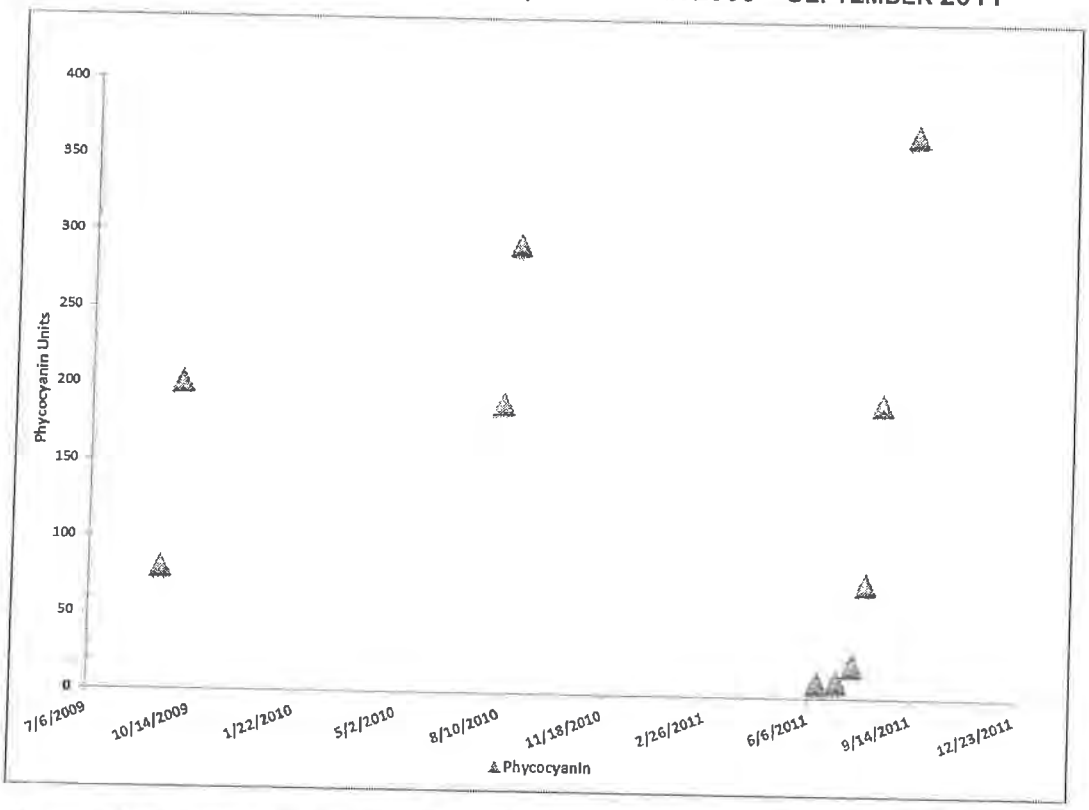


FIGURE 2-4: PHYCOCYANIN DATA, SEPTEMBER 2009 – SEPTEMBER 2011



The extensive data collection performed by CSLAP has consistently shown that phosphorus levels are above the threshold that limits the potential for excessive algae growth, as illustrated on Figure 2-1. The data also shows water clarity has been better than the standard most of the time, with less than the standard in 2010, however the data indicates that pond is predominately in the eutrophic range based upon NYSDEC criteria. Chlorophyll a data is indicative of a eutrophic pond.

The total phosphorus load contributed by the Little Fresh Pond watershed would need to be reduced from current and historical levels to be protective of long-term water quality and improve the classification of the lake's trophic status to a better designation than eutrophic. A challenging issue with freshwater ponds and phosphorus is the accumulation of phosphorus in the pond's sediments and recycling of that phosphorus to the pond's water column. When this occurs, phosphorus release from sediments can be a significant source of phosphorus and even be the predominant phosphorus source that controls water quality.

Phosphorus accumulation in sediments results from algae growth and upon death sinking to the pond's bottom to decay. The decaying dead algae then require oxygen and at high demands, the sediments (i.e. muds) become anaerobic (i.e. devoid of oxygen). When anaerobic conditions occur, the phosphorus bound in the dead algae is released back into the water column in a soluble form and becomes "fertilizer" for more algae growth.

2.3 New York State Impaired Water Body Designation

Little Fresh Pond is listed on the New York State 303d list of impaired water bodies, http://www.dec.ny.gov/chemical/31290.html , due to phosphorus under the category Part 3a category of Waterbodies for which TMDL Development May be Deferred (Requiring Verification of Impairment).

2.4 Septic System Phosphorus Geochemistry and Legacy Issues

Phosphorus geochemistry plays a major role in determining how much of the phosphorus being discharged to the ground within a watershed will reach the groundwater and the receiving surface water body. Unlike nitrogen, the relationship between phosphorus loading within the watershed and phosphorus levels measured within the receiving water body are controlled by complex bio-geochemical processes.

A detailed discussion of the phosphorus geochemistry issue is presented in the peer reviewed EPA-sponsored Report, attached as Appendix A, through Washington University entitled "Phosphorus Geochemistry in Septic Tanks, Soil Absorption Systems and Groundwater", 2005 of which Lombardo Associates, Inc. was the principal investigator.

2.4.1 Phosphorus Removal Mechanisms and Capacity of Soils

Septic, stormwater and other sources of phosphorus (P) are removed by soils by the following mechanisms:

1. Mineralization with iron, aluminum and/or calcium – essentially permanent P removal
2. Sorption – which is usually temporary in sandy soils

2.4.1.1 Mineralization

Simplistically stated, mineralization, or alternately stated precipitation, is the transformation of the phosphorus in water to a solid material (thereby removed from the water) due to a chemical reaction with iron, aluminum and calcium that becomes dissolved in the water. In septic systems the process is biologically mediated as the septic organic matter is "food" for certain bacteria that transform certain forms of solid iron in soils to a soluble form thus enabling the chemical precipitation of phosphorus in the form predominately of vivianite and stringite. In acidic soils with aluminum, some of the aluminum will dissolve with the acidic water and an aluminum-phosphorus solid material of variscite is produced. In highly alkaline soils with dissolved calcium, the phosphorus–calcium chemical compound apatite is produced.

These chemical mineralization processes generally only occur in the area below the leaching pools/septic drainfields as described in the Appendix A document.

2.4.1.2 Sorption

The soils through which septic, stormwater and other waters travel have the potential to bind phosphorus by sorption of the phosphorus to the soils and thereby preventing the phosphorus from reaching the receiving water body. The capacity of the soils to bind phosphorus by sorption is referred to as the assimilative capacity. Once this capacity is consumed, the soils

will no longer remove phosphorus by sorption and phosphorus breakthrough to a surface water body occurs. This time to breakthrough can be long, i.e. decades, and is a function of distance of the discharge location to the receiving water body and soil characteristics. Properties closest to a pond would be candidate locations where breakthrough may have occurred. Consequently one could estimate phosphorus breakthrough depending on the specifics of historical septic system use, distance from the pond and soil types.

2.4.1.3 Retardation Factor

As the US Geological Survey has discovered on Cape Cod, phosphorus sorbed to sandy soils is desorbed (i.e. released) from the soils and will discharge to the surface water body http://toxics.usgs.gov/highlights/phosphorous_migration.html. The phenomenon is referred to as the phosphorus retardation factor which is the factor that phosphorus takes to migrate as compared to groundwater travel time. A retardation factor of 20 means phosphorus moves 20 times slower than groundwater.

2.4.1.4 Legacy Issues

The legacy issue for Little Fresh Pond is that prior phosphorus discharges may not yet have reached the Pond and consequently would affect the time required to reverse eutrophication even if all phosphorus discharges were terminated. Although groundwater treatment techniques using permeable reactive barriers are available to address this issue, due to the dispersed development around Little Fresh Pond, it is not considered financially feasible.

Due to the retardation-desorption and sediment release of phosphorus, instituting a no-net increase policy may not prove to be sufficient to protect water quality in Little Fresh Pond. Calculating the assimilative capacity and determining if the sediment contribution requires data and efforts that are beyond the scope of this report.

2.4.1.5 Future Development Issues and Recommendations

As the pond is already eutrophic, LAI recommends that the Association strive to engage future development and property upgrades to be part of the solution to Little Fresh Pond water quality improvement. Again, as stated in the CSLAP reports, additional phosphorus discharges will likely result in higher levels of water quality impairment. As stated above, under accelerated eutrophication phosphorus accumulation in the sediments will accelerate and become an additional source of phosphorus. The extent to which it is a factor in the Pond's water quality is unknown by LAI at this time. Sediment sealing by alum and pond aeration are techniques that are used to address the sediment phosphorus release issue.

As such, it is recommended that any proposed increase in phosphorus contributions to the watershed due to new development and upgrade of existing development include reductions of phosphorus discharges. Due to the already existing adverse eutrophic conditions in Little Fresh Pond, efforts at reducing existing discharges should be pursued.

The concept of no net phosphorus contribution of new development and major property upgrades (usually defined as greater than a certain value of the building or a building addition size) should be considered by the Association as a recommendation/request to the Town of Southampton. This approach for nitrogen is used on Cape Cod for certain types of projects in watersheds of impaired water bodies, as a condition of project permitting/approval. A typical

approach is to include existing septic systems from nearby areas into the wastewater treatment system for the development such that removal of the nitrogen mass from the existing systems is greater than the nitrogen mass being discharged by the new development's system. Consequently the development doesn't make the impaired water body worse. The extent to which the no net nitrogen (or phosphorus) contribution is negative then becomes a positive contribution to the Pond's water quality restoration. While this means expanding the treatment system's capacity in areas of full time property use, for seasonally used properties nitrogen and phosphorus removal may be cost -effectively achieved by connecting nearby developed properties and having their wastewater sent to the treatment system during non-use by the development and discharging to their conventional systems during periods of summer use by the development. This approach can be easily engineered and operated. Other strategies are possible including upgrading individual septic systems with individual advanced wastewater treatment systems.

It is noted that the Pond's capacity to receive phosphorus and maintain water quality is specified by Total Maximum Load (TMDL) studies which may be required to be performed as the Pond is listed on the State's 303d Impaired waters List. Once the TMDL is established, then how those TMDL budgets are apportioned to properties within the watershed is a matter of public policy and the legal system. In this regard, one would expect that all properties have some rights to discharge some amount of phosphorus. It is beyond the scope of this project to address this issue.

2.4.1.6 Nitrogen Issues

While the discussion has been on phosphorus discharges to Little Fresh Pond as phosphorus is the controlling nutrient, nitrogen discharges will affect the water quality of Peconic Bay and efforts to reduce nitrogen discharges should receive consideration as part of wastewater and stormwater management practices.

2.4.1.7 Recommendations

Due to the fact that Little Fresh Pond is eutrophic, it is recommended that the Pond Association request the Town develop the policy of no net phosphorus contribution from development within the Pond's watershed and that developers be rewarded somehow to the extent that they become positive contributors to the Pond's water quality restoration. Broadly speaking the policy could be adopted for all impaired water bodies that are designated as impaired by NYSDEC and those classified as eutrophic based upon NYSDEC's criteria and the CSLAP reports.

2.5 Project Environmental Impact Statement

It is noted that the Town of Southampton Planning Board, as lead agency, has determined that the proposed Southampton Country Day Camp may have a significant adverse impact on the environment and a Draft Environmental Impact Statement must be prepared. The action involves the change of use from a pre-existing, non-conforming tennis camp use to a non-conforming day camp use on a residentially zone parcel and the demolition / reconstruction / relocation of the existing structures and new structures and the addition of accessory pools and sport court/playgrounds. The project is located on a 17.28 acre parcel which fronts on Little Fresh Pond located in the R-20 Zoning District at 665 Majors Path in North Sea, Town of Southampton, New York.

3. Evaluation of Development Impact on Little Fresh Pond

3.1 Preliminary Simplistic TMDL Analysis

LAI has prepared a simplistic mass balance Total Maximum Daily Load (TMDL) analysis for Pond water quality maintenance based upon the Pond's hydrologic characteristics as determined by CSLAP with the results presented on Table 3-1.

Table 3-1 Simplistic TMDL - Carrying Capacity Analysis - Little Fresh Pond Southampton NY

Simplistic TMDL - Carrying Capacity Analysis - Little Fresh Pond Southampton NY			
19.3	acres		
3	meters avg depth		
553	acres watershed area		
0.4	yrs retention		
0.02	mg/l Phosphorus TMDL requirement basis		
Pond Volume		**Equivalent Watershed Homes -assuming no soils P removal**	
8,272,567	cf	0.02	Based upon Pond P conc (mg/l)
61,878,799	gal	25.80	lbs/yr P alllowed for TMDL
154,696,998	Gallons - annual	3.7	lbs/yr discharged per typical residential property with NO soil removal
1,290,172,961	lbs annual		
1,290	Mill lbs annual	6.97	EDUs (with no soil removal of P) max allowed to protect

The conclusion one can draw from this analysis is that the Pond has a low tolerance / high sensitivity to development – as we do not expect the soils to remove much P from a long term perspective. The data in Section 2 indicates that existing development has already exceeded the Pond's development carrying capacity. Based upon our analysis of the proposed development, with conventional septic systems its current discharge consumes 77 % of the Pond's phosphorous discharge capacity.

3.2 Summary of Existing and Proposed Conditions

The Southampton Country Day Camp (SCDC) existing facilities consist of the following uses:

- 13 cottages
- (1) 4-bedroom single-family residence
- Cabin
- Dining Hall
- Club House
- Shop Building w/ Caretaker's Office

- 7 Tennis Courts
- Basketball Court

Table 3-2 presents the design basis for the various scenarios of grandfathered and various levels of project development as described on the Southampton Country Day Camp Renovation Plans as prepared by Jeffrey T. Butler, P.E., P.C. dated Feb. 28, 2011 and revised as of Jan. 13, 2012. As presented on Sheet S-4 of the Butler Drawings, the grandfathered occupancy load of the cottages is 122 occupants, and the existing sanitary flow, based on 75 gpd / occupant and 300 gpd / single family residence, is 9,450 gpd. The tennis courts add 100 gpd / court, for a total design flow of 10,150 gpd. The property is used seasonally from May-October, resulting in approximately 180 days of use. Drawing S-4 indicates the proposed flow of:

40 persons x 75 gpd/person	= 3,000 gpd
420 campers x 5 gpd/camper	= 2,100 gpd
Total	5,100 gpd

with a Suffolk County Groundwater Management Zone V volume allowed yield of 5,184 gpd.

It is noted that the SCDHS code for campers is 15 gpd/camper – with 10 gpd/camper for density load calculation purposes and 5 gpd/camper for shower. Dining hall loads would be an additional load and would be 2,220 gpd per Drawing S-4 – based upon 296 seats and 7.5 gpd/seat. It appears that the proposed flow calculations are in error, the implications of which are unclear.

Determining the actual use and associated nutrient discharges to groundwater is a key consideration in determining the potential impact of a change in use at the SCDC. The water quality data reflects actual use – not SCDHS design flow projections of use. SCDHS design flows are used for sizing septic tanks and leaching pools with sufficient capacity to process peak flows, with a safety factor included. In addition, the existing property reportedly has not been used at capacity. Water use records and an estimate of the landscaping demand on the water use are used to provide a sound basis for estimating actual historical wastewater discharges to groundwater. For the purpose of this analysis, LAI has used the following assumptions concerning historical use of the property, based on observations reported by the Little Fresh Pond Association:

- Occupancy by up to 24 people
- Use of the 7 tennis courts

The following modifications to SCDHS design flows have been made to estimate actual average daily flows:

- 60 gpd / occupant (75 gpd per SCDHS)
- 75 gpd / tennis court (100 gpd per SCDHS)

The proposed development consists of the following uses:

- Day Camp with 150 campers and 40 staff, operating for a ten (10) week period from mid June through late August.
- Tennis Club operating from May – October (180 days)

The proposed SCDC development is scheduled to be carried out in the following two phases:

- Swimming Pool and Recreation Courts – increased intensity of use, no building renovations (50 additional occupant assumed, using the Bath House)
- Phase I – Building Renovations, Partial Use of Day Camp (150 Campers, 40 Staff)
- Phase II – Full Use of Day Camp (420 Campers, 95 Staff)

For analytical purposes, the swimming pool is assumed to be in use for 15 weeks (105 days), and is assumed to attract an average of 50 occupants making use of the Bath House. The SCDHS flow / occupant for a bath house is 5-gpd / occupant, a value that does not require modification in LAI's opinion.

TABLE 3-2: EXISTING AND PROPOSED NITROGEN AND PHOSPHORUS DISCHARGES

Category		2012 Existing Actual (Est.)	2013 Increased Intensity (Est.)	Phase I Partial Use	Phase II Full Use	Phase II Renovations SCDS Flow Basis	Sanitary Grand fathered Flow Basis
Design Basis							
	# of Day Campers	0	0	150	360	420	
	# of Overnight Occupants	24	24	40	40	40	122
	# of Days of Operation - Camp	180	180	70	70		
	# of Tennis Courts	7	7	6	6	6	7
	# of Days of Operation - Tennis Club	180	180	180	180		
	# of Swimming Pool Occupants	0	50				
	# of Days of Operation - Pool	105	105				
	Single Family Residence	1	1	0	0	0	1
	# of Days of Occupancy - SFR	180	180	180	180		
SCDHS Sanitary Flow							
	Day Camper (gpd)	15	15	15	15	15	15
	Dining Hall (gpd) 226 seats @ 7.5 gpd/seat			2,200	2,200	2,200	2,200
	Overnight Occupant (gpd)	60	60	60	60	75	75
	Tennis Courts (gpd)	75	75	75	75	100	100
	Bath House Occupant (gpd)	5	5	5	5	5	5
	Single Family Residence (gpd)	200	200	200	200	300	300
	Total Annual Sanitary Flow (gpy)	*389,700*	*415,950*	*406,500*	*627,000*	*3,613,500*	*3,704,750*
	Seasonal Daily Sanitary Flow (gpy)	*2,165*	*2,415*	*7,300*	*10,450*	*12,100*	*12,350*
	Average Daily Sanitary Flow (gpd)	*1,068*	*1,140*	*1,114*	*1,718*		
Raw Wastewater Quality							
	TN (mg/L)	60	60	60	60	60	60
	TP (mg/L)	6.0	6.0	6.0	6.0	6.0	6.0
Nutrients Discharged to Groundwater - Conventional Sewage Disposal System							
	TN (lb/yr)	195	208	204	314	1,809	1,855
	TP (lb/yr)	19.5	20.8	20.4	31.4	180.9	185.5
Equivalent Dwelling Units (EDUs) of SCDC discharge	Number of EDUs based upon projected SCDC site P discharge - assuming no soils removal	5.3	5.7	5.6	8.6	49.5	50.8

Table 3-2 presents the nutrient loading calculations for the above-listed development phases and assumptions. The nutrient loadings are presented using the following treatment assumptions:

- Conventional Sewage Disposal Systems
- Best Available Technology (BAT) Systems for Nitrogen and Phosphorus Removal

The BAT systems are assumed to have the following effluent quality:

- Nitrogen: Low Range – 3 mg/L High Range – 5 mg/L
- Phosphorus: Low Range – 0.5 mg/L High Range – 1.0 mg/L

Table 3-2 also presents the number of EDUs (single family residences) that would need to be connected to a treatment system to offset the nitrogen and phosphorus discharged to groundwater to result in no net discharge associated with the SCDC facility. The numbers are rounded up, therefore the full-time use scenario is not simply a multiple of the seasonal use scenario.

Table 3-2 Continued: Existing and Proposed Nitrogen and Phosphorus Discharges

Category			2012 Existing Actual (Est.)	2013 Increased Intensity (Est.)	Phase I Partial Use	Phase II Full Use	Phase II Renovations SCDS Flow Basis	Sanitary Grand fathered Flow Basis
Wastewater Effluent Quality - BAT System								
	TN Range	High (mg/L)	5.0					
		Low (mg/L)	3.0					
	TP Range	High (mg/L)	1.0					
		Low (mg/L)	0.5					
Nutrient Discharged to Groundwater - BAT System								
	TN Range	High (lb/yr)	16.3	17.4	17.0	26.2	150.8	154.6
		Low (lb/yr)	9.8	10.4	10.2	15.7	90.5	92.7
	TP Range	High (mg/L)	3.3	3.5	3.4	5.2	30.2	30.9
		Low (lb/yr)	1.63	1.74	1.70	2.62	15.08	15.46
Typical Conventional Sewage Disposal System - Single Family Residence								
	Flow (gpd)		200				300	
	TN (mg/L)		60				60	
	TP (mg/L)		6				6	
	TN / EDU (lb/yr)		37				55	
	TP / EDU (lb/yr)		3.7				5.5	
# of EDUs Required to Offset Nitrogen and Phosphorus Discharge to Achieve No Net Discharge - Assuming Seasonal Facility Use								
	# of EDUs Required - High		***n/a***	***1***	***1***	***1***	***3***	***3***
	# of EDUs Required - Low		***n/a***	***1***	***1***	***1***	***2***	***2***
# of EDUs Required to Offset Nitrogen and Phosphorus Discharge to Achieve No Net Discharge - Assuming Full Time Facility Use								
	TN Discharged to GW	High (lb/yr)	33.0	36.8	111.2	159.1	184.3	188.1
		Low (lb/yr)	19.8	22.1	66.7	95.5	110.6	112.9
	TP Discharged to GW	High (mg/L)	6.6	7.4	22.2	31.8	36.9	37.6
		Low (lb/yr)	3.30	3.68	11.12	15.91	18.43	18.81
	# of EDUs Required - High		***n/a***	***2***	***4***	***5***	***4***	***4***
	# of EDUs Required - Low		***n/a***	***1***	***2***	***3***	***3***	***3***

4. DISCLOSURES

Lombardo Associates, Inc. (LAI) has had communications with the Southampton Country Day Camp developer's engineer regarding the use of LAI's nitrogen and phosphorus removal technologies prior to being engaged by the Little Fresh Pond Association.

Additionally, Lombardo Associates, Inc. engineers and provides a wastewater nitrogen removal system that is approved by the Suffolk County Department of Health Services as well as a wastewater phosphorus removal system that has been used in New York State.

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APPENDIX A - PHOSPHORUS GEOCHEMISTRY IN SEPTIC TANKS, SOIL ABSORPTION SYSTEMS AND GROUNDWATER

PHOSPHORUS GEOCHEMISTRY IN SEPTIC TANKS, SOIL ABSORPTION SYSTEMS, AND GROUNDWATER

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DISCLAIMER

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ABSTRACT

Although phosphorus is an essential nutrient for plant growth, excess phosphorus in aquatic ecosystems may result in water quality degradation due to excessive algae growth. Whereas there exists a substantial body of knowledge with respect to phosphorus removal in subsurface wastewater soil absorption systems, there are gaps in understanding and applying this knowledge to actual situations. The objective of this handbook is to document the current understanding of phosphorus geochemistry. Specifically, the handbook details phosphorus chemistry and removal in septic tanks and soil absorption systems (SAS). In addition, the fate of phosphorus in the groundwater below soil absorption systems is addressed. The information in this handbook is designed to provide guidance on phosphorus removal processes in the subsurface to professionals involved in planning, design, construction, management, and regulation of decentralized wastewater management systems.

Wastewater phosphorus is present in various forms, each of which behaves differently in septic tanks, the biomat portion of soil absorption systems, the vadose zone, and the groundwater zone. In order to understand phosphorus removal in these systems and in the subsurface environment, basic phosphorus geochemistry must be understood. Phosphorus chemistry in wastewater treatment systems is governed by physical, chemical and/or biological processes. Mineral precipitation and adsorption mechanisms dominate phosphorus removal in septic tanks, soil adsorption zones, and the subsurface environment.

Phosphorus removal in septic tanks is largely due to particle settling, although some chemical precipitation also occurs. Approximately 20 to 30 % of wastewater phosphorus is removed in septic tanks. Phosphorus removal in SAS is primarily achieved by mineral precipitation. Research suggests that the dominant phosphorus minerals in SAS are iron and aluminum precipitates, the stability of which is influenced by pH, redox conditions, and the chemistry of aluminum and iron. The vadose zone in soil absorption systems retains a variable amount of phosphorus (23 to 99%). The characteristics of the soil, wastewater, and site influence the degree to which phosphate is retained in the vadose zone. The phosphate concentrations that occur in groundwater appear to be strongly affected by attenuation reactions that are focused in the "rapid transformation zone" immediately underlying the SAS infiltration pipes. Further, adsorption processes are important for determining the rate at which phosphorus migrates through groundwater.

Research priorities to further the understanding of phosphorus geochemical processes are presented and consist of:

- Further microscale plume assessment
- Development of standardized methodologies for assessing transport at the microscale
- Behavior at the groundwater-surface water interface and other 'hotspots'
- Site indexing for vulnerability

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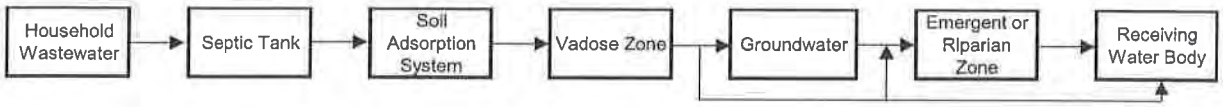
SECTION I: PHOSPHORUS GEOCHEMISTRY

I. OVERVIEW

A. Handbook objectives

There exists a substantial body of knowledge with respect to phosphorus removal in subsurface wastewater soil absorption systems. There are gaps, however, in understanding and applying this knowledge. The objective of this handbook is to document the current understanding of phosphorus geochemical processes. Specifically, the handbook details phosphorus chemistry and removal in septic tanks and soil absorption systems. In addition, the fate of phosphorus in the groundwater below soil absorption systems will be covered. To a more limited extent, the handbook also addresses the sources of phosphorus in wastewater and the ultimate fate, and effects, of phosphorus in receiving water bodies. Thus, the handbook addresses phosphorus removal in the typical on-site wastewater treatment systems composed of a septic tank, drainfield or leachfield, and soil absorption system, and underlain by groundwater (Figure I-1), as well as the receiving water body.

Figure I-1: Components of typical onsite wastewater treatment system



The handbook is designed to provide guidance on phosphorus removal to professionals involved in planning, design, construction, management, and regulation of decentralized wastewater management systems. A companion study is examining phosphorus removal technologies for small flow systems.

B. Handbook outline

The handbook presents information on phosphorus concentrations and forms in wastewater, general phosphorus geochemistry principles, and phosphorus removal and fate in septic tanks, soil absorption systems, vadose zone, groundwater, the riparian zone, and receiving water body. Major conclusions in each section are as follows:

- Phosphorus in Water Bodies (Chapter II)
  - Excess phosphorus in aquatic ecosystems leads to decreased water clarity, low dissolved oxygen, dispersal of toxic compounds, and a shift from macrophyte-dominated ecology characterized by diverse biota to an algae-dominated system with low biodiversity
  - A US EPA survey estimates that 14 to 22% of US water bodies are impaired by nutrients, including phosphorus (Table VII-1)

- Typical phosphorus concentrations in lakes and estuaries vary by trophic status (Table VII-2)
- Phosphorus is typically the controlling nutrient for water quality degradation (algae growth) in fresh waters.

- Phosphorus in Wastewater (Chapter II)
  - Phosphorus in wastewater is estimated to impair 17% of the nation's estuaries and accounts for 5% of total anthropogenic (caused by humans) phosphorus loadings to the environment (Figure II-1)
  - In some watersheds, phosphorus loadings from septic systems specifically can account for 25% or more of total phosphorus loadings (Table II-1).
  - Although ambient water quality standards for phosphorus do exist, septic tanks and soil absorption systems are usually not subject to phosphorus removal requirements unless subject to a groundwater discharge permit
  - Phosphorus in wastewater is present in many physical and chemical forms
  - Although the majority of phosphate in raw wastewater and septic tank effluent is dissolved orthophosphate, regulations are generally based on total phosphorus concentrations
  - Typical total phosphorus concentrations in raw wastewater range from 4 ~ 15 mg-P/l

- Phosphorus Geochemistry (Chapter III)
  - Mineral precipitation and adsorption are the two dominant processes governing phosphorus fate in the environment
  - Mineral precipitation is a three-dimensional process involving the formation of a phosphate mineral
  - Phosphate minerals commonly contain aluminum, iron, and calcium as the co-precipitating cations
  - The stability of phosphate minerals depends on the concentrations of the cations with which phosphate precipitates which, in turn, depend on pH, redox potential and other factors, and dissolved phosphate concentrations can be estimated using solubility products (Table III-2)
  - Adsorption is a two-dimensional process involving the association of phosphate with the surface of a particle
  - Phosphate most commonly adsorbs to the surfaces of aluminum and iron (oxy)hydroxide minerals, as well as some clay minerals
  - Phosphate adsorption to mineral surfaces is very complex and a variety of techniques have been used to describe it. In many instances this can be described by the Freundlich isotherm (Equation 1)
  - pH and redox potential both influence the nature of phosphate mineral precipitation and adsorption in septic tanks, soils, and groundwater

- Phosphorus Removal in Septic Tanks (Chapter IV)
  - Approximately 20 to 30% of total phosphorus in raw wastewater is removed in septic tanks

- Phosphorus removal in septic tanks involves settling of phosphorus-containing particles, as well as some precipitation of the iron mineral vivianite
- Typical concentrations of total phosphorus in the effluent of septic tanks range from 1.2 ~ 16 mg-P/l (Table IV-1)

- Phosphorus Removal in Soil Absorption Systems (Chapter V)
  - The dominant phosphorus removal mechanism in soil absorption systems appears to be mineral precipitation
  - Soils have been observed to be enriched in phosphorus by a factor of 2 to 4 within 1 m of dispersal systems (Figure V-1)
  - Phosphorus minerals in soil absorption systems appear to be both Fe-P and Al-P precipitates
  - Knowing which mineral phase controls phosphate solubility under different environmental conditions should allow prediction of equilibrium phosphate concentrations in the soil porewater and, therefore, phosphorus removal
    - Under oxidizing conditions, the controlling phases can be amorphous hydroxyapatite, beta tricalcium phosphate, strengite or variscite, depending on pH
    - Under reducing conditions, vivianite probably controls phosphate solubility
  - The vadose zone in soil absorption systems retains a variable amount of phosphorus (23 to 99%)
  - The factors that influence phosphorus removal in the vadose zone are:
    - Soil characteristics: fine-grained, noncalcareous soils remove the most phosphorus, while coarse-grained, calcareous soils remove the least amount of phosphorus (Table V-1)
    - Wastewater characteristics: high NH_4^+ concentrations and low alkalinity can enhance removal in noncalcareous soils with gibbsite
    - Site characteristics: high hydraulic loading rates and other conditions that may give rise to rapid lateral movement of water will decrease retention in soil absorption systems and thereby increase transport to surface waters

II. PHOSPHORUS IN WASTEWATER

Introduction

A. Ecological implications of excess phosphorus

Although phosphorus is an essential nutrient for plant growth, excess phosphorus in aquatic ecosystems results in water quality degradation. Of particular concern are the side effects of the algae growth associated with phosphorus enrichment. These include (Vollenweider 1968; Horne and Goldman 1994):

- Decreased water clarity;
- Low dissolved oxygen, which, in turn, can lead to fish kills and poor drinking water quality (due to the presence of reduced substances such as sulfides, Mn(II) and Fe(II));
- Dispersal of toxic compounds (hepatotoxins and neurotoxins) associated with certain types of algae blooms; and
- A shift from a macrophyte-dominated ecology characterized by diverse biota to an algae-dominated system with low biodiversity.

An inventory by the US EPA estimated that 14 to 22% of US water bodies are impaired by nutrients (Table II-1; US EPA 1997). An impaired water body is one that is either partially supporting or not supporting beneficial uses including, but not limited to, drinking water, recreation, and fishing. As much as two-thirds of this nutrient impairment is due to excess phosphorus (Litke 1999).

Table II-1: Summary of nutrient status of streams, lakes, and estuaries in the US

Water Body Type	% Assessed	% Nutrient Impaired	% Impaired by Agricultural Sources	% Impaired by Municipal WWTP(1) Discharge
Streams & Rivers	19	14	25	5
Lakes & Ponds	20	20	19	7
Estuaries	72	22	10	17

Note: (1) WWTP = wastewater treatment plant
Source: US EPA 1997

The process of nutrient enrichment is called eutrophication, and the degree of eutrophication in a given water body can be described by its trophic state. Each trophic state is characterized by a typical range of total phosphorus concentrations (Table II-2). For reference, phosphorus concentrations in streams not impacted by human activities are approximately 0.016 to 0.018 mg/l (Litke 1999), while total phosphorus

concentrations between 0.02 and 0.03 mg-P/l are known to stimulate algae growth (Dillon and Rigler 1974; Schindler 1977).

Table II-2: Typical total phosphorus concentrations (mg/l) by trophic state

	Trophic State			
Aquatic System	**Oligotrophic**	**Mesotrophic**	**Eutrophic**	**Hypertrophic**
Lake	< 0.01	0.01 – 0.03	0.03 - 0.1	> 0.1
River	--	< 0.01	0.01 – 0.05	> 0.05

Source: Newton and Jarrell 1999

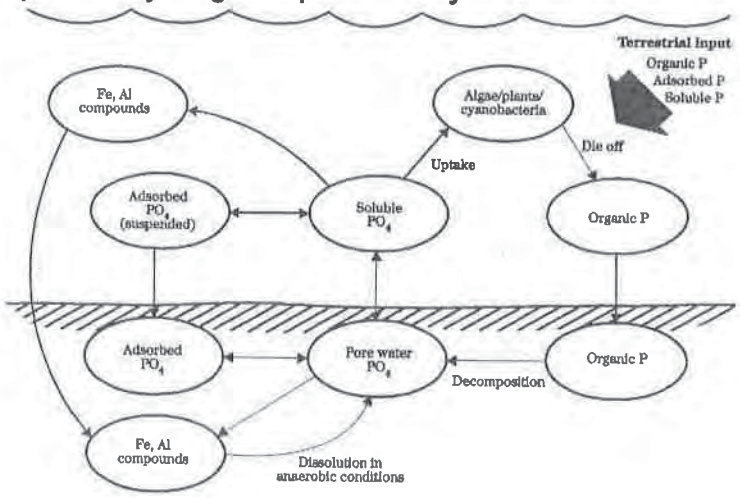
Some aquatic systems are more sensitive to inputs of phosphorus than others. The most sensitive systems are (Newton and Jarrell 1999):

- phytoplankton-dominated small streams
- periphyton-dominated small and large streams and lakes
- mesotrophic lakes
- stratified, deep lakes
- mesotrophic or oligotrophic polymictic lakes
- shallow lakes with high macrophyte coverage

It should be noted that these system types are not mutually exclusive.

The phosphorus in aquatic ecosystems is part of a dynamic cycle that involves numerous environmental compartments (soil, water, and biota) and phosphorus forms (adsorbed, soluble, and organic), as shown in Figure II-1. Thus, the phosphorus concentrations listed in Table II-2 are a small fraction of total phosphorus in a lake or estuary. Moreover, it may sometimes be difficult to relate phosphorus concentrations in water to a given trophic state, because of rapid uptake of phosphorus by algae.

Figure II-1: Phosphorus Cycling in Aquatic Ecosystems

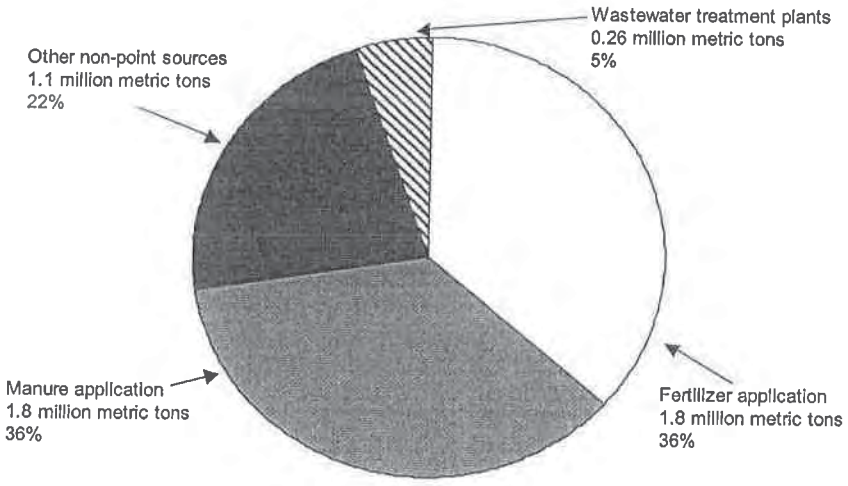


Wastewater phosphorus is present in various forms, each of which behaves differently in septic tanks, soil absorption systems, the vadose zone, groundwater, and the riparian zone. The phosphorus forms are identified in this section, along with the standard analytical methods used to quantify each one. In addition, typical phosphorus concentrations in raw municipal wastewater and regulatory standards applicable to on-site wastewater systems are discussed.

B. Wastewater as an important source of phosphorus

Wastewater treatment plants impair 17, 7, and 5% of estuaries, lakes and ponds, and streams and rivers, respectively. As shown in Figure II-2, the most recent nationwide loading estimates indicate that wastewater treatment plant discharges account for 5% of anthropogenic (caused by humans) phosphorus loadings (Figure II-2; Gianessi and Peskin 1984).

Figure II-2: Anthropogenic sources of phosphorus to the environment



Source: Gianessi and Peskin 1984

There are no national data available for phosphorus contributions from on-site wastewater treatment systems to the environment. However, studies performed as part of total maximum daily load (TMDL) development and lake water quality suggest that septic systems can contribute 4 to 55% of total phosphorus to lakes.

Table II-3: Contributions of septic tanks to phosphorus loads determined during TMDL development

Water Body	Water Body Type	% Total Phosphorus Load from Septic Tanks	Reference
Cottonwood Lake, SD	Freshwater lake	4	SD DENR 2003
Lake Carlton, FL	Freshwater lake	14	FL DEP 2003
Pineview Reservoir, UT	Reservoir	20	UT DEQ 2003
Pend Oreille Lake, ID	Freshwater lake	25	ID WQC 2003
Ontario Lakes	Freshwater lake	55	Dillon *et al.* 1986
Otsego Lake	Freshwater lake	20	Albright, 1996

C. Chemical forms

Phosphorus forms can be categorized on the basis of physical or chemical characteristics. Physically, phosphorus is divided into two fractions (Jenkins and Hermanowicz 1991):

1. Dissolved phosphorus that passes through a filter, usually 0.2 or 0.45 µm average pore size, and
2. Particulate phosphorus that is associated with particles retained on the filter membrane during filtration.

For many years, the filtration standard was the Millipore filter with a 0.45 µm average pore size. However, some laboratories now use 0.2 µm pore size, in filtration with significant differences in phosphorus loading noted with respect to filtration through a 0.45 µm pore size.

Dissolved phosphorus is sometimes referred to as soluble phosphorus, while particulate phosphorus is sometimes called suspended phosphorus. The sum of dissolved and particulate is equal to total phosphorus. Note that the definition of dissolved phosphorus is an operational one because it is simply equal to the phosphorus that passes through a filter of a given pore size (*i.e.*, 0.2 or 0.45 µm in most cases). This operationally defined dissolved phosphorus may include very small phosphorus-bearing particles and thus this phosphorus is not truly dissolved (*i.e.*, not surrounded solely by

water molecules). Particulate phosphorus is comprised of organic phosphorus, phosphates adsorbed to the surfaces of iron oxide and other minerals, as well as a number of discrete phosphate minerals. A larger portion of particulate phosphorus will pass through a 0.45 µm filter than a 0.2 µm filter and thereby be assigned to the dissolved phosphorus burden. These differences can be large, requiring consideration when interpreting analytical data.

Chemically, phosphorus in wastewater can be categorized as orthophosphate, condensed phosphates, or organic phosphorus:

1. Orthophosphate (o-phosphate) includes H_3PO_4, $H_2PO_4^-$, HPO_4^{2-}, and PO_4^{3-}. In waters with a pH close to 7, $H_2PO_4^-$ and HPO_4^{2-} are the predominant orthophosphate forms (Figure II-3 and Table II-4; Stumm and Morgan 1981). These forms are also sometimes referred to as inorganic phosphorus, reactive phosphorus or simply phosphate. Table II-4 and Figure II-3 merely represent the distribution of the , the aforementioned orthophosphate species and do not consider other soluble phosphorus species such as the many soluble metal-phosphate complexes are present in wastewater and natural water.
2. Condensed phosphates include various polyphosphate forms such as pyrophosphate ($P_2O_7^{4-}$) and $P_3O_{10}^{5-}$ (Crites and Tchobanoglous 1998). Derived primarily from laundry detergents and other cleansers, condensed phosphates convert slowly to orthophosphate.
3. Organic phosphorus includes phosphorus incorporated with organic compounds, such as sugars, phospholipids, and nucleotides (Jenkins and Hermanowicz 1991).
4. The phosphorus-bearing species listed above can complex or associate with dissolved cations and organic species present in wastewater, soil solutions or groundwater. The formation of these complexes will further enhance the solubility of o-phosphate or limit adsorption reactions.

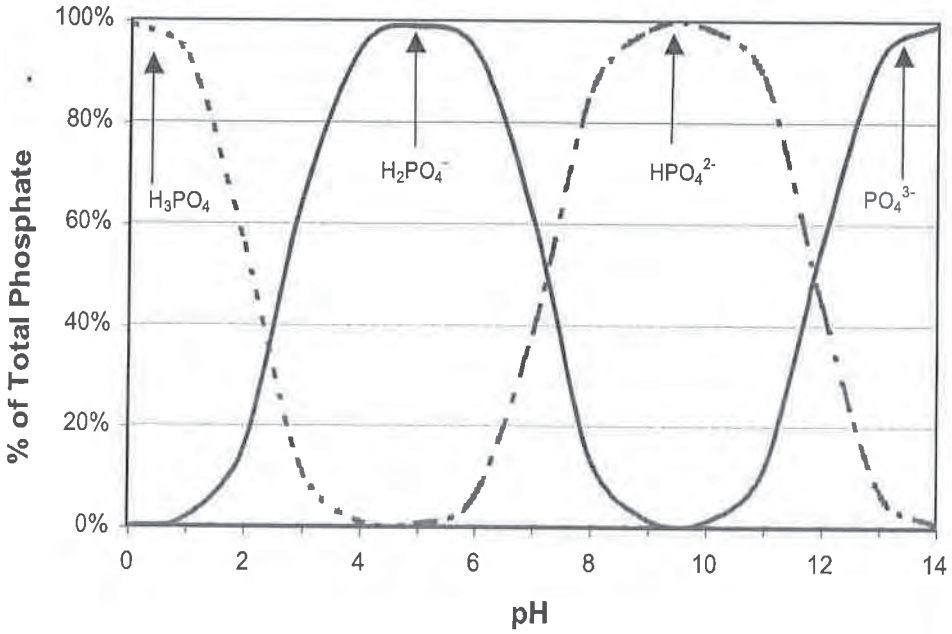
Table II-4: Equilibrium constants describing acid dissociation chemistry of orthophosphate species

Reaction	pKa[1]
$H_3PO_4 = H_2PO_4^- + H^+$	2.1 to 2.2
$H_2PO_4^- = HPO_4^{2-} + H^+$	7.2
$HPO_4^{2-} = PO_4^{3-} + H^+$	11.9 to 12.4

Note: (1) The pKa is equal to –log(K) for the reaction.
Source: Smith and Martell 1976; Stumm and Morgan 1981

The chemical and physical classifications overlap. That is, orthophosphate can be dissolved or can be particulate. Similarly, organic phosphorus can be dissolved or particulate.

Figure II-3: Equilibrium species distribution as a function of pH for the orthophosphate system.



Note: (1) The pKa is equal to –log(K) for the reaction, where K is the equilibrium constant. Calculated using equilibrium constants (pKa = 2.1, 7.2, and 11.9) in Table II-4.

Orthophosphate and, to a lesser degree, polyphosphates are available to algae for growth. Particulate phosphorus may also be available for growth because algae release alkaline phosphatase, an enzyme capable of cleaving orthophosphate from the organic particles (Horne and Goldman 1994). Regulatory standards imposed on wastewater effluent, or water quality criteria set for surface water bodies, are usually based on total phosphorus concentrations as described in Section II.E.

D. Analytical techniques

Phosphorus analysis typically involves colorimetric determination of orthophosphate. If chemical forms of phosphorus other than orthophosphate are desired, they are first converted to orthophosphate and then determined colorimetrically (APHA, 1999).

Colorimetric analysis is most commonly conducted by the ascorbic acid method (Standard Method 4300; APHA 1999) that is suitable for phosphorus concentrations in the range of 0.01 to 6 mg/l. Conversion of condensed phosphates and organic phosphorus to orthophosphate is performed by hydrolysis and oxidation, respectively. Using these analytical techniques phosphorus can be divided into reactive, acid-hydrolyzable, and total fractions as illustrated in Table II-5. These fractions approximately correspond to the chemical forms of phosphorus. There are other procedures targeted at providing additional information, such as the bioavailability of

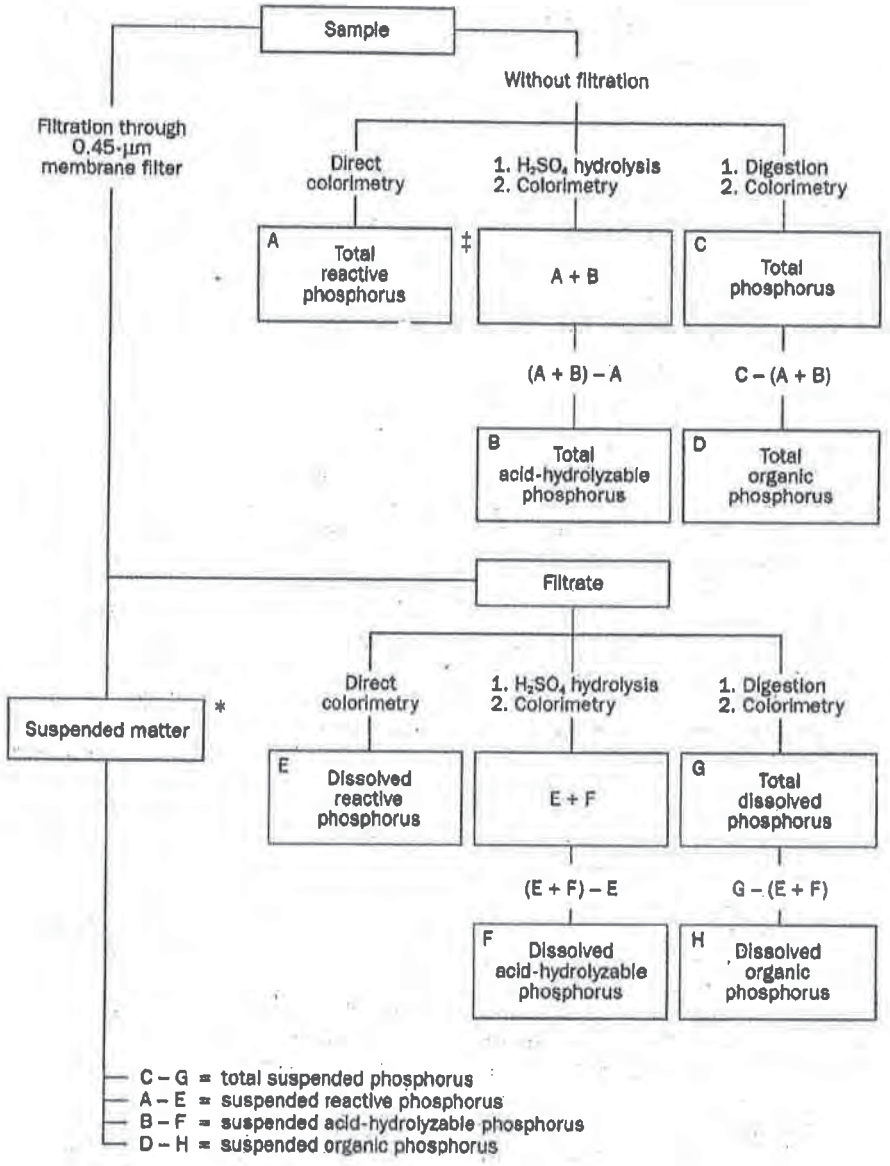
organophosphorus species (*e.g.* Pant *et al.* 2002). These latter methods are not routinely available in commercial laboratories.

Table II-5: Summary of analytical techniques for phosphorus measurement

Analytical Phosphorus Fraction	Summary of Method	Actual Chemical Form Measured
Reactive phosphorus	Measure phosphate colorimetrically in unhydrolyzed, unoxidized sample	Mostly orthophosphate, some condensed phosphate
Acid-hydrolyzable phosphorus	Boil sample in weak sulfuric acid (H_2SO_4), measure colorimetrically	Orthophosphate, condensed phosphates, some organic phosphorus
Total phosphorus	Oxidize sample with persulfate or another technique (known as "digestion") and measure colorimetrically	Orthophosphate, condensed phosphates, organic phosphorus

Figure II-4 shows how the condensed phosphate and organic phosphorus fractions can be determined by difference from the analytical fraction of Table II-5. Furthermore, each phosphorus fraction can be measured in filtered (*i.e.*, for dissolved phosphorus fractions) or unfiltered (for total phosphorus fractions) samples. The suspended phosphorus fractions are determined by difference from the total phosphorus fractions and dissolved phosphorus fractions as shown in Figure II-4.

Figure II-4: Steps for analysis of phosphorus fractions



Source: APHA 1999

E. Concentrations in raw wastewater

Phosphorus concentrations are generally reported as total phosphorus concentrations. For analyses of total phosphorus, the concentrations are reported in units of "mg-P/L". These analyses would include all forms of phosphorus species present in the water. For analyses of reactive phosphorus (or o-phosphate), the concentrations are reported in units of "mg/l PO_4-P", which would correspond to the mg of the element phosphorus present as an orthophosphate species *(i.e.* $H_3PO_4^0$, $H_2PO_4^-$, HPO_4^{2-}, PO_4^{3-} and any other o-PO_4 complexes) in each liter of solution. Thus, the concentration of 1 mg/l PO_4-P corresponds to: 1 mg-P/L (present as orthophosphate), 0.032 mM P as phosphate or simply 0.032 mM PO_4 (phosphorus has a molecular weight of 31 mg/mmol), and 3.1 mg PO_4 (PO_4 has a molecular weight of 95 mg/mmol).

The concentration of total phosphorus in raw municipal wastewater ranges from 4 to 15 mg-P/l in areas where phosphorus-containing detergents are regulated (Table II-6). Total phosphorus in wastewater can be as high as 50 mg-P/l where detergent phosphate is not regulated (Veenstra *et al* 1997). Before the use of phosphorus detergents, the concentration of phosphorus in raw wastewater was approximately 3 mg-P/l (Hetling and Carcich 1972). By 1970, the average phosphorus concentration in raw wastewater increased to 11 mg-P/l, approximately 6 mg/l of which was derived from phosphorus detergents. As of 1999, 27 states had partial or full bans on phosphorus in detergents (Table II-7; Litke 1999). Phosphorus bans typically involve setting a phosphorus limit for detergents, usually 0.5 to 8.7% phosphorus by weight (Litke 1999). In 1994, the detergent industry voluntarily ended the manufacture of phosphate detergent for household laundry (Litke 1999). However, phosphorus remains a significant component of automatic dishwashing detergent.

Table II-6: Phosphorus concentrations in raw wastewater

Reported Total Phosphorus (mg-P/l)	Reported Dissolved Phosphorus (mg-P/l)	Reference
4 to 15 (7 is typical)	--	Crites and Tchobanoglous 1998
6 to 8	5 to 7	Jenkins and Hermanowicz 1991
6 to 12	--	US EPA 2002
7	5	WEF 1992

Approximately 50% of phosphorus in raw wastewater is orthophosphate, 40% polyphosphates, and 10% organic phosphorus (Tchobanoglous and Schroeder 1987). Organic phosphorus, especially particulate organic phosphorus, is more predominant in industrial wastes and wastewater sludges (Crites and Tchobanoglous 1998).

Estimated phosphorus loads from household sources average 1.0 to 1.3 kg/capita/year (Jenkins and Hermanowicz 1991; Crites and Tchobanoglous 1998), broken down as follows:

- Human waste: 0.6 kg/capita/year
- Laundry detergents (with no phosphorus limitation): 0.3 kg/capita/year
- Other household detergents and cleaners: 0.1 kg/capita/year

Industrial and commercial sources of phosphorus are highly variable.

Table II-7: States with phosphorus detergent bans

Years	Detergent Ban	Partial Ban
1970-79	Connecticut Florida Indiana Maine Michigan Minnesota New York Vermont Wisconsin	Illinois
1980-89	Maryland North Carolina Virginia	Idaho Montana Ohio
1990-98	Arkansas Georgia Massachusetts New Hampshire Oregon Pennsylvania Rhode Island South Carolina Washington	Missouri Texas

Source: Litke 1999

F. Regulatory standards

The goal of regulating phosphorus in wastewater is to protect the water quality of the ambient waters that receive wastewater flows. Protection of ambient water quality from excessive phosphorus is accomplished with a two-pronged approach.

First, ambient water quality standards (WQS) are established for surface waters. These WQS are set by states, tribes, or territories as mandated by the 1977 Clean Water Act and may be narrative or numeric. New Jersey's Water Quality Standard provides an example of a narrative nutrient standard (EPA 2003):

> "Except as due to natural conditions, nutrients shall not be allowed in concentrations that cause objectionable algal densities, nuisance aquatic vegetation, abnormal diurnal fluctuations in dissolved oxygen or pH, changes to the composition of aquatic ecosystems, or otherwise render the waters unsuitable for the designated uses." (January 22, 2002)

If numeric criteria are used instead, such criteria are established for a given designated use, water body type or, in some cases, statewide for a specific parameter. A recent US EPA survey of state, tribe, and territory nutrient criteria (EPA 2003) showed that all states have established narrative (i.e. qualitative) nutrient criteria, while two-thirds have adopted numeric criteria as well. Most numeric criteria have been adopted for freshwater lakes, with fewer adopted for estuarine and marine waters, or for rivers and streams. Existing state numeric phosphorus criteria range from 0.001 mg-P/l (for marine and estuarine waters in Alaska) to 0.1 mg-P/l (*e.g.*, for upland streams in Vermont). All numeric criteria are based on total phosphorus concentrations.

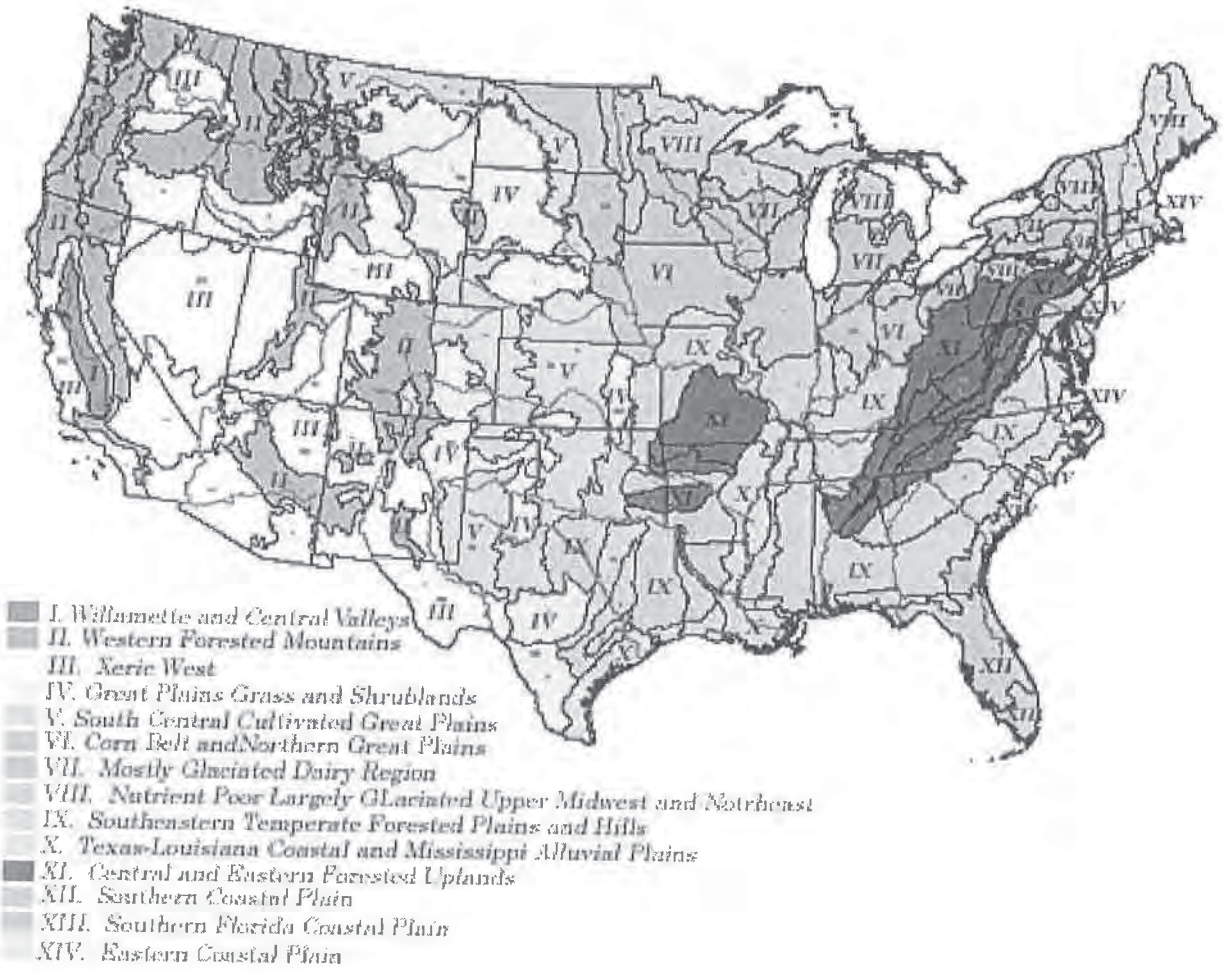
The US EPA is publishing recommended water quality criteria to provide guidance for states and tribes in adoption of regional-specific and locally appropriate water quality criteria for nutrients in lakes, reservoirs, rivers, streams, and wetlands. The current phosphorus criteria established by EPA are summarized in Table II-8. States and tribes are expected to adopt or revise the EPA nutrient criteria into water quality standards by 2004.

Table II-8: US EPA phosphorus criteria by ecoregion

	Total Phosphorus Criteria (µg/l)		
Ecoregion	**Lakes & Reservoirs**	**Rivers & Streams**	**Wetlands[1]**
I	55	47	--
II	8.8	10	--
III	20	22	--
IV	20	23	--
V	33	67	--
VI	38	76	--
VII	15	33	--
VIII	8.0	10	--
IX	20	37	--
X	60	128	--
XI	8.0	10	--
XII	10	40	--
XIII	18	15	10
XIV	8.0	31	

Note: (1) Wetland criteria were developed only for Ecoregion XIII (*i.e.*, the southern Florida coastal plain).
Source: EPA 2003

Figure II-5: Ecoregions used for EPA phosphorus criteria development



Source: EPA 2003

The second part of the two-pronged approach for protecting water bodies from excessive phosphorus enrichment is to set phosphorus concentration limits on effluent discharge. Most commonly, these permits are issued under the National Pollutant Discharge Elimination System (NPDES). Phosphorus concentration limits are usually determined by estimating the concentration required to meet the WQS of the receiving water body and are set by the state, tribe, or territory. Prior to 1973, there were few centralized municipal wastewater treatment facilities with phosphorus concentration limits (Litke 1999). By 1997, there were over 1,100 facilities with phosphorus concentration limits, representing 7% of all municipal treatment facilities and 17% of total wastewater flows (Litke 1999). Phosphorus limits on wastewater are typically set between 1 and 1.5 mg-P/l, with some as low as 0.01 mg-P/l.

Septic tank effluent is not subject to NPDES permit requirements because it is discharged in the subsurface environment and enters the groundwater system. Subsurface discharge systems are regulated in two ways. First, small flows below a state-defined cutoff design flow, are regulated by the onsite codes of state Departments of Health or other agencies involved in permitting septic system construction and repair. No onsite codes dictate phosphorus requirements for septic systems yet, most likely because the technologies needed to achieve low phosphorus concentrations in septic tank effluent are not available or it has been assumed that the site soils are capable of removing phosphorus. Second, subsurface discharge systems with high design flows require groundwater discharge permits. The design flow at which groundwater permits become required varies by state, as illustrated Table II-9, which contains a few states for illustration.

Table II-9: Design flow at which groundwater permits are required

State	Design Flow (liters per day)
Arizona	11,350 lpd (3,000 gallons per day)
Connecticut	18,925 lpd (5,000 gpd)
Florida	37,850 lpd (10,000 gpd) for domestic septic system
Massachusetts	37,850 lpd (10,000 gpd)
New Jersey	11,350 lpd (3,000 gpd)
Washington	13,250 lpd (3,500 gpd)

Phosphorus effluent limits may be part of a groundwater discharge permit for cluster systems.

Phosphorus loadings from septic tanks also may be regulated as a non-point source during development of a total maximum daily load (TMDL) for a given water body. A TMDL, as established under section 303 of the Clean Water Act, is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. For example, a TMDL developed for Lake Carlton, Florida, requires 41% reduction in non-point phosphorus sources, of which septic systems accounted for 14% (FL DEP 2003).

III. PHOSPHORUS GEOCHEMISTRY

In order to understand phosphorus removal in septic tanks, soil absorption systems, and the subsurface environment (consisting of the vadose zone, groundwater, and riparian zones), basic phosphorus geochemistry must be understood. Phosphorus chemistry in wastewater treatment systems is governed predominantly by physical, chemical and/or biological processes (US EPA 2002). Centralized wastewater treatments facilities, rather than onsite systems, often exploit the biological processes for phosphorus removal (*e.g.*, as part of Sequencing Batch Reactor, A/O – Anaerobic/Oxic (containing oxygen) – and Modified Bardenpho processes; US EPA 1987) and chemical precipitation techniques by addition of iron or aluminum salts. Biological processes are less relevant to a discussion of removal in septic systems. Rather, mineral precipitation and soil adsorption mechanisms dominate phosphorus removal in septic tanks, soil infiltration zones, and the subsurface environment. Both of these mechanisms, the former a chemical process and the latter a combination of physical and chemical processes, will be discussed here. Note that it is common practice to lump the terms precipitation and adsorption together as "sorption", particularly if it is unclear whether precipitation or adsorption is taking place (Harris 2002). However, each will be discussed separately. An emphasis will be placed on *phosphate* precipitation and adsorption because this form usually accounts for the majority of phosphorus in raw municipal wastewater (Tchobanoglous and Schroeder 1985).

A. Precipitation

Precipitation involves "the formation of a three-dimensional solid phase arrangement of molecules from the solution phase" (Doner and Grossl 2002). This is distinct from adsorption, which involves the formation of a two-dimensional structure (*i.e.*, PO_4^{3-} on the surface of a mineral rather than within the mineral itself). The distinction between these two processes is important because surface adsorption is usually limited by a fixed availability of sorption sites in a particular soil that eventually will be used up if sewage loading occurs over long periods. Precipitation reactions, on the other hand, are potentially sustainable provided that the supply of cations necessary to complete the reaction is also sustainable.

The phosphate minerals potentially formed in septic tanks and soil absorption systems generally contain aluminum, iron and/or calcium (Ptacek *et al.* 1994; Harris 2002). Table III-1 presents typical septic tank effluent concentrations for these species which may participate in forming phosphate minerals.

Table III-1: Typical Concentrations of Aluminum, Iron, and Calcium in Septic Tank Effluent

Element	Typical Concentration (mg/l)
Aluminum	< 0.1
Iron	0.5
Calcium	75

The phosphate minerals include:

○ Beta tricalcium phosphate	$Ca_3(PO_4)_2$
○ Hydroxyapatite	$Ca_5(OH)(PO_4)_3$
○ Fluorapatite	$Ca_5(PO_4)_3F$
○ Strengite	$FePO_4 \cdot 2H_2O$
○ Struvite	$NH_4MgPO_4 \cdot 6H_2O$
○ Variscite	$AlPO_4 \cdot 2H_2O$
○ Vivianite	$Fe_3(PO_4)_2 \cdot 8H_2O$
○ Wavellite	$Al_3(OH)_3(PO_4)_2 \cdot 8H_2O$

Under reducing conditions vivianite solubility probably controls the soluble phosphate concentration (Nriagu *et al.* 1984; Robertson 1998). Under oxidizing conditions the controlling phase can be amorphous hydroxyapatite (Jenkins *et al.* 1971), beta tricalcium phosphate (Moore and Reddy 1994), strengite or variscite (Robertson 1998) depending on the pH (Figure III-1). Nriagu and Reddy (1994) suggest that several other PO_4 minerals are also stable in the vadose zone and groundwater environments.

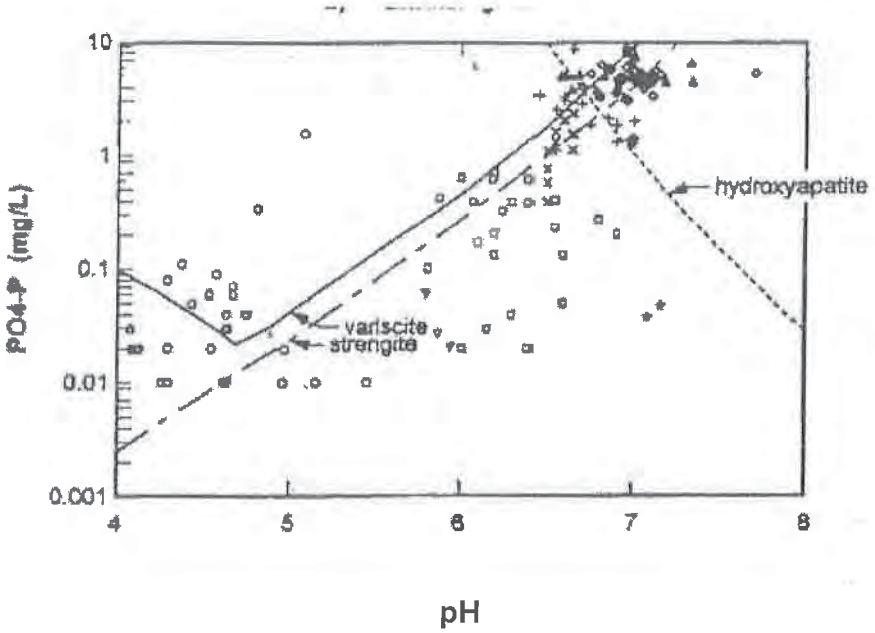
The formation of these mineral phases is described by a solubility product. Solubility products (shortened to K_{sp}) for the important phosphate minerals are shown in Table III-2. Note that phosphate forms minerals with both oxidized iron (Fe^{3+}) and reduced iron (Fe^{2+}), and thus iron-phosphate minerals will behave differently under different redox conditions. Robertston *et al.* (1998) presented the soluble phosphate concentrations that would be expected to be in equilibrium with these mineral forms under oxidizing conditions along with field data as shown in Figure III-1.

Table III-2: Range of solubility products reported for common phosphate minerals

Mineral Name	Dissolution Equation	Solubility Product (25 °C)	Reference(s)
Beta tricalcium phosphate	β-$Ca_3(PO_4)_2$= 3 Ca^{2+} + 2 PO_4^{3-}	10^{-29}	Schweingruber 1984
Hydroxyapatite	$Ca_5(OH)(PO_4)_3$ = 5 Ca^{2+} + 3 PO_4^{3} + OH^-	10^{-40} to 10^{-57}	Baker *et al.* 1998; as cited in Stumm and Morgan 1981
Fluorapatite	$Ca_5(PO_4)_3F$ = 5 Ca^{2+} + 3 PO_4^{3-} + F^-	10^{-59}	as cited in Stumm and Morgan 1981
Strengite	$FePO_4 \cdot 2H_2O$ = Fe^{3+} + PO_4^{3-} + 2 H_2O	10^{-26}	as cited in Stumm and Morgan 1981
Struvite	$NH_4MgPO_4 \cdot 6H_2O$ = NH_4^+ + Mg^{2+} + PO_4^{3-} + 6 H_2O	$10^{-13.1}$ to $10^{-13.3}$	Taylor *et al.* 1963; Burns and Finlayson 1982
Variscite	$AlPO_4 \cdot 2H_2O$ = Al^{3+} + PO_4^{3-} + 2 H_2O	10^{-21}	as cited in Stumm and Morgan 1981
Vivianite	$Fe_3(PO_4)_2 \cdot 8H_2O$ = 3 Fe^{2+} + 2 PO_4^{3-} + 8 H_2O	10^{-36}	Parkhurst *et al.* 1980

Figure III-1: Phosphate concentrations in proximal plume core zones compared to solubility curves for hydroxyapatite, strengite, variscite and vivianite for oxidizing plumes

Hydroxyapatite curve calculated using Cambridge plume water composition (Ca2+ = 74 mg/L); vivianite curve calculated using Delawana reducing plume water composition (Fe = 10 mg/L); strengite curve calculated using Cambridge plume water composition assuming equilibrium with amorphous Fe(OH)3; variscite curve calculated using Muskoka plume water composition assuming equilibrium with gibbsite at pH > 4.9 and jurbanite at pH < 4.9.



Source: Robertston *et al.* (1998)

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SOLUBILITY PRODUCTS

The solubility product is the product of the dissolved components that comprise a mineral - each raised to their respective stoichiometric coefficient - assuming the mineral is at equilibrium with the aqueous solution. For example, the precipitation and dissolution of tricalcium phosphate can be described by:

$$Ca_3(PO_4)_{2(s)} = 3\ Ca^{2+} + 2\ PO_4^{3-}$$

At chemical equilibrium for an ideal solution, the solubility product for tricalcium phosphate formation is:

$$K_{sp} = [Ca^{2+}]^3\ [PO_4^{3-}]^2 = 10^{-29}\ M^5$$

The value of the solubility product can generally be obtained from chemical textbooks (*e.g.*, Stumm and Morgan 1981; Appello and Postma 1993) or from compilations of chemical equilibrium constants (*e.g.*, Martell and Smith 1975) and will depend on the temperature, pressure, and ionic strength of the solution. It should be noted that while PO_4^{3-} is the chemical species often used in the solubility product equation, most of the phosphate in the environment will actually be $H_2PO_4^-$ or HPO_4^{2-}. The solution pH must be known so that the concentration of PO_4^{3-} can be calculated from measured total soluble phosphate concentrations (see Figure II-3).

The ion activity product (IAP) is useful for determining whether phosphate is over- or under-saturated with respect to a given mineral. For example, to determine whether wastewater from a septic tank was under-saturated or over-saturated with respect to tricalcium phosphate, the IAP would be calculated as follows:

$$IAP = [Ca^{2+}]^3\ [PO_4^{3-}]^2$$

If the calculated IAP is less than the known K_{sp}, then the wastewater effluent is under-saturated with respect to tricalcium phosphate. This suggests that more tricalcium phosphate could dissolve and/or that there is another less soluble mineral phase controlling calcium and/or phosphate concentrations in solution. Conversely, if the IAP is greater than the known K_{sp}, then more tricalcium phosphate should precipitate out because the solution is oversaturated. The saturation index = log (IAP/K_{sp}) is another way to assess whether a solution is over or under-saturated with respect to a particular mineral. A negative value for the saturation index indicates undersaturation and a positive value indicates oversaturation. Given the imprecision of IAP calculations, log (IAP/Ksp) values that lie in the range -0.5 to + 0.5 are indicative of equilibrium conditions.

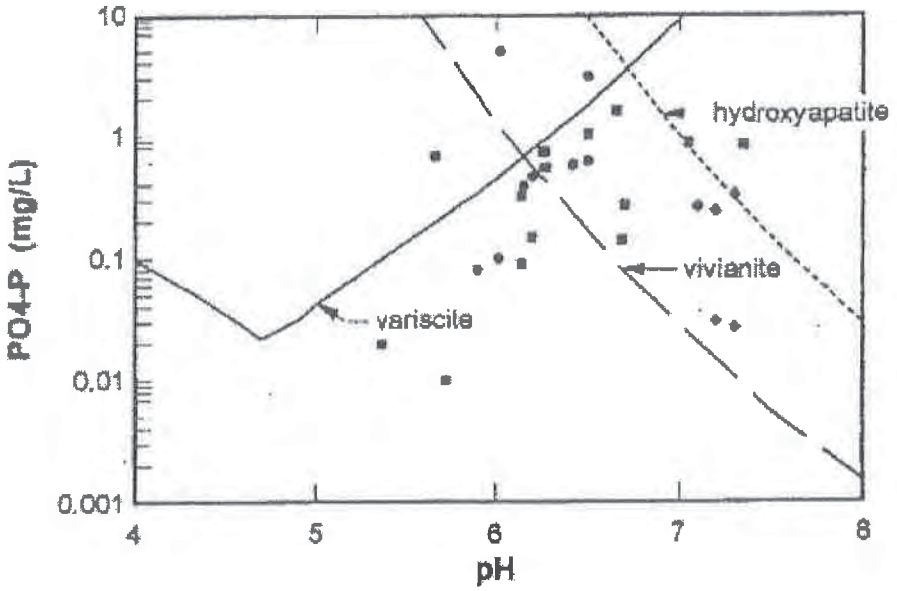
For more information refer to Snoeyink and Jenkins (1980), Stumm and Morgan (1981), Tchobanoglous and Schroeder (1987).

Solubility products are useful for determining the mineral phase that potentially controls the soluble phosphate concentration in septic tanks, soils, and groundwater. The controlling mineral phase is generally the least soluble mineral phase present, that is, the one that will determine the concentration of phosphate in solution. The controlling phase can be assessed by calculating the equilibrium phosphate concentration given the K_{sp} of the mineral, or by inspection of a solubility diagram. The theoretical determination of the controlling phase for phosphate is sensitive to the K_{sp} used, as well as the concentration of important cations, specifically aluminum, calcium, and iron. K_{sp} calculations assume equilibrium conditions exist between the aqueous species and all of the mineral phases considered. However, there are known kinetic limitations to the formation of well-crystalline hydroxyapatite. Freshly precipitated calcium phosphate can

undergo transformation through several metastable precursor phases, from octacalcium phosphate to amorphous calcium phosphate, to calcium-deficient hydroxyapatite and finally to stoichiometric hydroxyapatite (Johnsson and Nancollas, 1992; Liu *et al.* 2001). The precursor phases may be more soluble, but often they precipitate first because of their faster rates of formation. The latter phase is the thermodynamically stable phase and least soluble. The actual pathways will vary depending on inhibitory effects, the presence of organic matter, biological activity, and pH and solution composition. A number of septic system plumes exhibit hydroxyapatite supersaturation (Robertson *et al.* 1998), presumably as a result of the slow rate of mineral formation.

Figure III-2: Phosphate concentrations in proximal plume core zones compared to solubility curves for hydroxyapatite, strengite, variscite and vivianite for reducing plumes

Hydroxyapatite curve calculated using Cambridge plume water composition (Ca2+ = 74 mg/L); vivianite curve calculated using Delawana reducing plume water composition (Fe = 10 mg/L); strengite curve calculated using Cambridge plume water composition assuming equilibrium with amorphous Fe(OH)3; variscite curve calculated using Muskoka plume water composition assuming equilibrium with gibbsite at pH > 4.9 and jurbanite at pH < 4.9.



Source: Robertston *et al.* (1998)

Iron in the environment exists predominantly in either the reduced ferrous [Fe(II)] or oxidized ferric [Fe(III)] form. Ferrous iron is relatively soluble in water and is therefore quite mobile. Ferric iron, on the other hand, tends to form insoluble Fe(III) oxyhydroxides and is therefore relatively immobile. The iron cycle in most environments involves alternate reduction (mobilization) of ferric iron followed by oxidation (immobilization) of ferrous iron. Most of these reactions are microbially catalyzed under natural conditions.

In addition to depending on the pH and the concentration of the elements with which phosphate forms minerals, the mineral phase controlling phosphate concentrations in septic tanks and soil absorption systems will vary with the redox status of the soil. Iron is a redox active element, existing as Fe(III) at high redox potentials but Fe(II) at low redox potentials. The former precipitates in the form of the phosphate mineral strengite, while the latter forms vivianite. Whereas iron-phosphate minerals are sensitive to changes in redox conditions, aluminum-phosphate and calcium-phosphate minerals are more stable under a wider range of redox conditions (Smith *et al.* 2001). Robertston *et al.* (1998) presented the soluble phosphate concentrations that would be expected to be in equilibrium with these mineral forms under reducing conditions along with field data as shown in Figure III-2.

TERMINOLOGY

pe - pe is the negative logarithm of electron activity, which is a theoretical representation of oxidation/reduction potential. A positive pe represents oxidizing conditions, and a negative pe represents reducing conditions.
Redox - a reversible chemical reaction in which one reaction is an oxidation and the reverse is a reduction

In general, because aluminum and iron are common constituents of phosphate minerals, the concentrations of Al^{3+}, Ca^{2+}, Fe^{3+} (or Fe^{2+}) specifically, not just total aluminum, calcium or iron, must be known if the concentration of phosphate is to be predicted. In Figures III-3 and III-4, these concentrations were predicted with the equilibrium speciation modeling program MINEQL$^+$. Many other equilibrium speciation modeling programs, such as the public domain models PHREEQC and Visual MINTEQ and the commercial JESS, can also accomplish this task. Information on these chemical equilibrium speciation programs can be found on the web as follows:

- JESS: http://jess.murdoch.edu.au/jess/jess_home.htm
- MINEQL$^+$: http://www.mineql.com/mineql.html
- PHREEQC: http://wwwbrr.cr.usgs.gov/projects/GWC_coupled/phreeqc/
- Visual MINTEQ: http://www.lwr.kth.se/english/OurSoftware/Vminteq/index.htm

These modeling programs use information on the solubility products of the aluminum-, calcium-, and iron-containing minerals to estimate the Al^{3+}, Ca^{2+}, and Fe^{3+} (or Fe^{2+}) activity in soil solutions. Whether Fe^{3+} or Fe^{2+} will be present will depend on the redox status of the water, with Fe^{2+} predominant at pe $\leq$ 0 (Stumm and Morgan 1981; see definition of pe in "Redox Concepts").

The most common phases that control Al^{3+} in the shallow subsurface environment are aluminum hydroxides (*e.g.*, gibbsite) and aluminum hydroxysulfate solids (potentially jurbanite) (Table III-3). Thus, knowing the pH and, in the case of jurbanite, the concentration of SO_4^{2-}, would allow prediction of the concentration of Al^{3+} in solution. This is demonstrated in Figure III-3, which shows that, assuming the concentration of SO_4^{2-} is 30 mg/l, gibbsite controls the concentration of Al^{3+} for pH > 5 to 6. Note that

Al^{3+} concentrations would increase from as high as ~3 x 10^{-6} mg/l at pH 7 (when gibbsite is controlling Al solubility) to as much as ~90 mg/l at pH 4 (when jurbanite is controlling Al solubility). It should be noted that at pH 7, the total dissolved concentration of Al will be higher than the concentration of Al^{3+}, whereas at pH 4 most dissolved Al will be present as Al^{3+}. The predicted equilibrium concentration of Al^{3+} in the soil solution is strongly dependent on the Al solids assumed to be controlling the aqueous concentrations and the values of the respective solubility products.

A similar exercise can be performed for calcium and iron. In the case of calcium, calcite usually controls Ca^{2+} concentrations in solution. For some soils, in particular, those found in evaporative settings, gypsum also may control the concentration of Ca^{2+} in solution. In the case of iron, ferrihydrite and goethite control the concentration of Fe^{3+} under oxic conditions (Figure III-4a), while siderite controls the concentration of Fe^{2+} under reducing conditions (Figure III-4b) (Zanini *et al.* 1998, Ptacek, 1998).

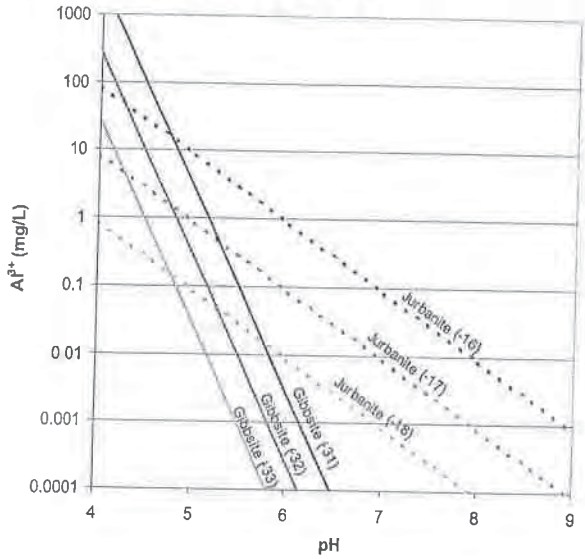
Table III-3: Common aluminum, calcium, and iron mineral phases

Mineral Name	Equation	Reported Range of K_{SP}
Aluminum Minerals		
Gibbsite	$Al(OH)_3 = Al^{3+} + 3\ OH^-$	10^{-31} to 10^{-33}
Jurbanite	$AlOHSO_4 * 5H_2O = Al^{3+} + OH^- + SO_4^{2}$	10^{-17}
Calcium Minerals		
Calcite	$CaCO_3 = Ca^{2+} + CO_3^{2-}$	10^{-10}
Iron (Fe^{3+}) Minerals		
Amorphous Ferric Hydroxide	$Fe(OH)_3 = Fe^{3+} = 3OH^-$	10^{-37} to 10^{-39}
Goethite	α-$FeOOH + H_2O = Fe^{3+} + 3OH^- + H_2O$	10^{-41} to 10^{-42}
Hematite	$Fe_2O_3 + 3\ H^+ = 2\ Fe^{3+} + 3\ OH^-$	10^{-43}
Iron (Fe2+) Minerals		
Siderite	$FeCO_3 = Fe^{2+} + CO_3^{2-}$	$10^{-8.4}$

Source: as cited in Stumm and Morgan 1981

Figure III-3: Equilibrium concentration of Al^{3+} (not total soluble Al) as a function of pH in the presence of gibbsite and jurbanite and with $[SO_4^{2-}]$ = 30 mg/l.

Numbers in parentheses are the log of the K_{sp} for gibbsite or jurbanite dissolution.

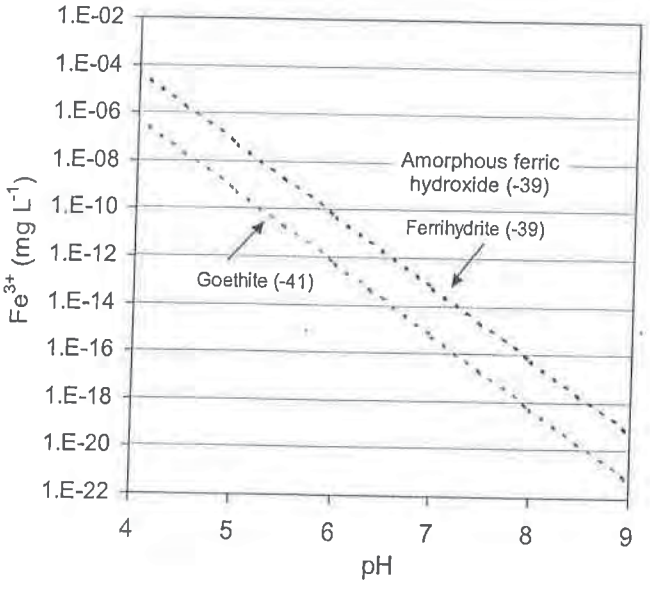


The clay minerals kaolinite and montmorillonite may also control Al^{3+} solubility, although this is less common.

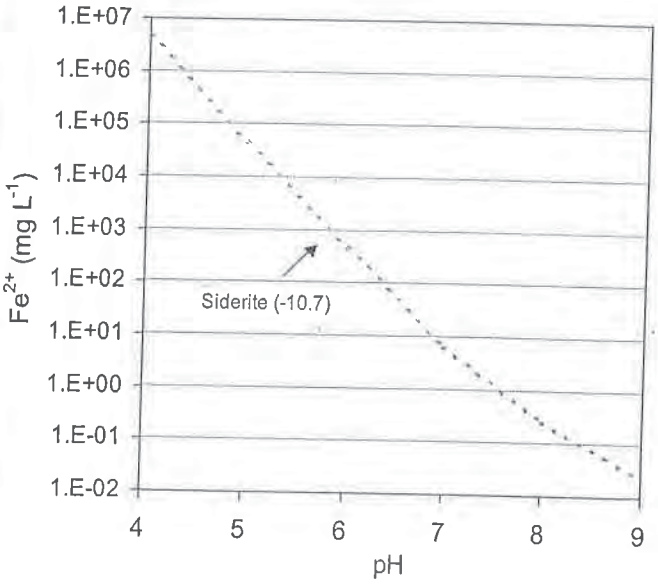
Figure III-4: Predicted concentration of Fe^{3+} (not total soluble Fe) as a function of pH in the presence of: (a) amorphous ferric hydroxide and goethite; and (b) siderite.

Numbers in parentheses are the log of the K_{sp} for the dissolution of the iron mineral phases. Note the different y-axes for the graphs.

(a)



(b)



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B. Adsorption

Adsorption is the association of phosphate with the surfaces of a particle. There are a number of different types of adsorption, including (Stumm 1998):

- *Hydrophobic adsorption* due the repulsion of sparingly soluble components by water
- *Electrostatic adsorption* due to forces of attraction arising from the difference in charge of the solute species and the adsorbing solid phase
- *Specific adsorption* includes chemical interactions between a solute and a solid surface that are stronger than simple electrostatic attractions. For example, the formation of chemical bonds between the solute species and a specific surface site on the adsorbing phase

Studies show that phosphate adsorption takes place via specific adsorption, that is the formation of a bond between phosphate and a specific site on the adsorbing solid phase (Figure III-5; Sposito 1989). Specific adsorption binds ions much more strongly than does hydrophobic or electrostatic adsorption.

Because both of the major forms of phosphate present in wastewaters ($H_2PO_4^-$ and HPO_4^{2-}) are anions, they will generally be attracted to positively-charged mineral surfaces. The surface charges of many oxide and hydroxide minerals vary as the pH changes due to protonation/deprotonation of surface hydroxyl groups. As a result, the surface varies from being net positively charged at low pH to net negatively charged at high pH. The pH at which the negative surface charges balance the positive surface charges is referred to as the point of zero charge or pH_{pzc}. The pH_{pzc} is a characteristic which is intrinsic to the mineral. Minerals with high pH_{pzc} values remain positively charged at higher pH values than minerals with lower pH_{pzc} values. Minerals that are positively charged under near-neutral pH conditions in the subsurface include aluminum (hydr)oxides, iron (hydr)oxides, and manganese oxides, and some clay minerals (Ptacek *et al.* 1994; Foussard *et al.* 1995):

- Corundum: α-Al_2O_3
- Gibbsite: $Al(OH)_3$
- Boehmite: γ-AlOOH
- Goethite α-FeOOH
- Ferrihydrite: $Fe(OH)_3$
- Hematite: Fe_3O_4
- Pyrolusite: β-MnO_2
- Allophane: $Al_2O_3 \cdot (SiO_2)_{1.3\text{-}2} \cdot 2.5\text{-}3\ H_2O$

These (hydr)oxides and clay minerals are positively charged because of the addition of H^+ atoms to (*i.e.*, protonation of) the surface functional groups.

Note that once the phosphate adsorbs to the surface of these (hydr)oxide or clay minerals, it actually forms a bond with the Al (in the case of corundum, gibbsite, boehmite, allophane), Fe (in the case of goethite, ferrihydrite, or hematite), or Mn (in the case of pyrolusite) atoms.

In one study, the quantity of phosphate adsorbed on goethite was 2.5 µmol P m^{-2} compared with 0.97 µmol m^{-2} on hematite (Barrón *et al.* 1988), because goethite is characterized by more accessible surface OH groups (1 µmol = 10^{-6} moles). In another study, phosphate adsorption was highest on allophane, followed by ferrihydrite, goethite, gibbsite, hematite, and the clay minerals kaolinite and montmorillonite (Figure III-7). Allophane materials are thought to have a high affinity for phosphate because of their high surface area (Parfitt 1980). Clay minerals adsorb less phosphate because of the lower specific surface area suitable for phosphate adsorption (Parfitt 1978).

Quantifying mineral surface charge

Charge on mineral surfaces can be caused by various processes. With respect to phosphate adsorption, the ionization of surface functional groups is the most important charge-generating process. Surface group ionization refers to hydroxyl groups at the surface of the mineral gaining or losing H^+ atoms, depending on the pH of the surrounding solution.

Whether a mineral surface tends to be positively charged or not can be assessed by measuring the point of zero charge, pH_{pzc}, or the pH at which the clean mineral surface has an equivalent amount of negative and positive charge (i.e. zero net charge). Above the pH_{pzc}, the surface will have a net negative charge, while below the pH_{pzc} the surface will have a net positive charge.

The mineral surfaces that will have a net positive charge at circumneutral pH are those that have a pH_{pzc} greater than 6 to 8. These include the following metal (aluminum, iron, and manganese) oxide and (oxy)hydroxide minerals:

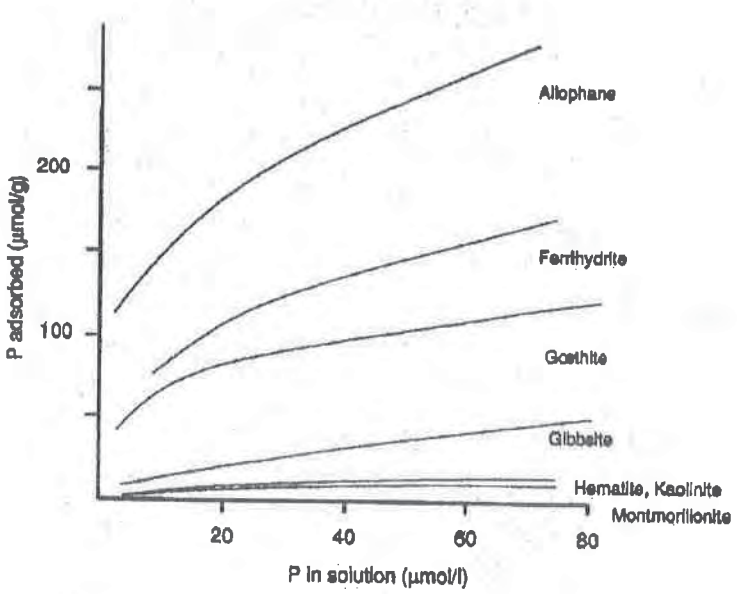
Mineral	pH_{pzc}
○ β-MnO_2	7.2
○ α-FeOOH	7.8
○ γ-AlOOH	8.2
○ $Fe(OH)_3$	8.5
○ $Al(OH)_3$	8.9
○ α-Al_2O_3	9.1

Therefore, these minerals are the ones that are most likely to adsorb phosphate.

For more information, refer to Sposito 1989 and Stumm 1992.

Phosphate can also adsorb on calcite ($CaCO_3$) surfaces (Borrero *et al.* 1988), despite calcite having a negative charge under slightly-basic to basic pH conditions (White 1982). Phosphate adsorption apparently occurs on only 5% of the pure calcite surface, but these adsorption sites act as nuclei for the precipitation of calcium phosphate minerals (Cole *et al.* 1953). Nevertheless, it is likely that Al and Fe oxides are the most important components determining phosphate adsorption capacity in soils, including calcareous soils (Holford and Mattingly 1975; Parfitt 1978; Hamad *et al.* 1992).

Figure III-5: Phosphate sorption on various minerals



Source: Sollins *et al.* 1991

The presence of organic matter affects the adsorption of phosphate to minerals. Organic acids (e.g., oxalic, citric, malic acids) can compete with orthophosphate for sites on mineral and soil surfaces, thereby decreasing phosphate adsorption (Fontes et al. 1992; Hue 1991). On the other hand, soils that are rich in organic carbon may have an enhanced capacity for immobilization of P as organic-bound material (humic-P, Borie and Zunino, 1983), which could have the effect of counteracting the diminished sorptive capacity of such soils.

Studies have shown that phosphate adsorption to surfaces is characterized by a fast, initial adsorption reaction during which an OH^- or H_2O molecule is released from the surface and a phosphate surface complex is formed (Parfitt *et al.* 1976, Goldbery and Sposito 1985, Torrent *et al.* 1992). This initial fast reaction may, in some cases, be followed by a slow process, perhaps involving phosphorus diffusion to adsorption sites within the solid matrix (Olila and Reddy 1997, Torrent *et al.* 1992).

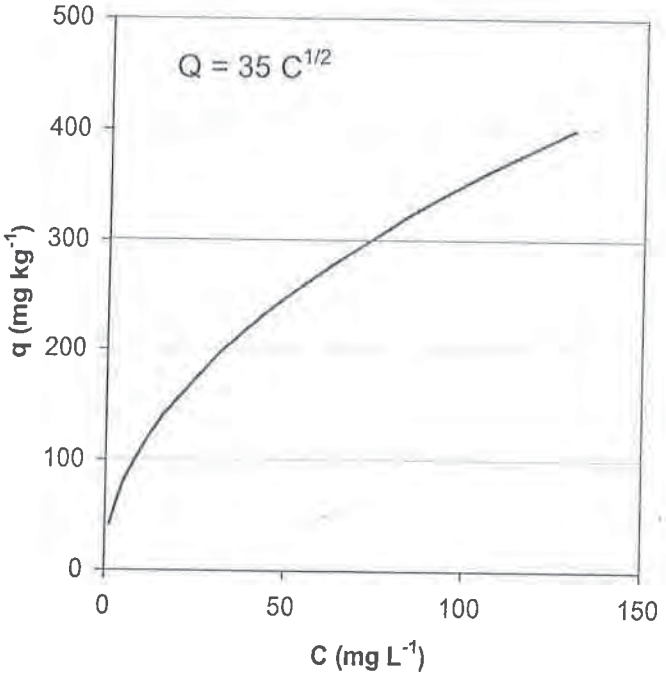
There are many techniques used to explain phosphate adsorption to mineral surfaces. In many instances, equilibrium data describing phosphate adsorption to specific oxide surfaces or to soils in general can be approximated by the Freundlich equation:

$$q = K_f C^{1/n} \quad (1)$$

where q is the mass of phosphate adsorbed to the soil [mg/kg], K_f is a constant, C is the concentration of phosphate in solution at equilibrium [mg/l], and n is a unitless constant (usually close to 2 for phosphate). In its simplest form, considering only the linear portion of the adsorption curve, n is assigned a value of 1 and the ratio of adsorbed phosphate to phosphate in solution is referred to as the distribution coefficient (K_d). This is the commonly used parameter in the well-known retardation equation describing

solute migration velocity in groundwater. There are two main limitations of using a K_f or K_d model to describe adsorption of a hydrolysable species on a variably-charged mineral surface. First, this model does not account for the pH dependent speciation of phosphate, and therefore does not represent changes in the speciation and charge of the phosphate species under varying pH conditions. Second, this model does not account for the change in surface charge of the mineral adsorbent as a function of pH. Many common adsorbents vary from net negative to net positive under the range in pH values that commonly occur at wastewater disposal sites. Note that if the Freundlich isotherm is used to describe phosphate adsorption to soils, it may incorporate both true adsorption processes and mineral precipitation. A theoretical Freundlich isotherm for phosphate adsorption is shown in Figure III-6. Note that the shape is similar to the shape of the curves in Figure III-5.

Figure III-6: Theoretical phosphate adsorption described by a Freundlich isotherm with $K_f = 35$ and $n = 2$



Both the original and modified Freundlich equations demonstrate that the concentration of phosphate in solution is the factor that controls the extent of adsorption (Froussard *et al.* 1995).

The Freundlich isotherm often fails to accurately predict P breakthrough behavior in laboratory column experiments and at field sites. The primary usefulness of Freundlich isotherms is to compare the adsorption affinities for different soils and aquifer materials under a specific set of geochemical conditions.

C. pH and Eh effects

As demonstrated in Figures II-2, III-2, III-3 III-4, pH influences the solubility of phosphate minerals, the adsorption of phosphate onto mineral surfaces, as well as the speciation of the aluminum, calcium, and iron commonly contained in phosphate minerals. Moreover, pH interacts with the redox potential of the septic tank, soil solution, or groundwater to influence the adsorption and precipitation reactions governing phosphate chemistry. The redox potential of a solution, often expressed as pe, is a measure of how oxidizing or reducing that solution is and is explained in more detail in the following section on "Redox Concepts". The dominant pH and redox effects that influence phosphate chemistry are as follows:

A *decrease in pH* causes:

- An increase from PO_4^{3-} to HPO_4^{2-} to $H_2PO_4^-$ to H_3PO_4 as the dominant phosphate species (Figure II-3)
- A decrease in the fraction of phosphate species bound as complexed species as the result in changes in the dominant phosphate species and changes in the stability of the complexes
- An increase in the positive surface charge of iron and aluminum (hydr)oxides, and therefore an increase in the affinity that these surfaces have for phosphate adsorption (Goldberg and Sposito 1984)
- An increase in Al^{3+} concentrations in solution (Figure III-3)
- An increase in Fe^{3+} and Fe^{2+} concentrations (Figure III-4)
- An increase in Ca^{2+} concentrations due to the increase in calcite solubility at lower values of pH

An increase in pH, of course, produces the opposite effects.

A *decrease in the redox potential (pe)* causes:

- An increase in the concentration of Fe(II) relative to Fe(III) and therefore a decrease in the stability of iron(III) (hydr)oxide minerals

These effects interact to determine the nature of adsorption and precipitation phenomena. The most important interactions and their consequences for precipitation and adsorption are described below.

Precipitation

The effects of pH and pe on precipitation can be summarized as follows:

- The higher Al^{3+} and Fe^{3+} (or Fe^{2+}) concentrations at lower pH result in lower phosphate concentrations in solution because of equilibrium with aluminum-phosphate and iron-phosphate minerals, assuming dissolved Al^{3+} and Fe^{3+} (or

Fe^{2+}) can be replenished from the soil and aquifer solids and are not limiting (refer to Table III-3 and Figure II-3; Robertson *et al.* 1998; Gold and Sims 2000).

- At higher pH levels, lower soluble phosphate concentrations can also occur if phosphate concentrations are limited by the equilibrium with respect to hydroxyapatite (note that the OH^- term in the solubility product equation for hydroxyapatite increases as pH increases; Table III-3).
- Low pe, and the concomitant reduction of Fe^{3+} to Fe^{2+}, results in the instability of strengite (a Fe(III) mineral) and the stability of vivianite (a Fe(II) mineral)). At similar total dissolved iron concentrations, phosphate concentrations in equilibrium with respect to vivianite are lower than they are in equilibrium with respect to strengite.

Thus, the mineral phases controlling phosphate precipitation and dissolution depend heavily on pH and pe. In oxidized soils, the solubility of phosphate is controlled by hydroxyapatite, notably the amorphous form rather than the crystalline form (Jenkins *et al.* 1971), possibly beta tricalcium phosphate (Moore and Reddy 1994), strengite or variscite (Robertson *et al.* 1998). Phosphate solubility in the presence of these minerals varies widely as a function of pH. For example, the predicted phosphate concentration at equilibrium with variscite, strengite, and hydroxyapatite is two orders of magnitude higher at pH 7 than at pH 5 (Figure III-1; Robertson *et al.* 1998). Under reducing (low pe) conditions, phosphate solubility varies less widely as a function of pH (Gold and Simms 2000) and is generally lower than it is under oxidizing conditions. This reduction in solubility may be largely due to the precipitation of vivianite (a Fe(II) mineral), which is less soluble than hydroxyapatite or beta tricalcium phosphate (Figure III-2; Nriagu *et al.* 1984; Robertson *et al.* 1998) and because of the relatively high concentration of Fe(II) that often develops under reducing conditions.

Adsorption

The effects of pH and pe on adsorption can be summarized as follows:

- The increase in the positive surface charge of the iron and aluminum oxides that occurs with decreasing pH will increase the extent of phosphate adsorption. However, adsorption will cease below pH 2, despite the fact that the positive surface charge will be very high, because most phosphate is converted to the uncharged species H_3PO_4.
- The reduction of iron that occurs at lower redox potentials leads to dissolution of Fe(III) (hydr)oxides. This reductive iron dissolution decreases the surface area of iron (hydr)oxides available for adsorption, and thus decreases phosphate adsorption to these surfaces. Aluminum hydroxides, however, are less affected by changes in redox potential. Under low pe conditions, reduced iron minerals, including siderite, are stable and may adsorb phosphate.

REDOX CONCEPTS

The transfer of electrons from one chemical species to another is called a reduction or oxidation reaction. **Reduction** refers to a gain of electrons (and therefore a decrease in positive charge), whereas **oxidation** refers to a loss of electrons (and therefore an increase in positive charge). Microbes mediate most redox reactions in septic tanks, soils, and groundwater. Adsorbed Fe(II) and zero-valent iron are as effective as microbes at reducing compounds in pore waters.

The **redox potential** of a solution suggests whether certain species should be present in their oxidized or reduced forms. Redox potential is typically described by electrode potential (referenced to a standard hydrogen electrode), **Eh**, according to the Nernst equation:

$$Eh = E° - RT/nF \ln(Q)$$

where E° is the potential for the given reaction at standard temperature and pressure (mV), R is the universal gas constant (8.314 J/mol/K), T is the temperature (K), n is the number of electrons transferred, F is Faraday's constant (96485 coulombs/mol), and Q is the reaction quotient (ratio of product concentrations to the reactant concentrations, all raised to their respective stoichiometric coefficients).

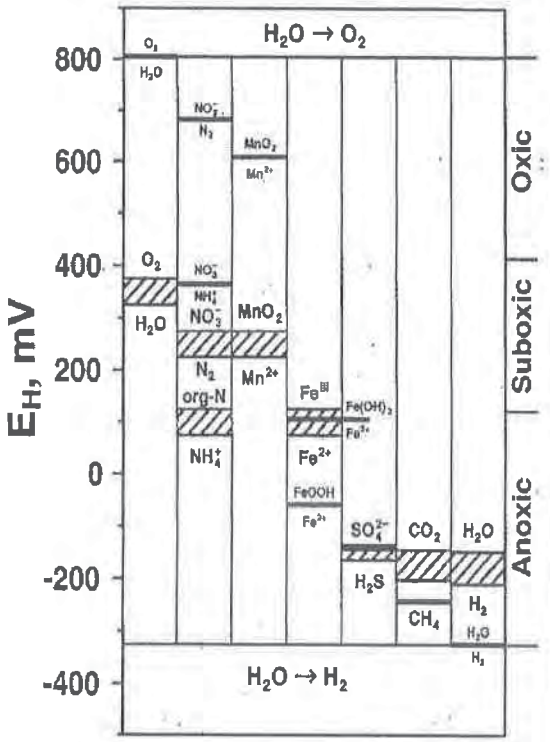
Redox potential can also be described by **pe**, which is the electron activity in p-notation (i.e. $-\log_{10}\{e^-\}$) . At 25°C, the pe is related to Eh as follows:

$$Eh(mV) = 59.2\ pe$$

Redox Status	pe	Eh (mV)
Oxic	> 7	> 400
Suboxic	2 to 7	100 to 400
Anoxic	< 2	< 100

Most soils maintain a pe of -6 to +12, or an Eh of -355 to 710 mV. This spans the range of oxic, suboxic, and anoxic redox conditions, as listed below. Note that iron and manganese reduction occurs under suboxic conditions, while sulfate reduction occurs under anoxic conditions.

The redox ladder below shows the Eh at which major redox reactions occur. The observed transformation from oxidized to reduced species occurs in the Eh range indicated by the



Source: Essington 2004.

The concept of highly-reduced areas at the drainfield is typical of subsurface organic plumes in which organic materials are introduced to induce anaerobic conditions and enable reductive biogeochemical activities to occur (Lovley 2001)

D. Kinetic issues

Precipitation of phosphorus minerals can occur over time scales on the order of minutes to hours, although the initial minerals that precipitate are often amorphous forms that may evolve into more crystalline forms over time. Adsorption can be characterized by both rapid and slow reactions, with the initial, rapid adsorption also occurring on the order of hours.

When phosphate is initially exposed to soil, there is rapid uptake of the phosphate through adsorption processes (Ptacek *et al.* 1994) followed by slower development of crystalline phosphate minerals within the adsorbent. For example, initial adsorption of phosphate by Fe-oxide surfaces can be followed by recrystallization to form $FePO_4 \cdot nH_2O$ (Stumm and Morgan 1981; Ptacek *et al.* 1994). Phosphate minerals will also form independent of the adsorbent. The initial rapid adsorption may slow down over time as sorption sites are depleted. Furthermore, adsorption on metal oxides may be very slowly reversible (Harris 2002). Reversibility of adsorption reactions, as well as

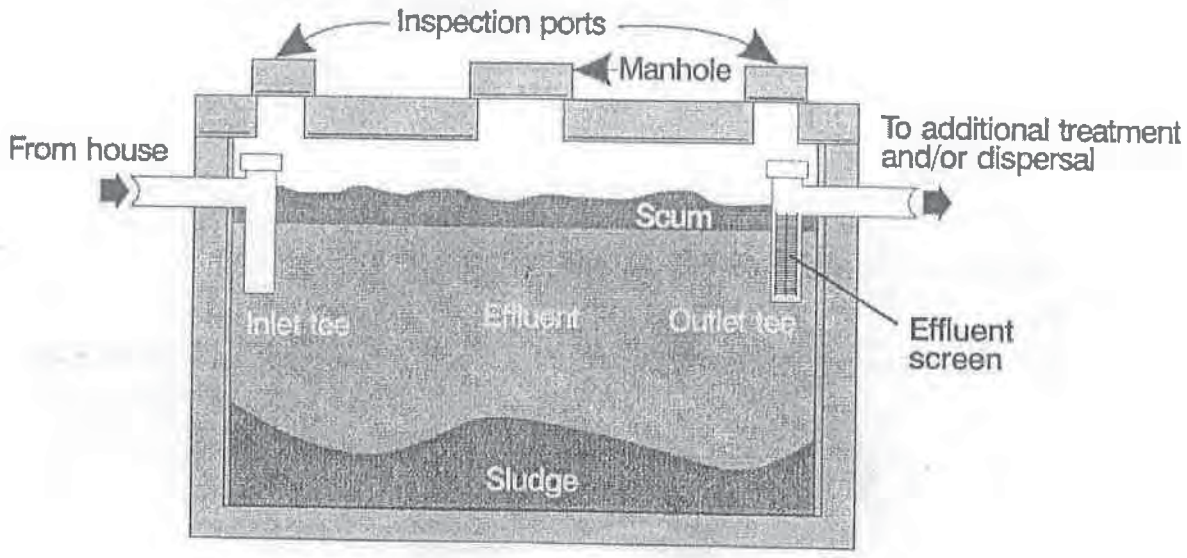
the kinetics of adsorption and precipitation (*i.e.*, of sorption, generally) will greatly influence the ultimate fate of phosphorus from on-site wastewater treatment systems (Robertson *et al.* 1998).

IV. PHOSPHORUS REMOVAL IN SEPTIC TANKS

A. Characteristics of Septic Tanks

Septic tanks receive wastewater from individual residences, as well as other non-sewered facilities (Crites and Tchobanoglous 1998). They are buried, watertight tanks that partially treat raw wastewater by equalizing hydraulic flows and retaining floatable and settleable solids. Grease and oils float to the surface of the tank and form a scum layer, while solids settle to the bottom of the tank and form a sludge layer (Figure IV-1; EPA 2002). The solids in the sludge layer are partially broken via anaerobic digestion, although the sludge must be regularly pumped out of the tank to prevent septic tank failure.

Figure IV-1: Conventional single-compartment septic tank



Source: EPA 2002

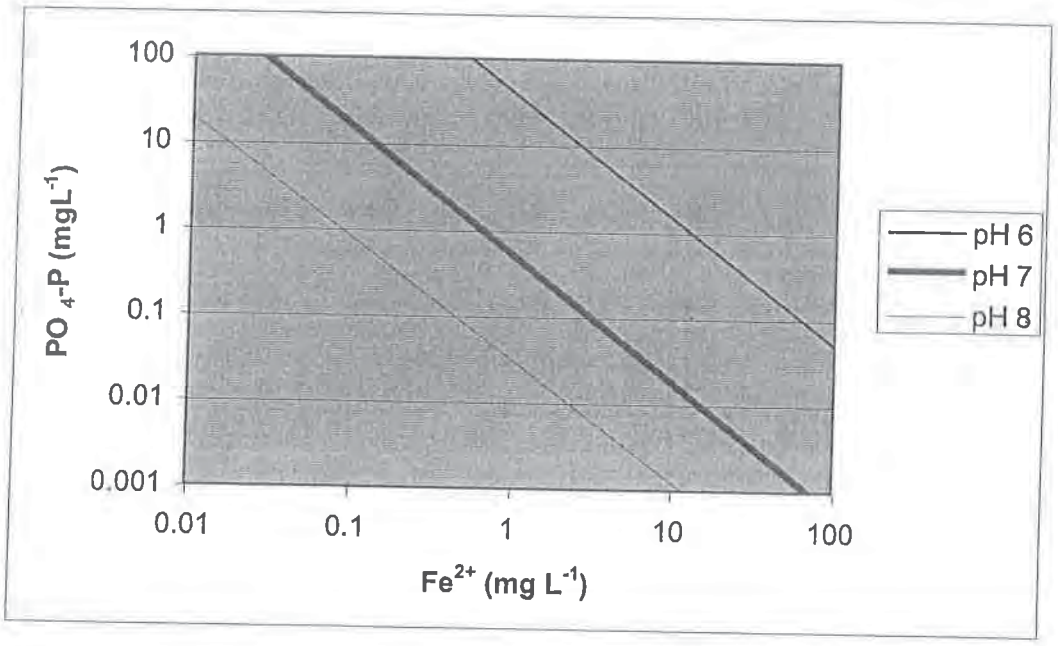
B. Phosphorus Removal Mechanisms

Phosphorus removal in septic tanks is largely a physical process, with some chemical precipitation occurring as well. Between 20 and 30% of total phosphorus in raw wastewater is separated out in the form of sludge in a septic tank (Wood 1993). Most of this phosphorus is particulate phosphorus. Particulate phosphorus in raw wastewater can be in the range of 1 to 3 mg-P/l, or approximately 20% of total phosphorus (assuming total phosphorus is 5 to 15 mg-P/l; Table II-6).

Orthophosphate may also be removed in septic tanks through mineral precipitation reactions particularly vivianite precipitation (Zanini *et al.* 1998). If vivianite precipitation does affect the concentration of orthophosphate in the effluent of a given septic tank, then the equilibrium concentration of orthophosphate in solution is a function of the concentration of Fe^{2+} which is controlled by biological factors . Robertson *et al.* (1998) measured 0.12 to 25 mg/l total Fe in the effluent of 10 septic tanks, most of which was presumed to be Fe(II) generally, and Fe^{2+} specifically, due to the reducing conditions in the tank. In the septic tank, the wastewater approaches or exceeds saturation with respect to vivianite (Robertson *et al.* 1998). Thus it is possible that vivianite precipitation begins initially in the septic tank, thereby limiting phosphorus concentrations occurring in the wastewater (Zanini *et al.* 1998). Orthophosphate concentrations in equilibrium with these iron concentrations would range from << 0.01 mg/l to 1,000 mg/l, depending on the pH of the septic tank effluent (Figure IV-2).

Figure IV-2: Predicted orthophosphate concentrations in the presence of vivianite as a function of Fe^{2+} concentrations.

This figure assumes equilibrium in pure water, and in the absence of strong complexes. Orthophosphate concentrations observed in the presence of organic complexes are expected to be higher.



C. Effluent loadings and concentrations

Studies of phosphorus concentrations in septic tank effluent have measured total phosphorus in the range of 1.2 to 22 mg-P/l (Table IV-1). Note that these data may reflect wastewater concentrations before bans were placed on phosphorus in

detergents, and thus may be higher than current values. Approximately 85% of phosphorus in septic tank effluent is expected to be dissolved (Gold 2000).

Table IV-1: Concentrations of total phosphorus in septic tank effluent

Location	Type of System	Average Total Phosphorus (mg-P/l)	Reference
Virginia	On-site, single home	16	Reneau *et al.* 1989
Wisconsin	On-site, single home	13	UW 1978
Wisconsin	On-site, single home	22	Harkin *et al.* 1979
Florida	On-site, single home	11	Ayres Associates 1993
Florida	On-site, single home	17	Ayres Associates 1996
Wisconsin	SDGS, 90 connections	8.1	Otis 1978
Texas	Nine homes	8.2	Brown *et al.* 1977
Ontario	10 on-site systems, single homes, campground, school, or resort	1.2-12*	Robertson *et al.* 1998

* Values represent PO_4-P only at several sites

Total phosphorus loadings from septic tank effluents have been estimated to be 15 to 17 kg/ha/yr (Lombardo Associates 1980; Gold and Sims 2000). The lower number assumes 170 l/capita/day, three people per household, five households per hectare and a wastewater effluent containing 15 mg-P/l. The higher number is based on 3.4 kg-P/household/yr and five households per hectare. These numbers are what might be seen in regions where bans on detergent phosphorus have not been implemented. In regions with phosphorus bans, septic tank effluent would contain approximately 7 to 8 mg-P/l, while household phosphorus production would be closer to 1.3 kg-P/household/yr. This would yield phosphorus loadings from septic tanks closer to 5 to 11 kg/ha/yr. Nevertheless, with the exception of fertilizer in agricultural systems, phosphorus loading from septic tanks effluent remains high relative to other loadings (Table IV-2)

Table IV-2: **Annual phosphorus loadings from various sources**

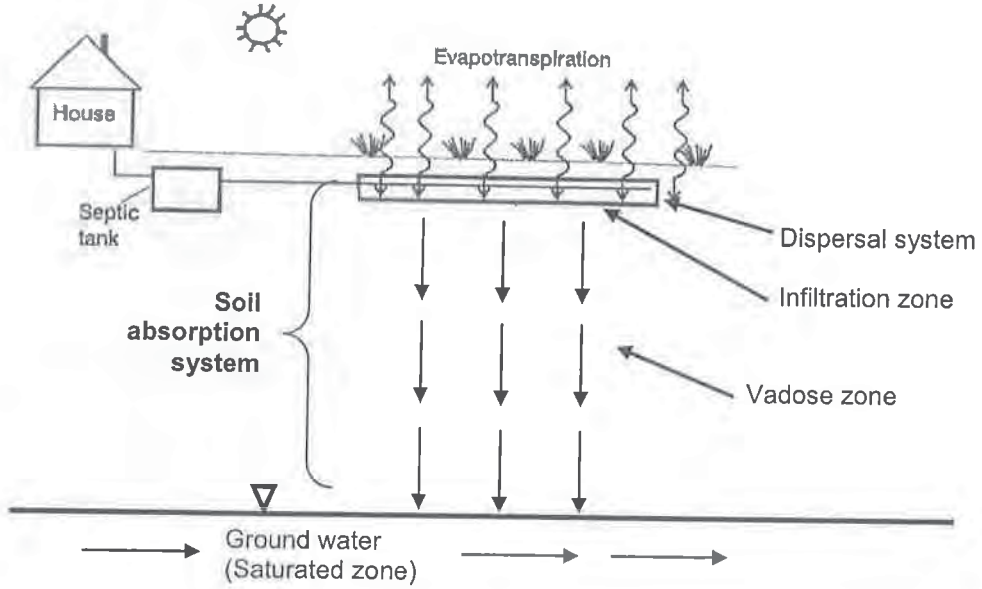
Phosphorus Source	Annual Loading [kg/ha/yr]	Predominant Phosphorus Form	Reference
Septic tank effluent (5 mg-P/l or 1.3 kg-P/household/yr)	5 – 11	Dissolved orthophosphate and polyphosphates	Calculated using data from Table IV-1; see text for assumptions
Septic tank effluent (15-18 mg-P/l or 2.8-3.4 kg-P/household/yr)	15 – 17		Lombardo Associates 1980; Gold and Sims 2000
Atmospheric deposition	<1	Dissolved orthophosphate	Howarth *et al.* 1996
Maintenance of fertilized lawns	5	Particulate phosphorus	Sharpley *et al.* 1998; Pierzynski *et al.* 2000
Fertilizer manure from agricultural production systems	10-150		

V. PHOSPHORUS IN SOIL ABSORPTION SYSTEMS AND GROUNDWATER

A. Soil absorption systems basics

A soil absorption system encompasses the second and third components of a conventional on-site (septic) wastewater system, namely, the treatment and dispersal system. In a soil absorption system, septic tank effluent is discharged via a dispersal system to the infiltration zone, the vadose zone, and, ultimately, to ground water (Figure V-1). The infiltration zone may be only a few centimeters thick, but is the most biologically active zone in the subsurface and is often referred to as the "biomat". The infiltration zone acts as a fixed-film bioreactor in which BOD is oxidized and ammonia is nitrified. The vadose zone, also called the unsaturated zone is generally required to be at least 1 m or more in depth. This zone allows oxygen transport to the infiltration zone, and also allows geochemical reactions to occur as a result of soil-water interaction. Most of the phosphorus and pathogen removal occurs in the vadose zone (EPA 2002).

Figure V-1: Components of a wastewater soil absorption system



Source: US EPA 1997

Soil absorption systems are usually located in relatively permeable, unsaturated natural soils or imported fill material. Both the type of soil and the soil thickness (*i.e.*, distance between the infiltration zone and groundwater) will influence pollutant removal generally, and phosphorus removal specifically. The depth from the infiltration system to ground water (*i.e.*, thickness of the vadose zone) affects hydraulic function and pollutant removal by influencing soil water content, aeration status, media surface area, and hydraulic retention time (Cuyk *et al.* 2001). Thicker soil absorption systems generally yield better contaminant removal, although there are diminishing benefits beyond a vadose zone depth of 30 to 60 cm for many constituents (Cuyk *et al.* 2001). However, note that if the depth to the water table is only 30 cm below the infiltration

zone, the thickness of the vadose (unsaturated) zone will be essentially zero in all soils finer than medium sand because of the presence of the saturated capillary fringe occurring above the water table. This tension-saturated zone is thicker in fine-grained soils (Lambe and Whittman 1969) and effectively limits the diffusive influx of atmospheric O_2.

Processes controlling phosphorus movement in the vadose zone are generally fundamentally different from those in the groundwater zone. The vadose zone below a septic system infiltration bed is a geochemically dynamic environment where a host of oxidation and biodegradation reactions occur, many of which directly or indirectly effect P. Most of these reactions are largely completed by the time the effluent reaches the water table, with the result that the geochemistry of groundwater zone plume then evolves more slowly and less dramatically. Consequently, understanding vadose zone processes is the key to determining the ultimate fate of phosphorus from septic systems. The following section highlights several of these important processes.

TERMINOLOGY

Drain field: Also called leachfield, tile bed, infiltration bed, dispersal field, or disposal field, the drain field is a series of covered trenches or beds used for subsurface septic tank effluent dispersal. Trenches are usually shallow, level excavations, containing a perforated distribution pipe usually under- and overlain by media, typically rock. Bed systems consist of an excavated area with perforated distribution pipes 1 to 2 m apart. Wastewater effluent is discharged through the trench or bed surfaces, from which it infiltrates into the underlying soil.

Ground water: Also called the saturated zone, ground water is defined by the presence of soil pores that are saturated with water. The water table does not mark the upper limit of the saturated zone, however, as it is always overlain by a tension-saturated capillary fringe of variable thickness. The water table is the point of total water saturation at atmospheric pressure.

Infiltration zone: This is the zone directly below, or adjacent to, the dispersal system. For example, in leachfield trenches, the infiltrative surfaces are the bottom and the sidewalls of the trench. The infiltration zone is usually associated with a biomat that is a very biologically active zone in which BOD oxidization and nitrification occur.

Phosphorus rapid attenuation zone: Zone, immediately underlying the infiltration zone, in which phosphorus accumulates as secondary minerals.

Vadose zone: Also called the unsaturated zone, the vadose zone is the zone immediately below the land surface (and wastewater dispersal system) and above the water table where the pores contain both water and air, but are not totally saturated with water. In the context of soil absorption systems, the vadose zone is also known as the percolation zone. The vadose zone includes the capillary fringe and allows oxygen transport to the infiltration zone

Wastewater soil absorption system: Includes the drain field, the infiltrative surfaces of the drain field, and the soil around and beneath (percolation zone) the drain field.

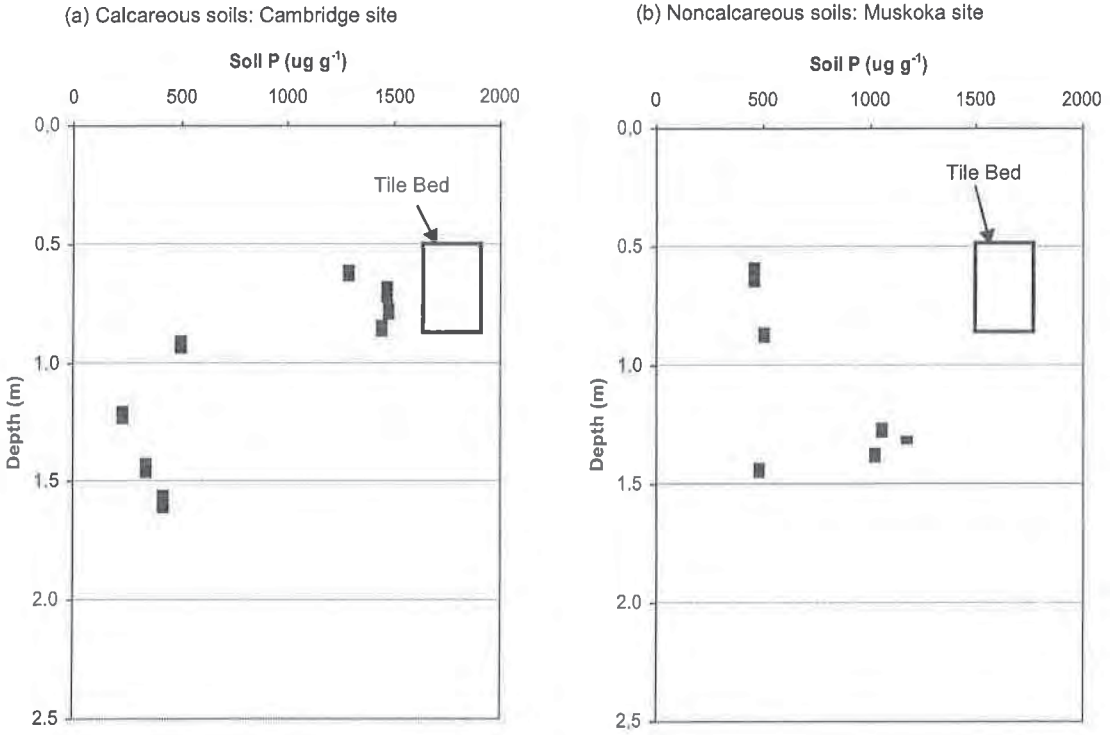
For more information: Crites and Tchobanoglous (1998); EPA (2002).

B. Dominant removal mechanisms

A review of the literature suggests that phosphorus accumulation in the area immediately underlying the infiltration zone appears to be common (Reneau and Petty 1976; Lund *et al.* 1976; Beek *et al.* 1977; Whelan 1988; Wood 1993; Walter *et al.* 1996, Zanini *et al.* 1998). For example, Zanini *et al.* (1998) found the soil at four septic systems was enriched in phosphorus by a factor of 2 to 4 within 1 m of the dispersal system (Figure V-2), while Whelan (1988) measured phosphorus-enriched soil within 20 cm of infiltration pipes at two 10-year old systems.

Figure V-2: Soil phosphorus measured in a calcareous site (a) and a noncalcareous site (b).

Note the zones of enrichment at approximately 0.75 m (a) and 1.4 m (b)below the soil surface.



Source: Zanini *et al.* 1998

The common occurrence of phosphorus attenuation and accumulation in the soils close to the septic system infiltration pipes has lead to the description of this environment as the "Phosphorus Rapid Transformation Zone" (Robertson and Harman, 1999) (The transformation is an attenuation of the phosphorus within this zone and is described as such from this point forward).This zone coincides with the biogeochemically active horizon that underlies the infiltration pipes (*e.g.*, the biomat or infiltration zone). Here a variety of reactions occur that can significantly affect phosphate behavior. These reactions are the consequence of organic-rich septic tank effluent oxidizing upon

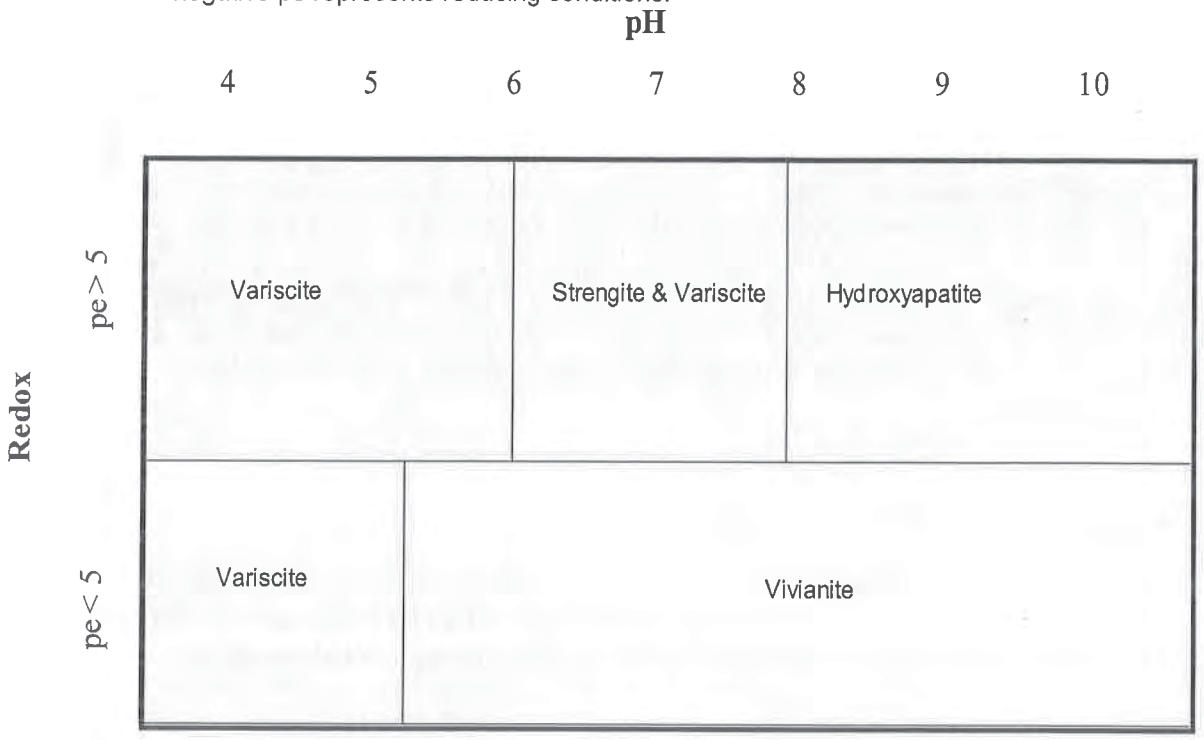
contact with the soil and include reductive dissolution of ferric oxyhydroxide minerals, oxidation of sewage NH_4, acidity generation, gibbsite dissolution, calcite dissolution, ferrous iron oxidation and others (Whilhelm *et al.* 1994; Zanini *et al.* 1998; Ptacek *et al.* 1994). Carbon oxidation and the associated reduction reactions usually occur within the first few tens of cm of the infiltration zone, although reduced compounds can subsequently travel to the groundwater (Ptacek 1998, Robertson *et al.* 2003). Specifically, if the percolation zone is large, then the wastewater effluent, while it is migrating to the groundwater zone is initially reduced, then will be subsequently oxidized. If the percolation zone is small, reducing conditions can be maintained all the way to the water table (Ptacek *et al.* 1994).

Electron microscope imaging and electron microprobe analyses suggest that the phosphorus that accumulates in the soil near the infiltration pipes often consists of secondary solids with formula consistent with the minerals strengite ($FePO_4.2H_2O$) and variscite ($AlPO_4.2H_2O$) (Zanini *et al.* 1998). Robertson *et al.* (1998) suggest that precipitation of phosphorus is an important sink in the soil absorption system and in the long term is more important than fast, reversible adsorption reactions. Because the zones of phosphorus enrichment are restricted to the areas close to infiltration pipes (<1m), these reactions must be completed relatively quickly after the effluent enters the subsurface (less than a few days), hence the term "rapid attenuation zone". Indeed, if adsorption was the dominant attenuation process, one would expect to observe a decrease in phosphorus removal over time in soil absorption systems, as sorption sites are used up. This was not the case during long-term monitoring at two mature septic systems, one in calcareous soil and one in noncalcareous soil, where phosphate concentrations arriving at the water table below the center of the bed remained attenuated by consistent amounts during monitoring that continued for over a decade (Robertson 2003).

Given that precipitation reactions, rather than adsorption reactions, appear to dominate phosphorus removal in the vadose zone, knowing which mineral phase controls phosphate solubility under different environmental conditions should allow prediction of equilibrium phosphate concentrations in the soil porewater, and, therefore, phosphorus removal in the soil. As illustrated in Figures III-1 and III-2, the mineral phases controlling phosphate solubility depend both on pH and pe. It is quite likely that these also play a role in phosphorus removal in the rapid attenuation zone, although information for these is generally limited. These general trends in mineral phases that could be controlling phosphate concentrations under specific conditions are summarized in Figure V-3. It should be noted that adsorption reactions still play an important, although less dominant, role in phosphorus retention in the vadose zone.

Figure V-3: Examples of mineral phases that may control phosphate solubility for different pH and pe conditions.

pe is the negative logarithm of electron activity, which is a theoretical representation of oxidation / reduction potential. A positive pe represents oxidizing conditions, and a negative pe represents reducing conditions.



C. Typical removal percentages

On mass basis, the vadose zone appears to retain a variable amount of phosphorus from the septic tank effluent. In a review of 10 mature septic system plumes in Ontario, Robertson *et al.* (1998) observed that phosphorus mass removal in the vadose zone was often substantial but variable, ranging from 23-99% depending on site conditions. The site conditions that influence phosphate retention in the vadose zone are discussed in Section V(D) below. Obviously, not all phosphorus is removed, and some does migrate to the groundwater. Predicting how much phosphorus is removed is complicated because soil conditions are heterogeneous and non-equilibrium processes may be present (Harris 2002).

It has been observed that resting a soil absorption system (that is, suspending septic tank effluent loading) for several months can lead to regeneration of some of the phosphate removal capacity in the vadose zone (Gold and Sims 2000). The reason for this is uncertain, but could be related to removal of phosphorus from the surface sorption sites by processes such as intraparticle diffusion or by the generation of fresh sorption sites, for example by the ongoing precipitation of secondary minerals such as ferrihydrite ($Fe(OH)_3$).

Because precipitation appears to be the dominant removal mechanism in the vadose zone of soil adsorption systems, the possibility of clogging the vadose zone pores with phosphate minerals needs to be considered. However, a simple calculation suggests that this may only be a problem when considering extremely long time frames. Assuming a hydraulic loading of 20.5 l/d/m^2 and 90% removal of the 5 mg/l phosphate in septic tank effluent via variscite ($AlPO_4 \cdot 2H_20$) precipitation:

- The mass of variscite retained in the vadose zone is 0.137 g/m^2/d
- The volume of variscite retained in the vadose zone (assuming ρ = 2.5 g/cm^3) is 3.4 x 10^{-4} l/m^2/d
- The total void volume (assuming 25% voids and a depth of 0.5 m) is 12 l/m^2

Thus, it would take 97 years (= 12 l/m^2 / 3.4 x 10^{-4} l/m^2/d) for the precipitated variscite to produce enough volume equivalent to clog the pore space of the vadose zone. It is important to note that the effective volume of the pore space can be less due to preferential flow.

D. Factors that influence phosphorus removal

The factors that influence phosphorus removal in soil absorption systems are those that influence the pH and pe of the vadose zone and the availability of Fe and Al. The most important of these are soil characteristics, wastewater characteristics, and site characteristics.

1. Soil characteristics

With respect to phosphorus attenuation in soil absorption systems, the most important soil characteristics to consider are the concentrations of calcium carbonate and ferric (oxy)hydroxide minerals and the grain size characteristics.

Calcareous soils are characterized by the presence of calcium carbonate in the parent material and by a calcic horizon, a layer of secondary accumulation of carbonates (usually Ca or Mg) in excess of 15% calcium carbonate equivalent and at least 5% more carbonate than an underlying layer (EPA 2003). For the purposes of this document however, we have arbitrarily chosen to define calcareous sediments as those which contain sufficient carbonate mineral content to buffer acidic groundwater to near neutral values within a time frame of a few days to a few weeks. Normally sediments with >1 wt% $CaCO_3$ equivalent content would possess this characteristic and are herein referred to as "calcareous". Calcareous sediments are normally derived from parent bedrock material containing limestone or dolomite, which includes sediments derived from most of the sedimentary basins in the US (*e.g.* Michigan Basin). Noncalcareous sediments are normally derived from igneous and metamorphic parent bedrock material and include areas such as much of New England, the Appalachian Mountains, northern Minnesota and Wisconsin, and many local areas in the Western states. Note that sediments that are calcareous may have noncalcareous soil zones, however, due to

carbonate leaching that has occurred due to weathering. Carbonate-leached soil zones can be several meters in thickness (Reardon et al.1980; Harman et al. 1966), depending on factors such sediment age, precipitation rates and original carbonate content. The least effective removal of phosphate in the rapid attenuation zone appears to occur in calcareous soils because the acidity generated by the oxidation reactions is rapidly buffered and neutral pH conditions are maintained, which Figure III-1 and Table VI-1 suggest is the least effective environment for precipitating phosphorus minerals. Significant phosphate removal may still occur in calcareous soils however (20-50%), but in this case the process appears to be related to the conversion of Fe^{2+} to Fe^{3+} at the redoxcline, which is the oxic/anoxic transition zone, and the subsequent precipitation of the sparingly soluble Fe-P minerals, such as strengite ($FePO_4.2H_2O$). Scanning electron microscopy shows that Fe is the dominant cation present in association with phosphorus minerals in calcareous soils (Zanini *et al.* 1998).

Noncalcareous soils are poorly buffered soils that contain less calcium carbonate than their calcareous counterparts and generally are less than 1% by weight $CaCO_3$ equivalent. Oxidation of septic tank effluent in noncalcareous soils leads to lowering of pH during microbial processes such as oxidation of organic matter and nitrification, described as:

$$NH_4^+ + 2\ O_2 \rightarrow NO_3^- + 2\ H^+ + H_2O \qquad (3)$$

Lower pH, in turn, lead to leaching of Fe^{3+} and Al^{3+}, which become available to precipitate with phosphate as the minerals strengite and variscite, respectively (Zanini et al. 1998). The most complete removal of phosphorus in the rapid attenuation zone (up to 99%) occurs in noncalcareous soils. Low pH enhances PO_4 sorption and can promote the precipitation of the Al-P mineral, variscite ($AlPO_4.2H_2O$). At pH values < 5.5, the precipitation of variscite has the potential to maintain PO_4 concentrations at very low levels (<0.1 mg/l, Robertson 2003). Results of scanning electron microscopy suggest that Al minerals are the dominant phosphate minerals in noncalcareous soils (Robertson 2003). Note, however, that acidity generation in noncalcareous soils depends on both the soil characteristics and the wastewater characteristics. Specifically, lowering of the pH will occur only if complete nitrification of septic tank effluent occurs and the wastewater has low alkalinity and the subsoils are noncalcareous. Lowering of pH does not always occur because septic tank effluent usually has high alkalinity and neutral pH (Robertson 2003).

Fine-grained soils allow more wide-spread development of reducing conditions and have more surface area, leading to increased adsorption and increased reductive dissolution of ferric (oxy)hydroxide solids that leads to increasing Fe(II) concentrations (Zanini et al. 1998). Conversely, coarse-grained soils maintain oxidizing conditions.

The ability of soils to immobilize phosphate, based on observed chemical composition but not on actual mineralogy, is summarized in Table V-1 (Zanini et al. 1998). The lowest phosphate concentrations are generally observed in fine-grained, noncalcareous soils in which the pH is <6 (Robertson 1998).

Table V-1: Hierarchy of soil types and their ability to retain phosphorus

Ability to Retain Phosphate	Soil Type	Dominant Phosphate Minerals
Most ↓ Least	Fine-grained, noncalcareous	Variscite, vivianite
	Coarse-grained, noncalcareous	Variscite
	Fine-grained, calcareous	Strengite
	Coarse-grained, calcareous	Strengite (minor)

2. Wastewater characteristics

The concentration of NH_4^+ and alkalinity are the predominant wastewater characteristics that influence phosphate removal in soil absorption systems. Higher concentrations of NH_4^+ will cause more nitrification in the vadose zone, and therefore a greater possibility for lowering of the vadose zone pH. Whether or not nitrification of the septic tank effluent does, in fact, lead to acidity generation depends on the alkalinity of the wastewater. Lower septic tank effluent alkalinity, combined with high NH_4^+ concentrations, will allow more acidity generation in vadose zone and therefore lead to better phosphorus removal (Robertson 2003). Graywater is an extreme case, with high alkalinity and low NH_4^+. Graywater thus has a very low potential to generate acidity, and therefore to improve phosphorus removal, in the vadose zone. The typical concentrations of NH_4^+ and alkalinity in septic tank effluent are presented in Table V-2 below.

Table V-2: NH_4^+ and Alkalinity Concentration for Typical Septic Tank Effluent

Compound	Typical Concentration
NH_4^+-N	30-60 mg/l
Alkalinity*	200 mg/l

* Determined largely by water supply quality

At locations where sewage oxidation reactions are incomplete, neutral pH conditions will normally be maintained and NH_4^+ and reduced iron will persist in the plume. Under these conditions the potential for phosphate removal in the rapid attenuation zone is probably diminished.

3. Site characteristics

A number of characteristics specific to the soil absorption system will influence phosphorus removal in the vadose zone. High hydraulic loading rates, from cluster systems or from high density systems, could lead to more reducing conditions in the vadose zone and thus diminished phosphorus removal.

Some conditions give rise to rapid transport of phosphorus to surface waters without sufficient attenuation in the vadose zone. Due to the slow kinetics of P-mineral

precipitation processes, very rapid flow rates can be particularly problematic. On the one hand, soil absorption systems placed too close to surface waters will not allow sufficient transport time for phosphorus attenuation. On the other hand, the soil absorption system may be sufficiently set back from surface waters, but certain site conditions may give rise to rapid lateral movement of water. For example, saturated flow – from high hydraulic loading rates –can lead to preferential flow paths. Thus, if infiltration of septic tank effluent exceeds its vertical transport across the percolation zone then the pore water content will increase and eventually will start to drain horizontally (Gachter *et al.* 1998). In addition, a high water table can enhance rapid lateral movement of water, as can an impermeable soil horizon. The presence of macropores (*i.e.*, fractures, root channels, animal burrows, etc.) can lead to preferential flow paths for water even under unsaturated flow conditions (Gachter *et al.* 1998).

E. Phosphorus Removal Zones

1. Septic System Phosphorus in the Unsaturated Zone

The common occurrence of phosphorus attenuation in the soils close to septic system infiltration pipes has lead to the description of this environment as the "Phosphorus Rapid Transformation Zone" (Robertson and Harman, 1999). This zone coincides with the biogeochemically active horizon that underlies the infiltration pipes. Here a variety of reactions occur that can significantly affect PO_4 behavior including; reductive dissolution of ferric oxyhydroxide minerals, oxidation of sewage organic carbon and NH_4, acidity generation, gibbsite dissolution, calcite dissolution, ferrous iron oxidation and others (Whilhelm *et al.* 1994; Zanini *et al.* 1998). In a review of 10 mature septic system plumes in Ontario, Robertson *et al.* (1998) observed that phosphorus mass removal in the rapid attenuation zone was often substantial but variable, ranging from 23-99% depending on site conditions. Electron imaging and other evidence suggested that PO_4 was precipitating as secondary phases with stoichiometry consistent with the minerals strengite ($FePO_4.2H_2O$) and variscite ($AlPO_4.2H_2O$), resulting in localized zones of phosphorus enrichment in the soils. Because the zones of phosphorus enrichment were restricted to the areas close to the infiltration pipes (<1m), these reactions must be completed relatively quickly after the effluent enters the subsurface (less than a few days), hence the term "rapid transformation zone". The zone underlying the rapid attenuation zone is characterized by porewater and groundwater with distinctly lower PO_4 concentrations (23-99%) compared to the septic tank effluent values (Pounds *et al.* 1978; Enfield *et al.* 1981; Robertson, 1995; Robertson *et al.* 1998) and an absence of further obvious accumulation of phosphorus in the soils. Thus the mineral precipitation reactions that appear to contribute to this process are kinetically fast reactions. Review of the literature suggests that phosphorus accumulation in the localized area immediately underlying the infiltration pipes appears to be widespread (Reneau and Petty, 1976; Lund *et al.* 1976; Beek *et al.* 1977; Whelan, 1988; Wood, 1993; Walter *et al.* 1996).

This evidence suggests that mineral precipitation reactions likely play an important role in attenuating sewage phosphorus concentrations, but these reactions are focused in the soils close to the infiltration pipes and appear to be of lesser importance once the porewater enters the groundwater zone.

2. Septic System Phosphorus in the Groundwater Zone

In most silt and clay rich soils, groundwater velocities are slow enough (<10 m/yr) and phosphate retardation factors are high enough (>30) that phosphate migration (<0.3 m/yr) is not normally of concern. The Killarney site case history, described herein, presents such an example, where PO_4 from a seasonal use cottage septic system has migrated < 1 m in silty fine sand during 17 years of operation. PO_4 migration from septic systems is normally only a concern in permeable sand and gravel soils where relatively high groundwater velocities are present (20-300 m/yr). At these sites, PO_4 migration on the order of 1 m/yr may occur. A number of plume studies have been documented with high concentrations of PO_4 (>1 mg/LP) extending more than 10 m from the tile beds. The Cambridge, Langton and Point Pelee case histories provide such examples. However, not all septic system plumes on permeable sands exhibit significant PO_4 migration. The Muskoka case history provides an example of a septic system on permeable sand where there has been no migration of detectable phosphate away from the tile bed area, during 13 years of operation. Unlike the previous three sites, which are on calcareous sands and have neutral pH plumes, the Muskoka plume is acidic (pH 4.5) because of an absence of buffering capacity in the sand and PO_4 is highly attenuated as a result of mineral precipitation reactions involving Al. Thus, noncalcareous sands (< 1 wt % $CaCO_3$ equiv.) can be much less vulnerable to phosphorus migration than are similar calcareous sands. Noncalcareous soils are present in a number of regions of the U.S. that are underlain by granitic bedrock, including most of New England, the central Appalachians, Minnesota and various areas in the western states. Noncalcareous terrain is often characterized by headwater streams with low dissolved mineral contents (TDS <100 mg/L, EC <200 uS). The final case history however (Ashumet Valley plume), provides an example of an onsite treatment system located on noncalcareous sand, but where large scale phosphorus plume migration has occurred (600 m). At this site significantly acidic conditions did not develop because of incomplete oxidation of the sewage effluent, thus phosphorus attenuation was incomplete and migration ensued.

Finally, although most soils have a relatively large capacity for natural attenuation of phosphate, the potential for attenuation is probably much less during flow through fractures in bedrock. Thus, septic systems located on thin soils, as often occur in association with lakeside dwellings, are probably most at risk of phosphate contamination. However, we are aware of no field studies that adequately assess the nature of phosphorus migration in thin soil environments, where fracture flow and surface breakout problems are likely to be important transport processes. Certainly septic systems in such environments should be an important focus of future research activity, even though installation of adequate monitoring capability will undoubtedly be an onerous task.

a) Sorption

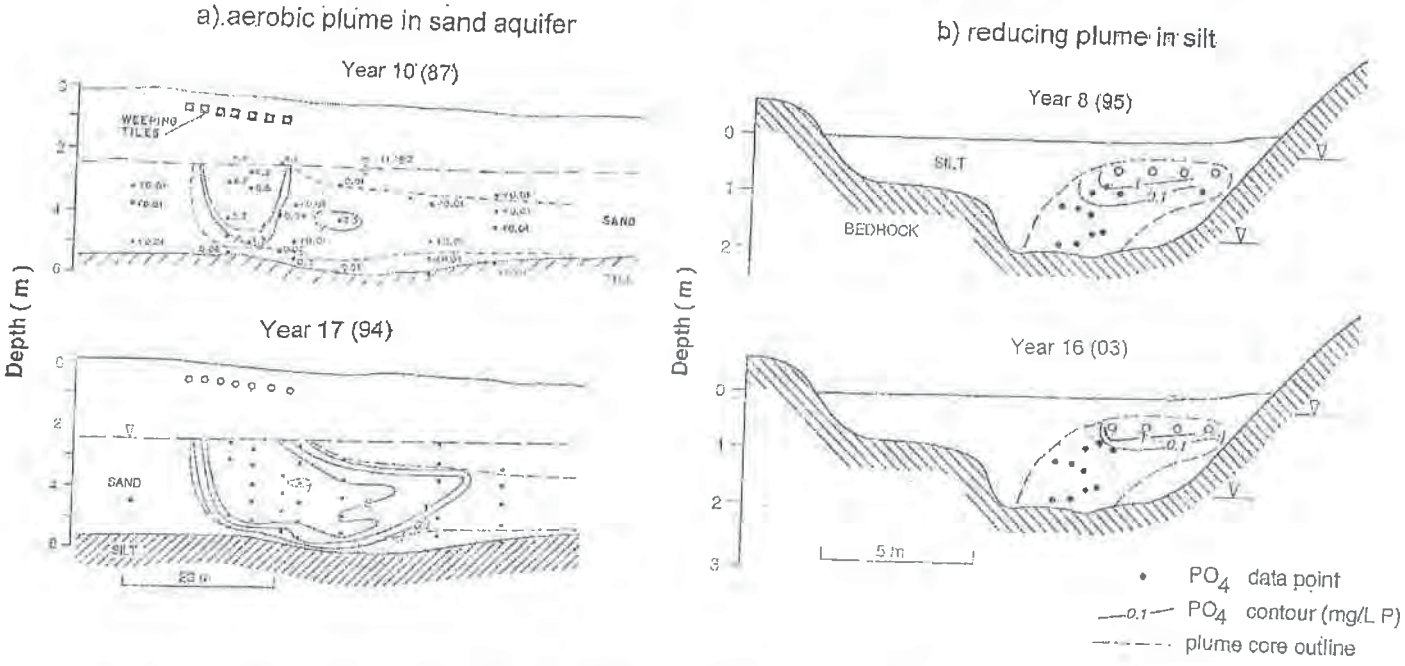
Although phosphorus mineral precipitation reactions appear to be less active once the groundwater zone is encountered, PO_4 often occurs as anionic species (HPO_4^{2-}, $H_2PO_4^-$) that are highly affected by surface sorption processes. When these processes are fast and reversible they result in retardation of the PO_4 migration velocity, but they do not necessarily diminish concentration levels that are present in the groundwater.

However, most laboratory studies have indicated that phosphate sorption is non-linear (varies with phosphorus concentration and pH) and in some cases is not easily reversible (Goldberg and Sposito, 1985; Barrow,1991; Torrent *et al.* 1992; Froussard *et al.* 1995). Non-reversible sorption processes have the potential to further attenuate PO_4 concentrations in the groundwater zone, but field evidence in support of this remains uncertain. As a result of sorption processes, PO_4 migration velocity is almost always much slower than that of other mobile plume constituents such as Cl. In their review of 10 mature septic system plumes, Robertson *et al.* 1998 observed PO_4 zones ranging in length from <2m (sites on silts and noncalcareous sands) to 70m (sites on calcareous sands) and inferred from this, PO_4 retardation factors (ratio of groundwater velocity to solute velocity) ranging from 20-100, based on the periods of usage and the measured groundwater velocities. These represented a variety of sand and silt soils and a variety of wastewater sources. The largest reported PO_4 zone in a sewage plume is that of the Ashumet Valley plume originating from the Otis Military Reserve on Cape Cod. Here a P-rich plume zone with PO_4-P concentrations of 0.3-3 mg/L, extends 600m downgradient where it subsequently discharges to a small lake (McCobb et al. 2003). The groundwater velocity at the site (~130 m/yr) and the period of sewage loading (55 years, 1940-95) implies a retardation factor of ~15 or less for PO_4 migration in the coarse sand aquifer at the site. The precise value cannot be determined because the exact time of arrival of the phosphorus plume at the discharge point is unknown. Laboratory column tests utilizing soil cores from the plume zone suggest a phosphorus retardation factor of about 10 (Walters *et al.* 1995). The magnitude of adsorption is related to the presence of minerals that have a net positive surface charge at normal pH values, including most metal hydroxide species such as ferrihydrite, $Fe(OH)_3$ and gibbsite $Al(OH)_3$. Researchers have used the measured content of these hydroxide species, particularly $Fe(OH)_3$ to predict soil propensity for PO_4 sorption (e.g. Parkhurst *et al.* 2003).

Figure V-4 shows PO_4 plume development during 7-8 years of monitoring at two sites in Ontario, one an aerobic plume on a sand aquifer (Cambridge, R~20) and the second an anaerobic plume on silt (Killarney; Figure V-4; R~100). The higher retardation value for the silt site (R~100) is likely related to higher $Fe(OH)_3$ content in the finer grained silt soils there, although direct measurements were not made. The Cambridge site shows measurable PO4 migration, as expected, based on the retardation equation (phosphorus velocity ~ 1 m/yr), however at the Killarney site, the higher retardation

factor (~100) and slower ground water velocity (~1 m/yr) leads to a phosphorus migration velocity (< 0.02 cm/yr) that is too small to measure at that site.

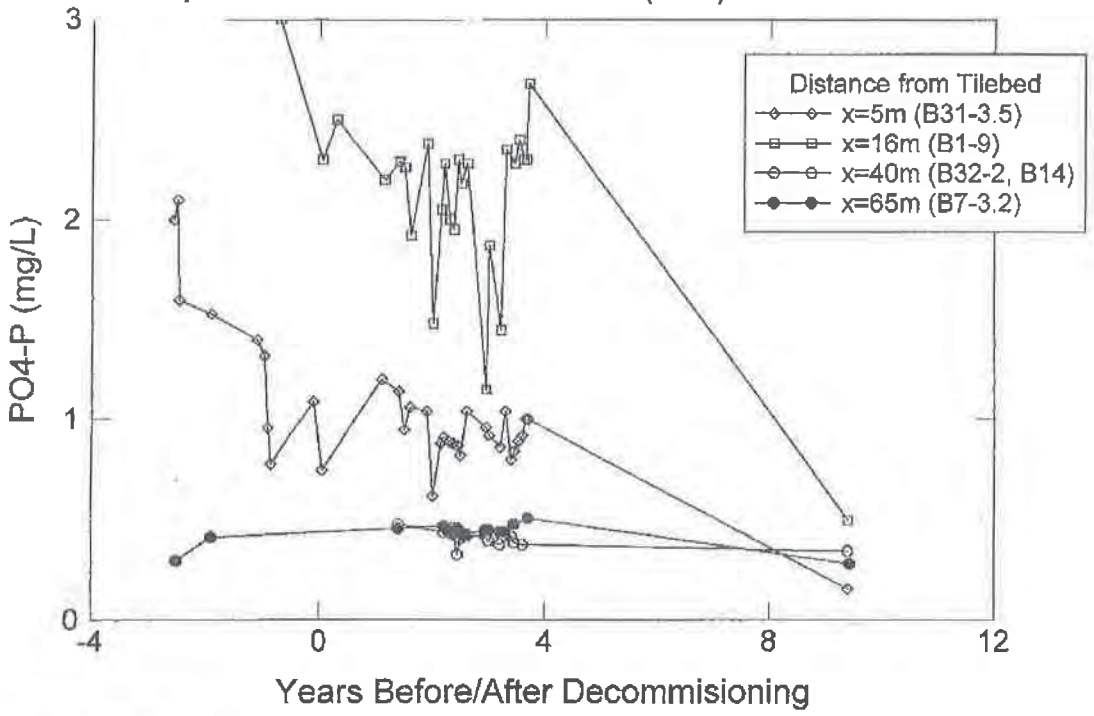
Figure V-4: **PO_4 migration in, a) a septic system plume in an aerobic, calcareous sand aquifer (Cambridge site, house, phosphorus retardation factor (R) =20) and b) in a reducing plume on silt-rich soils (Killarney site, seasonal use cottage, R= 100). Adapted from Robertson *et al.* (1998).**



Some researchers have noted that PO_4 breakthrough in laboratory column tests often persists at levels lower than that expected based on fast, reversible sorption. To explain the variance, they have inferred the presence of a second irreversible or kinetically slow 'sorption' step to account for this behavior (Chen *et al.* 1973; Martin *et al.* 1988; Davis and Kent, 1990; Isenbeck-Schroter *et al.* 1993). Processes such as intra-particle diffusion, slow surface recrystallization, or rate-limited direct mineral precipitation reactions have been suggested to account for this behavior. Examples of this could be the kinetically slow precipitation of hydroxyapatite. Septic system plume water is often found to be supersaturated with respect to hydroxyapatite in calcareous terrain, or vivianite in Fe-rich reducing plumes (Robertson *et al.* 1998). The importance of these slower secondary processes is that they may be less readily reversible and in some cases may constitute a consumption mechanism that can permanently immobilize P. One way to gain insight into the occurrence of secondary rate-limited attenuation processes is to observe the behavior of phosphorus plumes at sites where septic systems have been decommissioned. If secondary processes are active, phosphorus concentrations should slowly decline after the sewage source has been removed. Robertson and Harman (1999) observed phosphorus behavior for a four year period after decommissioning of a public school septic system on a calcareous sand aquifer in Ontario and observed that phosphorus concentrations in groundwater (0.3-2.0 mg/L)

remained remarkably invariant even though all other plume constituents returned to background values within one year of decommissioning. It was inferred that the 70m long phosphorus plume at the site was migrating at a velocity of 1.6 m/yr, based on the 44 year period of use. This represented a retardation factor of ~60 compared to the groundwater velocity of 100 m/yr. Further sampling of the plume in 2003, nine years after decommissioning (Figure V-5) showed that phosphorus concentrations at the proximal monitoring locations, 5 and 16m respectively from the center of the tilebed, showed 50-80% declines in phosphorus concentrations, whereas monitoring points located farther downgradient (40 and 62m) showed virtually no change from the in use period. Declining phosphorus concentrations at the upgradient locations were consistent with the previously indicated phosphorus plume migration velocity (1.6 m/yr) which suggests that the upgradient plume boundary should have migrated ~15 m during the 9 years after decommissioning. Overall, this behavior argues against the occurrence of any slow secondary attenuation reactions. This was observed even though the phosphorus plume zone remained supersaturated (SI +0.3 to +1.9) with respect to crystalline hydroxyapatite in the decommissioned period (Robertson and Harman 1998).

Figure V-5: PO_4 persistence after decommissioning of a septic system on a calcareous sand aquifer (Langton public school, groundwater velocity 100 m/yr). Adapted from Robertson and Harman (1999).



b) Anaerobic Plumes

In reducing plumes where significant concentrations of redox sensitive cations such as Fe may be present, PO_4 behavior could be much different upon decommissioning. If the plume zone is subsequently invaded with aerobic groundwater, Fe^{2+} will be oxidized

to Fe^{3+}, promoting the precipitation of Fe hydroxide minerals (*e.g.*, ferrihydride, $Fe(OH)_3$) which enhance PO_4 sorption, or PO_4 will precipitate directly as sparingly soluble Fe-P minerals such as strengite ($FePO_4.2H_2O$).

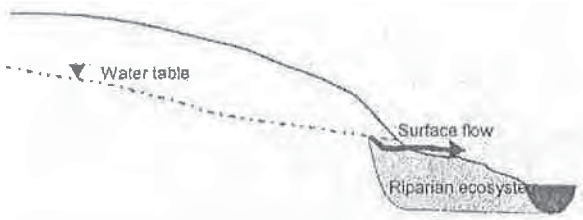
Phosphate behavior in the suboxic, Ashumet Valley plume has been studied extensively by the USGS since decommissioning of the sewage source in 1995 (Walter *et al.* 1996; McCobb *et al.* 2003; Parkhurst *et al.* 2003). The plume has several redox zones, including a proximal core that is devoid of DO, has nitrogen predominantly as NH_4 and has elevated Fe (up to 14 mg/L) resulting from reductive dissolution of ferric hydroxide minerals present in the aquifer promoted by sewage organic carbon load. Farther downgradient, the plume has a suboxic zone in which NH_4 is slowly converted to NO_3 and Fe concentrations decline (<0.1). Walter *et al.* (1996) carried out column tests simulating decommissioning and found that PO_4 concentrations in soils from the proximal anaerobic zone returned to background levels after the passage of five pore volumes of natural groundwater. They concluded that the conversion of Fe^{2+} to Fe^{3+} promoted PO_4 attenuation either by enhanced sorption onto fresh ferric hydroxide mineral surfaces, or by the direct precipitation of Fe-P minerals such as strengite. Parkhurst *et al.* (2003) carried out comprehensive three dimensional reactive transport modeling of the Ashumet Valley phosphorus plume to assist with predicting long term phosphorus loading to the small lake. The model, in addition to surface sorption processes, incorporated equilibrium and rate-limited mineral precipitation/dissolution reactions involving a variety of phosphorus minerals, including variscite, strengite, vivianite, and hydroxyapatite, as well as reactions that affect pH (e.g. organic carbon and NH_4 oxidation) and reactions that affect the concentrations of important cations such as Fe. Sensitivity analyses suggested that reactions involving Fe had the greatest effect on phosphorus concentrations, but that field evidence indicating disequilibrium with important Fe-P minerals such as vivianite and uncertainty in the longevity of ferric hydroxide reductive dissolution reactions, made long term predictions uncertain.

In summary, field evidence suggests that, in aerobic plumes, PO_4 migration in groundwater plumes can be reasonably predicted using the retardation equation, but that in reducing plumes mobility is more difficult to predict because of the strong interaction of PO_4 with redox sensitive cations such as Fe.

3. Septic System Phosphorus in the Riparian Zone

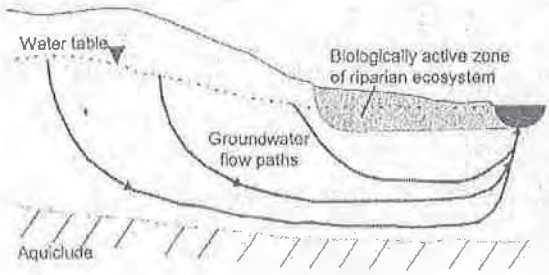
Septic system phosphorus removal in the riparian or hyporheic zone (HZ) is dependent upon groundwater flow paths, as illustrated in Figures V-6 to V-8, to ensure plume contact with the biogeochemically active HZ.

Figure V-6: Riparian Zone – Groundwater Seeps



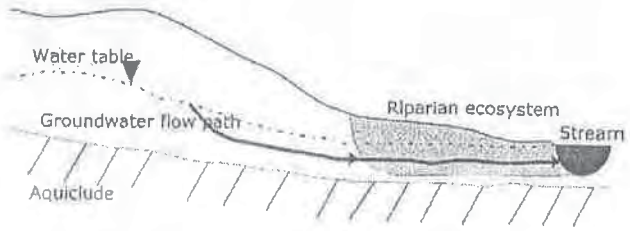
- Groundwater moves as surface flow across riparian ecosystem
- Lower groundwater N removal

Figure V-7: Riparian Zone – Deep Groundwater Bypass Flow



- Groundwater moves under riparian ecosystem
- Low groundwater N removal

Figure V-8: Riparian Zone – Shallow Subsurface Groundwater Flow



- Shallow groundwater moves through riparian ecosystem
- High groundwater N removal

Source: Groffman, P.M. (2003)

Limited research has been performed on septic system phosphorus changes in the riparian zone, in part due to sampling difficulties, (Wood, 1993).

A number of researchers (Moser *et al*, 2003; Correll, 1996) have described the reducing conditions in riparian/hyporheic zones that would entail elevated concentrations of Fe^{2+} as described in the Rapid Attenuation Zone (Section V.E.1.a) and the phosphorus removal mechanisms described therein presumably would occur.

F. Summary

1. Summary of PO_4 Behavior in the Subsurface Environment

1) The concentration of PO_4 that occurs in septic system plumes appears to be strongly affected by attenuation reactions that are focused in the "rapid attenuation zone" immediately underlying the tilebed infiltration pipes. Migration velocity in the groundwater zone however, appears to be controlled by sorption reactions that are both fast and reversible. In most silt and clay rich soils, because of the relatively slow groundwater velocities present (<10 m/yr) and high PO_4 retardation factors (>30), PO_4 migration, via intergranular flow, will be so slow (<0.3 m/yr) that impact on adjacent water bodies will generally not occur except over extremely long time periods (centuries). In sand aquifers however, where larger groundwater velocities are present, PO_4 migration of up to several meters per year may occur. In these environments impact on nearby surface water bodies can occur over much shorter time frames (decades).

2) Phosphorus concentrations in septic tank effluent are remarkably consistent (~8 mg/L average, range 3-20 mg/L) considering the variable nature of wastewater that enters septic tanks. This may indicate that mineral precipitation/dissolution or sorption/desorption reactions actively occur in the septic tank and control phosphorus levels. One possibility is that the ferrous phosphate mineral, vivianite, precipitates in the tank, as it has been noted that septic tank effluent often approaches or exceeds vivianite equilibrium.

3) When septic tank effluent is discharged to tilebeds, PO_4 concentrations can be substantially attenuated in the phosphorus "rapid attenuation zone", the biogeochemically active horizon coinciding with the zone of most intense sewage oxidation. This zone is usually located within several meters of the infiltration pipes and is characterized by accumulation of phosphorus in the soils.

4) The most complete removal of phosphorus in the rapid attenuation zone (up to 99%) occurs at locations where the soils are devoid of carbonate minerals such as calcite, in which case low pH conditions, caused by the oxidation of sewage organic carbon and NH_4, can persist in the subsurface environment. Low pH enhances PO_4 sorption and can promote the precipitation of an Al-P phase, potentially variscite ($AlPO_4.2H_2O$). At pH values < 5.5, the precipitation of variscite has the potential to maintain PO_4 concentrations at very low levels.

5) The least effective removal of phosphorus in the rapid attenuation zone appears to occur in soils that are carbonate-rich, in which case the acidity generated by the oxidation reactions is rapidly buffered and neutral pH conditions are maintained. Significant phosphorus removal (20-50%) may

still occur in calcareous soils however, but in this case the process appears to be related to the conversion of Fe^{2+} to Fe^{3+} at the redoxcline and the subsequent precipitation of the sparingly soluble Fe-P mineral strengite ($FePO_4.2H_2O$).

6) At locations where sewage oxidation reactions are incomplete, neutral pH conditions will normally be maintained and ferrous iron will persist in the plume. Under these conditions the potential for phosphorus removal in the rapid attenuation zone is probably lower.

7) When a septic system plume reaches the groundwater zone, if aerobic conditions are present, concentrations of PO_4 appear to be consistent; that is, further secondary attenuation reactions do not occur. Migration velocity is strongly retarded, however, likely by sorption reactions that are related to the presence of minerals with positive surface charges (*e.g.*, ferrihydride) at normal pH ranges. These sorption reactions appear to be both fast and slowly reversible.

8) In most sand aquifers PO_4 exhibits a retardation factor in the range of 10-100 whereas retardation in silty soils appears to be higher (>30). Thus, in sand aquifers which generally have groundwater velocities in the range of 10-100 m/yr, PO_4 plume migration velocity will be in the range of 0.1-10 m/yr, whereas in silt soils where groundwater velocities in the range of 1-10 m/yr are common, PO_4 migration velocity will normally range from 0.01-0.3 m/yr. In clay rich soils which normally have groundwater velocities <1 m/yr, PO_4 migration via intergranular flow will normally be < 0.03 m/yr.

9) In reducing plumes, predicting the mobility and persistence of PO_4 is less certain because of the complexity of reactions involving Fe (e.g. reductive dissolution of ferric hydroxide minerals may cause increasing concentrations of Fe along the flowpath) and the strong interaction of PO_4 and Fe.

G. Impact of Wastewater Pretreatment

With pre-treated wastewater, anaerobic conditions are less likely to occur and therefore iron phosphorus precipitation may be reduced. When pre-treatment includes nitrification, (required for de-nitrification), acidic conditions for aluminum dissolution may be less likely to occur and then mineralization of aluminum-phosphorus compounds (variscite) may be significantly diminished. Thus the potential for further attenuation of PO_4 in the subsurface may be less when secondary treated wastewater is applied, but field studies of pre-treatment are presently lacking and are needed. Also note that pretreated wastewater may have lower initial PO_4 concentration as a result of phosphorus removed by sludge precipitation, filtration, etc.

VI. CASE STUDIES

This section presents case histories of six sites depicting phosphorus behavior in different types of soils and relates this to the geochemistry of the septic tank soil absorption systems presented earlier in this report. Cited references are included. The sites selected represent typical sand and silt characteristics, both calcareous and noncalcareous, acidic and non-acidic conditions. The tables included at the end of this section present a summary of the phosphorus removal process (Table VI-1) and summarize the phosphorus behavior at each case history site.

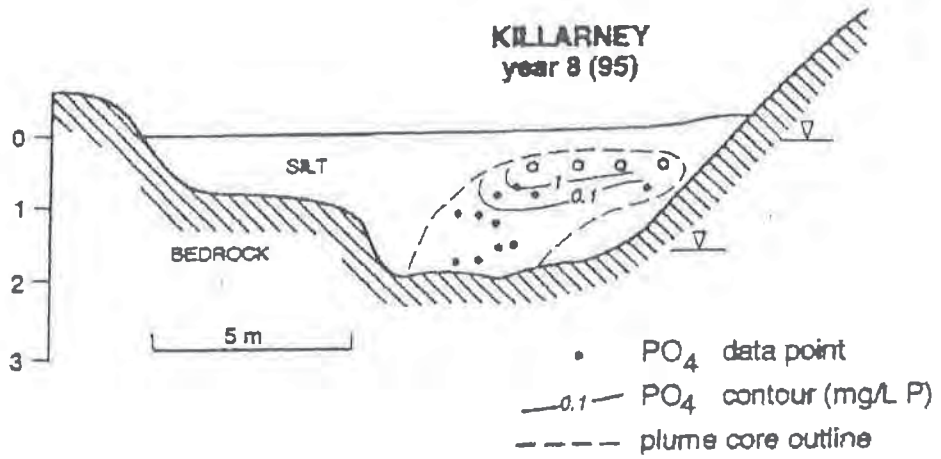
Case History No. 1: Killarney Site (Noncalcareous Silt)

The Killarney site is located 50 km south of Sudbury, Ontario, Canada. The overburden material consists of distinctly varied clayey to sandy lacustrine silt. The septic system is constructed within an isolated 2 meter thick silt pocket that is surrounded by granitic bedrock outcrop and is located 20 meters from a soft-water lake. Acidic conditions dominate at this site. The lake has low $CaCO_3$ equivalent alkalinity (< 1 mg/l) and is acid stressed, pH = 5.3. The area is prone to acidification because of the limited buffering capacity of the granitic and quartzitic terrain and the associated thin silty overburden.

The septic system, installed in 1987, serves a seasonal-use family cottage and is used six months of the year. Wastewater is generated from dishwashing, washbasin, and toilet facilities in the cottage, but no showering and clothes laundering is done. Water usage is 180 l/d during peak use in July and August, and about 50 l/d during the remaining four months. The septic system consists of a 3,000 liter septic tank, and a 47 m^2 infiltration bed. The 4" perforated PVC infiltration pipes were placed at a depth of 0.5 to 1.0 m, and are separated from the bedrock by a 1 m thickness of native lacustrine silt.

The soil characteristics are (soil's gradation by weight):
Sand (>0.053 mm): 5 %; Silt ((0.053-0.002 mm) 94 %; and Clay (<0.002 m): 1 %; $CaCO_3$: 1.6 wt. %; the water table rises to surface in spring, and falls to near the bedrock surface (2 m depth) during summer. The plume pH = 5.5; Phosphorus Retardation factor is >100; EC >200 μmhos/cm; and DOC = 44 mg/l.

Figure VI-1: Killarney Soil Diagram



The acidic soil conditions, and oxidation of the septic tank effluent constituents, such as, organic carbon and ammonia has resulted in lower pH conditions in this poorly buffered lacustrine silt. P removal of > 99% occurs within 0.5 m of the tiles, possibly as a result of precipitation of the Al-P mineral – variscite ($AlPO_4,2H_2O$) or the Fe(III) – P mineral strengite, or as a result of sorption reactions. With pH values less than 5.5, the precipitation of variscite has the potential to maintain PO_4 at very low concentration over a long period. The P plume has migrated <1 m in 17 years (1987-2003), and the P concentration at points >0.5 m from the tilebed is <0.01 mg/l. This indicates that P has a very high retardation factor (>100) and PO_4 migration is limited at this site. Therefore any impact on the adjacent water body would occur only over an extremely long period (centuries).

References:

Robertson, W.D., and D.W. Blowes.1995. Major ion and trace metal geochemistry of acidic septic system plume in silt. *Ground Water*, 33:275-283.

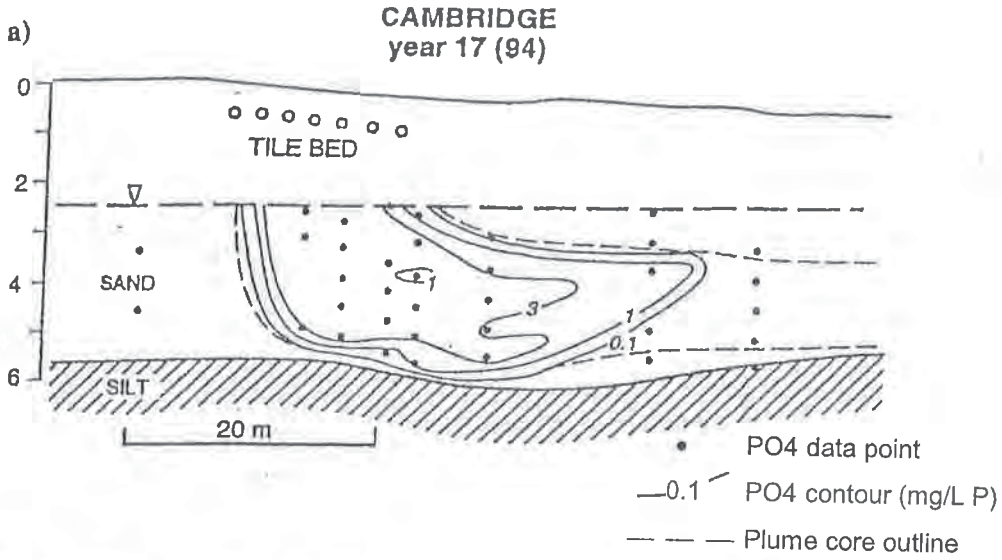
Robertson, W.D., S.L. Schiff, and C.J. Ptacek. 1998. Review of phosphate mobility and persistence in 10 septic system plumes. *Ground Water*, 36:1000-1010.

Case History No. 2: Cambridge Site (Calcareous Sand)

The Cambridge Site is located 100 km west of Toronto, Ontario, Canada. The septic system beds have served a four-person household since 1977 and has a gravity fed soil absorption (infiltration) field of 100 m^2. The flow to the system was metered between March and November of 2000, and averaged 1.3 m^3/day.

The soil characteristics are (gradation by weight):
Sand (0.06-2mm): 97%; Silt and Clay: 2.8%; Gravel: 0.30%; $CaCO_3$: 27%; CEC (Cation Exchange capacity): 5.0 meq/100g; pH: 7.0; Water table at 2.5 m depth.

Figure VI-2: Cambridge Soil Diagram



Septic System Plume: 500 monitoring points were installed to study the plume, enabling a detailed study. 75% of the septic tank PO_4-P concentration migrated through the vadose zone and formed a distinct P plume below the tile bed. The aquifer had limited dispersive capacity and dilution for a distance of more than 100 meters downgradient. A bromide tracer was used to determine groundwater velocities within the plume, which indicated that the septic tank effluent resides in the unsaturated zone for about 10 days, and then migrates laterally at a rate of 24 m/yr. In the shallow water table zone, PO_4-P advanced much slower, at a rate of 1 m/yr. High concentration of P in the proximal zone plume, 4.8 mg/l (approximately 75 % of the septic tank effluent value) indicates that the calcareous sand with neutral pH (7) has limited capacity to attenuate P in close proximity to the tile bed.

This site is typical of many permeable sands used for on-site sewage disposal. The P retardation factor in the groundwater zone was about 25 at this site, thus migration velocity was modestly slow (4% of plume velocity) plume travel rate. Figure VI-2 shows the P plume zone along the plume core cross-section.

Reference:

Robertson, W.D., S.L. Schiff, and C.J. Ptacek. 1998. "Review of phosphate mobility and persistence in 10 septic system plumes." *Ground Water*, 36:1000-1010.

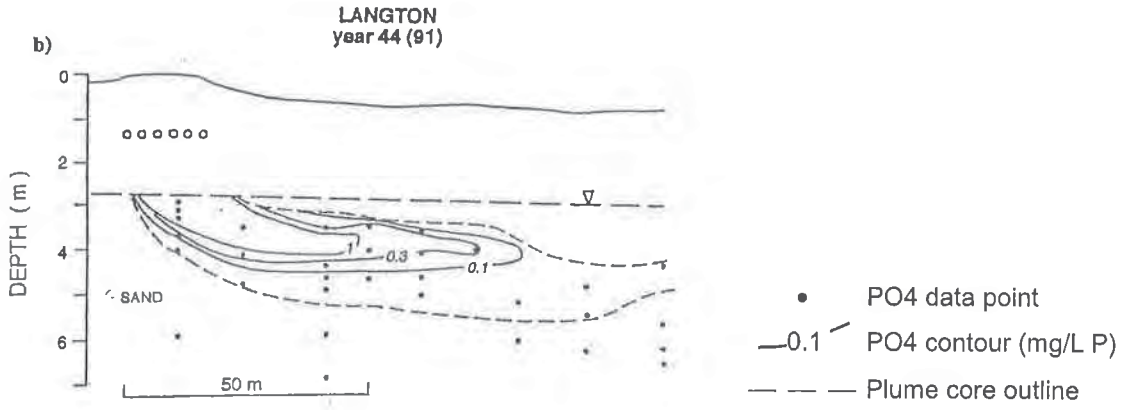
Case History No. 3: Langton Site (Calcareous Sand)

The Langton site is located in the Town of Langton, Ontario, Canada. The site is on a flat-lying deltaic sand deposit that supplies water to the local residents, mostly from shallow wells. The unconfined aquifer consists of homogeneous fine to medium sand to a depth of 8 meters, and is underlain by deposits of sand, silt and clay. The study

highlights the migration of a PO_4 – P plume in a calcareous sandy soil, typical of many sites used for disposal of septic tank effluent. The P plume was also studied after the tile bed was decommissioned.

The plume characteristics are: DOC: 0.70; pH: 6.6; Water table: 3.0 m depth.

Figure VI-3: Langton Soil Diagram



The study site is an elementary school with 200 students. The septic system was in operation for 47 years, starting in 1947 and was decommissioned in 1994 when a replacement infiltration bed was constructed. The long-term usage at this site enables one to assess the extent of the long-term capacity of the subsurface to attenuate the sewage derived contaminants. The estimated sewage flow was 30 l/d per student (6,000 l/d total flow). The septic system consists of 325 m^2 infiltration bed fed by gravity into open joint clay pipes positioned 1.5 m below the surface and 1.6 m above the average water table depth of 3.1 m.

400 monitoring points were installed in the area below the tile bed and for a distance of 110 m, downgradient. Extensive sampling in 1991 mapped the plume in detail. A bromide tracer test indicated that the septic tank effluent resides for one to two weeks in the vadose zone, and then enters the groundwater, traveling at a velocity of about 100 m/yr. The enriched PO_4 zone extends for a distance of 70 m and has PO_4-P in the range of 0.3 to 2 mg/l. Beyond 70 m distance, PO_4 levels decline to background values (< 0.05 mg/l P). The P retardation factor (R) is approximately 60 based on the apparent PO_4 migration velocity of 1.5 m/yr compared to a groundwater velocity of 100 m/yr.

The slightly calcareous soil at this site retained 85 % of PO_4 in the 1.6 m thick vadose zone even after 47 years of the infiltration bed use.

In conclusion, the calcium rich sands have moderate sorption capacity, and moderate capacity for precipitating P in the vadose zone. As a result, P migration velocities can be significant (~1 m/yr), which in some cases may lead to a need to protect adjacent surface water bodies.

References:

Harman, J., W.D. Robertson, J.A. Cherry, and L. Zanini. 1996. Impacts on a Sand Aquifer from a Septic System: Nitrate and Phosphate. *Ground Water*. 34:1105-1114.

Robertson, W.D., S.L. Schiff, and C.J. Ptacek. 1998. "Review of phosphate mobility and persistence in 10 septic system plumes." Ground Water, 36:1000-1010.

Robertson, W.D. and J. Harman. 1999. Phosphate Plume Persistence at Two Decommissioned Septic System Sites. *Ground Water*, 37: 228-236.

Case History No. 4: Point Pelee – Camp Henry (Calcareous Sand)

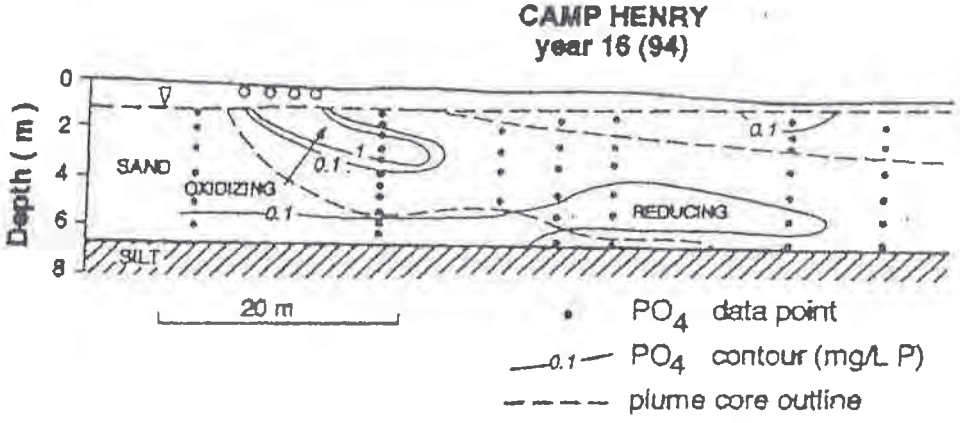
Point Pelee site is located in Point Pelee National Park (PPNP), Ontario, Canada along the north shore of Lake Erie. PPNP encloses the internationally protected Point Pelee marsh. PPNP receives 500,000 visitors and staff annually; wastewater is disposed through 30 separate tile beds. One of these, the Camp Henry site, is presented here.

The soil at the Camp Henry site consists of 7-8 m of poorly sorted sand with occasional pebble layers. The sands consist of 60% quartz, and 25% limestone, including shell fragments, and lesser amounts of microline, Ca-plagioclase, magnetic, epidote, amphibole, and kyanite. Below the acidified sand aquifer is low permeability clay till.

Wastewater at the site is from seasonal toilets and showers used by a day population of 50 persons, resulting in approximately 2,500 l/d of effluent which is gravity fed to the tile bed. In 1995, after 16 years of use, flow was diverted from the old tile bed to a new raised tile bed.

The aquifer's characteristics are (gradation by weight):
99 % sand with mean grain size of 470 μm and 1% silt + clay. This water table has a seasonal low depth of < 1.5 m; background groundwater pH is neutral (7).

Figure VI-4: Camp Henry Soil Diagram



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The observed groundwater plume from the old tile bed was at least 60 m long, 40 m wide, and 7 m thick. Thus, over a 16 year period, the plume has traveled at a velocity of >3.8 m/year. Directly below the tile bed, unsaturated zone, NH_3 and DOC are oxidized and some P is removed. NH_3-N decreased from 90 mg/l to 15 mg/l, and NO_3 increased from 0.05 mg/l to over 80 mg/l. Similarly, DOC decreased from > 30 mg/l in the effluent to a maximum of 13 mg/l in the plume. Concentrations of P in the effluent (12 mg/l) decreased to 1 - 1.5 mg/l at the edge of the tile bed. This attenuation process has increased the solid phase concentration of P from <300 mg/Kg in the background soil to >700 mg/Kg in the attenuation zone. The groundwater chemistry at the site can be divided into discrete redox zones. There is a shallow, 2-3 m thick suboxic zone close to the tile bed with elevated Mn and Fe, and intermediate Eh values (400 mv). At the base of the aquifer, there is 2-3 m thick reducing zone with low Eh values, <200mV.

The P migration conditions that prevail in this permeable sand are of concern because of moderately high groundwater velocities and the proximity of surface water environment. Elevated concentrations of P levels were found in the suboxic zone, close to the tile bed, > 3.0 mg/l, and in the reducing zone P levels were >0.3 mg/l for a distance of 60 m from the tile bed. These P levels are well above levels needed to cause algal blooms when released to surface water bodies. The 30 tile beds at the site are considered sufficient to contribute to the development of local eutrophic conditions in the associated park surface waters.

References:

Ptacek, C.J.. 1998. Geochemistry of Septic System Plume in a Coastal Barrier Bar, Point Pelee, Ontario, Canada. *Journal of Contaminant Hydrology*. 33: 293-312.

Robertson, W.D., S.L. Schiff, and C.J. Ptacek. 1998. "Review of phosphate mobility and persistence in 10 septic system plumes." Ground Water, 36:1000-1010.

Ptacek, C.J., D.L. Thompson, D.W. Blowes, A.S. Crowe, A.R. Pratt. 1999. Release of Wastewater Phosphorus from an Aquifer into Point Pelee Marsh. *Wetlands & Remediation: An International Conference*. Salt Lake City, UT. 215-222.

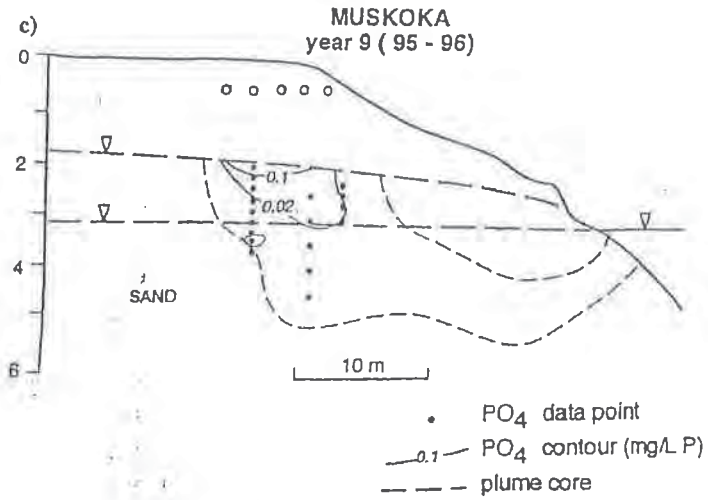
Case History No. 5: Muskoka Site (Noncalcareous sand, acidic)

The Muskoka Site is located on the edge of the Muskoka River near the town of Bracebridge, Ontario, Canada. At this site, fine to medium fluvial sand occurs to a depth of 10 m and overlies granitic bedrock which outcrops within 100 m of the site. The shallow unconfined sand aquifer is noncalcareous sand and background groundwater is acidic (pH ~5.7).

The septic system was installed in 1987 for a two-person household, which generates typical domestic wastewater including laundry and automatic dishwasher effluent. The infiltration bed (80 m^2) is gravity fed and is located 20 meters from the edge of the Muskoka River.

The aquifer soil characteristics are (gradation by weight):
Sand (0.06-2mm): 87%; Silt: 13 %; Clay (<0.002 mm): 0%; $CaCO_3$ equivalent content, 0.4 %; CEC: 2.2 meq/100g; the average water table at 3 m; background groundwater has pH: 5.7; DOC: 1.6 mg/l; EC: 75 µmhos/cm.

Figure VI-5: Muskoka Soil Diagram



250 monitoring points were installed. The septic system plume was found to migrate ~20 m to the edge of the river after about one year of operation, thus, the groundwater flow rate is ~20 m/yr. Similar to the Killarney site, DOC and NH_4 are oxidized in the unsaturated zone causing acidic pH values in the plume. pH values of 4.5 to 5.6 occur in the plume core zone. The location of the septic system plume is clearly indicated by the presence of elevated EC values (> 300 µS) but PO_4 levels remained <0.01 mg/l throughout the groundwater plume zone. Phosphate at the site is probably attenuated by precipitation of the sparingly soluble minerals, such as variscite ($Al\text{-}PO_4 \cdot 2H_2O$) in the vadose zone.

This site presents an example of a permeable sand where P is not present in the plume and there has been no detectable migration of phosphate during 13 years of its operation. With $CaCO_3$ at a very low level, the soil provided no buffering capacity and, consequently, precipitation of variscite has prevented migration of phosphate.

References:

Robertson, W.D., J.A. Cherry, and E.A. Sudicky. 1991. Ground-water contamination from two small septic systems on sand aquifers. Ground Water. 29: 82-92.

Robertson, W.D., S.L. Schiff, and C.J. Ptacek. 1998. "Review of phosphate mobility and persistence in 10 septic system plumes." Ground Water, 36:1000-1010.

Zanini, L., W.D. Roberston, C.J. Ptacek, S.L. Schiff. 1998. Phosphorus characterization in soils impacted by septic effluent at four sites in central Canada. Journal of Contaminant Hydrology. 33: 405-429.

Case History No. 6: Ashumet Valley Plume (Noncalcareous sand , with pH<7)

The Ashumet Valley Plume Pond is on Cape Cod, Massachusetts. The site is on a sand and gravel glacial-outwash plain on western Cape Cod known as the Mashpee Pitted Plain. The soils consist of medium to coarse-grained glaciofluvial sand and gravel underlain by deposits of fine to medium glaciolacustrine sand and silt. The uncontaminated groundwater in the aquifer has: pH: ~5.6; specific conductance < 80 μS/cm; DO concentration > 8 mg/l; P < 0.01 mg/l; Fe & Mn < 0.01 mg/l; and Boron < 0.05 mg/l. This case history presents the longest P plume migration from an on-site sewage disposal system.

The sewage source is from the Massachusetts Military Reservation (MMR), which discharged secondary treated effluent into local infiltration beds beginning in 1936 until termination in 1995 (60 years of operation). Ashumet Pond is ~500 meters from the infiltration beds, and the sewage-contaminated plume has been tracked to local discharge points along the western shore of the pond. The plume has migrated at a groundwater velocity of ~130 m/y, and the length of the P plume (~500 m) indicates a relatively low P retardation factor of <15 over the 60 year migration period.

The phosphate plume discharges have affected Ashumet Pond water quality. The plume has a relatively high concentration of PO_4-P (up to 5 mg/l) within 100 m of the shoreline. Along 267 m length of shoreline, P concentration in the pond bottom pore water exceeds the background level of 0.1 mg/l. P values as high as 2-3 mg/l occur within 10 m from the shoreline. Comprehensive data collection has enabled phosphorus flux calculations into the pond, which is estimated at up to 316 Kg/year. This flux is concentrated in a narrow zone near the shore where vigorous upward flow occurs. The pond is currently considered a mesotrophic system, and further increases in P-stimulated algal growth will likely result in the pond deteriorating to a eutrophic state. Mesotrophic lakes have middle fertility that are biologically productive, but not to an extent that their ecology is dominated by algae blooms.

The noncalcareous sand in this case, did not prevent the migration of phosphate from the infiltration beds. Apparently sufficiently acidic condition did not develop to completely attenuate P in this case, possibly as a result of the incomplete oxidation of the sewage constituents in the vadose zone below the infiltration bed.

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Figure VI-6: Migration of Phosphate Plume into Ashumet Pond in Ashumet Valley, Cape Cod, Massachusetts

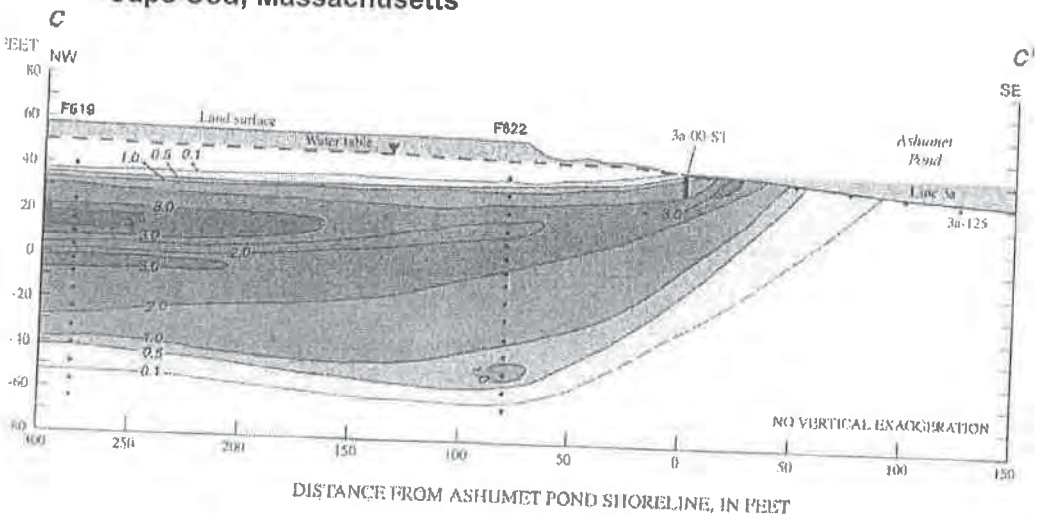


Table VI-1: Septic System Phosphorus Geochemistry

Subsurface Materials	Principal Phosphorus Geochemical Mechanisms	Capacity / Comments	Case Studies	Additional Comments
Silt	Sorption + Ppt.		▪ Killarney	
Calcareous Sands	Sorption + Fe-P Precipitation	▪ Removal capacity limited ▪ Retardation factor* of ~30	▪ Cambridge ▪ Langton ▪ Point Pelee	
Noncalcareous	Precipitation of Al-P mineral variscite due to solubilizing of Al with acidic conditions caused by ammonia nitrification	▪ P concentration <0.1 mg/l Possible ▪	▪ Muskoka ▪ Ashumet	Phosphorus removal may not occur without Al solubilization
Reduced environments	Reductive iron dissolution mineralization to vivianite and strengite	▪ Vivianite produced in reduced environment ▪ Strengite produced when oxidized environment encountered	▪ Point Pelee	Phosphorus will be released from strengite if anaerobic conditions redevelop

* *Retardation factor is ratio of groundwater velocity to phosphorus plume velocity.*

SECTION II: RESEARCH PRIORITIES

VII. RESEARCH NEEDS

In a prior document (Gold and Sims 2000), a number of research priorities relating to P contamination from on-site sewage disposal were outlined. The authors' recommend further work relating to the following topics;

1) further microscale assessment of P transport and dynamics in septic system plumes
2) development of standardized methodologies for assessing P dynamics and transport at the microscale
3) continued rigorous assessment of alternative technologies for improved P removal
4) further microscale studies relating to 'sink' or 'hotspot' areas of P attenuation
5) development of site indexing to assess vulnerability to nutrient loading from septic systems at the landscape and watershed scales rather than through site specific investigations
6) as well as producing a practitioner's manual on determining how sites can be relied upon for P removal, which will also, conversely, identify sites requiring P removal prior to discharge, especially in light of pre-treatment of wastewater, which may change expected subsurface geochemical phosphorus removal.

In the last several years research advances relating to these topics have, in general, been modest, thus the priorities listed above remain valid. However, additional comments are provided below.

1) Further microscale plume assessment

While a number of septic system plume studies have been presented in recent years (*e.g.*, Robertson *et al.* 1998, McCobb *et al.* 1999, Ashumet Valley plume), important information gaps still remain that warrant further site specific investigations.

a. Impact of Pretreatment on Subsurface Phosphorus Removal

With pre-treated wastewater, conditions are less likely to occur for phosphorus removal by iron phosphorus and aluminum phosphorus mineralization. Field studies of phosphorus removal with pre-treated wastewater are presently lacking and are needed.

b. Validity of mineral solubility and adsorption controls;

There is recurring evidence that several P minerals often suggested as important controls on concentrations in groundwater plumes, exhibit persistent supersaturation under field conditions. These include hydroxyapatite [$Ca_5(OH)(PO_4)_5$] in several neutral-pH plumes on calcareous sands (Cambridge, Langton, Long Point, Point Pelee plumes; Robertson *et al.* 1998; Ptacek *et al.* 1999) and vivianite ($Fe_3 (PO4)_2.8H_2O$) in several Fe-rich, reducing plumes (Ashumet Valley, Point Pelee plumes, McCobb *et al.* 1999, Ptacek *et al.* 1999). These observations suggest that there are kinetic limitations to the formation of the secondary minerals, and that equilibrium may not be attained under the groundwater flow conditions observed at these sites. Although equilibrium is not observed in field studies, equilibrium may be attained with respect to more soluble and less crystalline precursor phases. Several studies that have been successful in isolating secondary P solids in septic system plumes (Zanini *et al.* 1998, Ptacek and Pratt 1998; Robertson, 2003) have observed chemical compositions which differ somewhat from the common P-minerals for which solubility data is available (*i.e.*, hydroxyapatite, vivianite, strengite and variscite). Thus further work is warranted to more rigorously assess the nature, solubility and kinetics of formation of the solid phases that control P in septic system plumes. This is important because current studies suggest that, in some cases, mineralogical controls are capable of attenuating >99% of the sewage P mass within a few meters of the infiltration pipes (Robertson *et al.* 1998; Robertson, 2003).

Several studies have suggested that adsorption reactions play an important role in attenuating phosphate. Whereas there appears to be compelling evidence that mineral precipitation reactions dominant directly below the tile lines, the relative importance of precipitation versus adsorption is less clear further along groundwater flow paths. More information is needed on the relative importance of adsorption versus precipitation for a variety of site-specific conditions, and for a given site, as pH and oxidation/reduction conditions evolve over the life of a septic system plume.

c. Further confirmation of low pH, low P, septic system plumes in non calcareous terrain;

There are now several examples of acidic to very acidic conditions (pH 5.5-3) developing in septic system plumes on noncalcareous sands (Robertson *et al.* 1998, McCobb *et al.* 1999; Robertson, 2003). These low pH values result from acidity generated by the sewage oxidation reactions, including oxidation of DOC and oxidation of NH_4^+. The low pH waters normally contain elevated Al concentrations, which in turn have the

potential to limit P to very low concentrations (<0.1 mg/L) as a result of the precipitation of sparingly soluble Al-P minerals with compositions similar to the mineral variscite. In consideration of the potential importance of this attenuation reaction and the rather limited data that is currently available, additional case histories should be developed to further assess the potential for acidic conditions to develop in plumes on these terrains, and to identify the exact phases controlling P concentrations under acidic conditions. Such studies should also investigate other side effects associated with low pH conditions, particularly enhanced mobility of trace metals.

d. P migration via fracture flow, macropores, interflow and overland flow;

There are number of transport pathways that allow 'short circuiting' of septic tank effluent away from the normal porous media flowpaths where the principle natural attenuation processes occur. These include migration via bedrock fractures, overburden macropores (i.e., animal burrows, root channels), and surface 'breakout' with associated overland flow. We are aware of few studies that have been successful in rigorously documenting such transport pathways (Wood, 1993), particularly from a mass flux perspective, thus further work is recommended. This migration pathway has the potential to be of particular importance at many 'cottage country' lakes where onsite sewage disposal often occurs at the minimum setback distances (15-20 m) from the lakeshore, overburden is often thin and slopes may be steep. In these environments, installation of an appropriate monitoring network is often a daunting task, which is the reason few studies have been undertaken. Gachter *et al.* (1998) identified soil macropores and artificial drainage systems as the most important pathways for the vertical and horizontal transport of phosphorous from P enriched soils to water bodies

e. Processes controlling P migration after cessation of wastewater disposal

There is increasing evidence that release and transport of P will continue to be released from some septic systems long after wastewater disposal ceases (Walter *et al.*, 1996; Robertson and Harman, 1999; Ptacek *et al.*, 1999). It appears this release occurs due to long-term dissolution and desorption of P that was attenuated during the active stage of wastewater disposal. After wastewater disposal ceases, production of acid ceases, and an increase in pH is observed, potentially promoting P release. At other sites, if reducing conditions are maintained or become established, release of P can occur through reductive dissolution or desorption of P bound to Fe(III) or Mn(IV) phases. There is concern that this continued release of P from abandoned septic systems may contribute to P loading

to surface water bodies for many years or longer after abandonment. It is unclear which sites will release P and for what duration. Studies are required to identify the geochemical processes controlling P release and to assess the duration of the release after cessation of wastewater disposal.

2) **Development of standardized methodologies for assessing P transport at the microscale**

There is a need to develop standardized methodologies at the microscale if P transport is to be assessed at the regional scale. These methodologies include standardized site characterization programs, standardized groundwater transport study protocols, and standardized geochemical speciation and groundwater reactive transport models. From this standardized information, assessments of regional-scale fate and transport of P can be developed.

The mobility of P is dependent on a number of site-specific properties, such as grain size, depth to water table, and mineralogy of soil and aquifer solids. Whereas methodologies such as those used to quantify grain size are relatively uniform, other tests that are used to characterize other aquifer properties (e.g. mass of iron and manganese oxide coatings, clay type and content), are less well standardized. Extrapolation of results from individual research sites will only be possible if consistent methods are used at all the research sites, and if these methods are practical for application at the regional scale.

A number of approaches are available for instrumenting septic system sites to evaluate the fate and transport of P. These approaches range from intensive characterization programs that include collection of hundreds of water samples over several years or longer, to relatively simple monitoring programs which rely on a few samples over one season. Given the wealth of information that can be derived from detailed monitoring programs, it is desirable to carry out additional detailed studies under more varied regional conditions, so that detailed information on P transport becomes available for a wider range of geological conditions and soil types. These sampling programs should include installation of large arrays of piezometers. Groundwater should be sampled and analyzed to provide a comprehensive data set to provide the relevant geochemical information for interpreting the mechanisms controlling P transport and attenuation. Samples should be analyzed in a consistent manner for the various P forms (ortho-phosphate, total P, etc), and for parameters which are required to interpret P transport data, including pH, concentrations of major ions, and oxidation-reduction indicator species.

These studies should also include an evaluation of N dynamics, given the close association of redox reactions and P and N transport. Consistent field sampling techniques should be employed. For example, samples are often collected for analysis of total P and o-PO_4 without using preservation. If a groundwater plume contains elevated concentrations of ferrous iron, precipitation of this iron after sample collection may lead to scavenging of PO_4 and reporting of erroneously low concentrations of PO_4. Similarly, if an alternative system is being evaluated to assess the removal of P, information on the broader geochemistry is needed, and suitable sampling methods employed, to provide representative and comprehensive data sets to fully interpret processes controlling P attenuation.

Standardized modeling approaches should be employed to assess the fate and transport of P at the microscale. To date, geochemical speciation calculations to assess solubility and adsorption processes controlling P in septic system plumes have utilized a variety of geochemical computer codes, and different sets of thermodynamic constants for aqueous species, solubility constants, and surface constants for reactions directly affecting P concentrations and overall geochemistry. These differences lead to potentially different interpretations of the processes controlling P fate and transport. Use of a consistent database for P reactions is recommended.

There are a number of comprehensive reactive-solute transport models that incorporate physical, chemical and microbiological processes, including advection, dispersion, mineral precipitation-dissolution reactions, adsorption-desorption reactions, oxidation-reduction reactions, microbiologically mediated reactions and representative kinetic rate equations. There is a need to apply these models in a rigorous manner to existing plume chemistry data at a number of sites in geologically diverse terrain. These models should be applied in a consistent manner and used to assess the sensitivity of P transport to variations in aquifer characteristics. Geochemical data bases, including thermodynamic constants and kinetic rate constants, used in conjunction with reactive solute transport models also vary widely. There is a need to develop a consistent database to facilitate inter-site comparisons.

3) Continued rigorous assessment of alternative technologies for improved P removal

It is recommended that alternative small flows P removal technologies should be categorized by the following scientific mechanisms:

1. Sorption
2. Iron Mineralization

3. Aluminum Mineralization

4. Calcium Mineralization

4) P behavior at the groundwater-surface water interface and other 'hotspots';

The USGS is currently assessing the fate of P from the Ashumet Valley plume as it discharges to a small kettle lake (Ashumet Pond). The groundwater plume is moderately acidic (pH ~5.7) and has P concentrations of ~1-4 mg/L (McCobb, et. al. 1999). Present indications are that P migrates through the lakeshore riparian zone in a relatively conservative manner. Studies of septic system P migration into a wetland also indicated migration into the wetland in a relatively conservative manner (Ptacek *et al.* 1999). Few other studies however, have been successful in documenting P plume discharge to surface water environments. Shorelines with large vegetation, for example, may thrive on the available P in this zone. Further studies should be undertaken to establish if the behavior at Ashumet Pond is typical at other sites. In particular, studies should also include sites on calcareous sands where previous studies have shown that neutral pH plumes with potentially higher P concentrations could be present.

Once discharged to the surface water environment, there is potential for P to be consumed by aquatic species. After senescence, this bound P accumulates in bottom soils. If reducing conditions are present at soil/water interface, P can be released back to the water column, again becoming available as a nutrient for growth. Under certain conditions (e.g. oxidizing soil/water interface, rapid burial environment), P that has entered the water body is not released, and is effectively removed from the system. Detailed studies on P release from wastewater plumes into a variety of water body types would provide greater insight into the fate of P once released to surface water bodies.

The principal 'hotspot' associated with subsurface P migration appears to be the 'rapid transformation zone' (Zanini *et al.* 1998), the zone coinciding with the horizon of most intense sewage oxidation, usually located within 1 m below the tile bed infiltration pipes. Here P removal can be substantial but it is also highly variable (23-99%, Robertson *et al.* 1998). Although Zanini *et al.* (1998) identified the presence of a variety of authogenic P solids in these zones which were indicative of mineral precipitation reactions, their precise mineralogy and solubility characteristics were not established. Thus further mineralogical assessment of the P solids from this zone is warranted.

5) Site indexing for P vulnerability

As suggested previously (Gold and Sims, 2000), the high cost of site-by-site assessment argues for the use of landscape and watershed scale indexing techniques. Although this has yet to be attempted for P vulnerability from septic systems, the knowledge base may now be sufficient to allow preliminary steps in this direction. Maguire and Sims (2002) assessed soil testing to predict phosphorous leaching. Vulnerability scores might include a variety of factors such as those listed below:

a. septic system P mass loading compared to mass loading from other sources

b. sensitivity of surface water bodies to additional P loading

c. overburden permeability

d. overburden thickness

e. depth of water table

f. cation exchange capacity

g. carbonate mineral content

h. oxyhydroxide mineral content

6) Practitioner's Manual for Site Selection

A practitioner's manual should be developed providing guidelines for determining whether sites are capable of providing P removal, or whether P removal must be performed prior to discharge. This is especially true where wastewater pre-treatment is performed, as the pre-treatment methods may change the biochemical activity in the subsurface environment and affect the ability and therefore create a need for P removal.

To address the phosphorus geochemistry research needs will require funding of long-term research efforts as the processes that need to be examined require examination of phosphorus geochemical transformations over time. Also, a thorough understanding of hydrogeologic conditions at sites is essential for meaningful analysis. It is important to note that many of the important insights presented in this report have resulted from research programs over 10 +/- years at the internationally acclaimed Earth Science Department at the University of Waterloo. Short-term efforts are unlikely to produce needed breakthroughs.

Also regarding site indexing for phosphorus vulnerability that could produce meaningful guides for practitioners, recommended techniques will need to be field verified to determine their accuracy and practical utility. Proper long-term funding and having objective feedback by practitioners of these efforts is strongly recommended.

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Little Fresh Pond Questions and Answers, 2015 CSLAP

Q1. What is the condition of our lake this year?

A1. Water quality conditions in Little Fresh Pond were probably slightly less favorable than usual in 2015. Water clarity was slightly lower and plant coverage was slightly higher, although algae levels (and most other water quality indicators) were close to normal. A small shoreline blue green algae bloom was apparent in September.

Q2. Is there anything new that showed up in the testing this year?

A2. Chloride sampling results were highly variable, ranging from lakes with little to high likely impacts from road salt runoff, although no actual impacts were apparent.

Q3. How does the condition of our lake this year compare with other lakes in the area?

A3. Little Fresh Pond has slightly higher water clarity, and slightly lower algae and nutrient levels, with few instances of blooms- than other Long Island lakes. The lake also does not typically suffer from invasive weed problems, despite the presence of fanwort (an invasive plant species).

Q4. Are there any trends in our lake's condition?

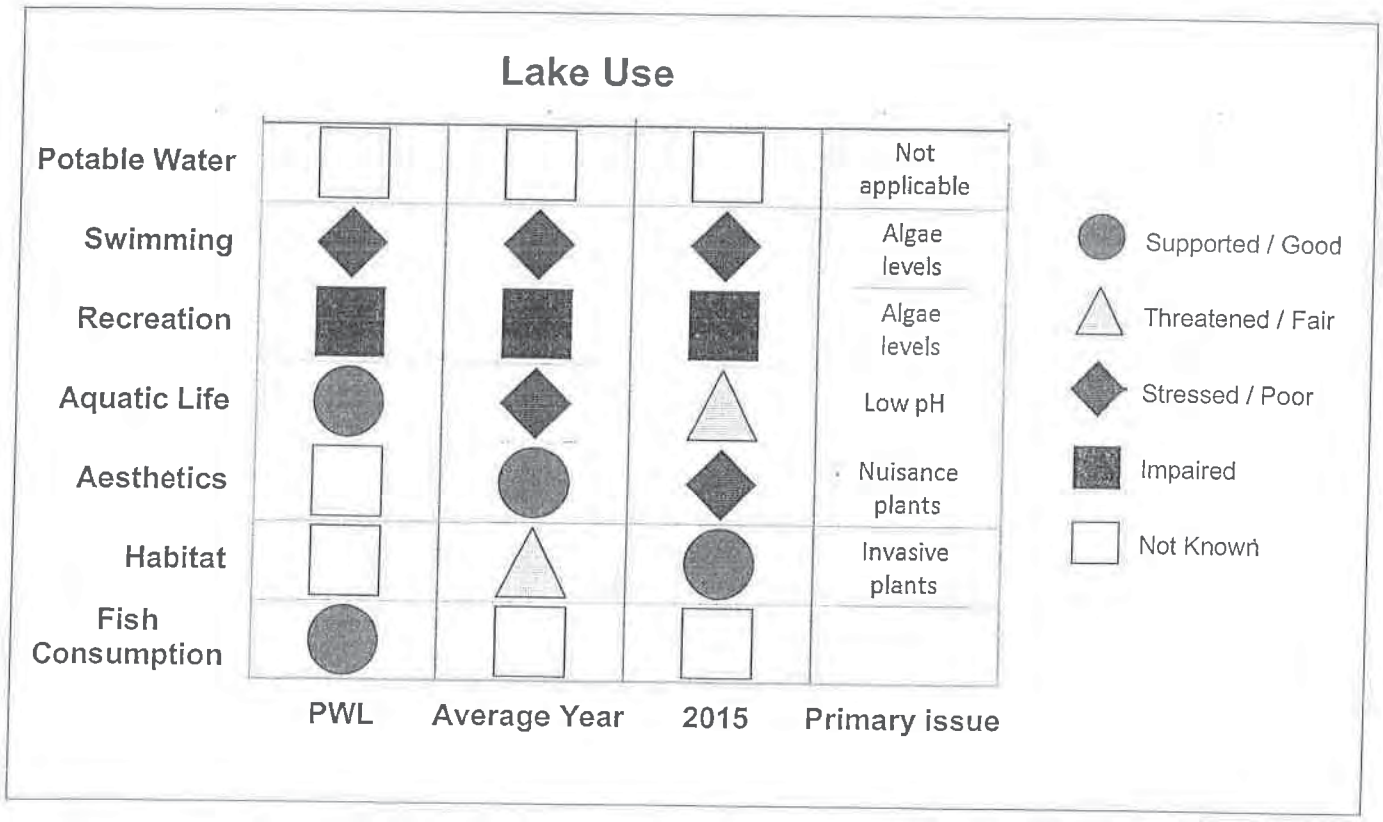
A4. Water quality conditions in the lake vary slightly from year to year, and except for a small decrease in conductivity and increase in pH over the last 10-15 years, no long term trends have been apparent. Water quality and recreational assessments have improved slightly over the same period.

Q5. Should we be concerned about the condition of our lake? Are we close to a tipping point?

A5. Little Fresh Pond has exhibited shoreline blue green algae blooms in the past and in 2015, and the lake has sufficiently high nutrient levels to support these blooms. Efforts should be undertaken to minimize additional nutrient loading to the lake.

Q6. Are any actions indicated, based on the trends and this year's results?

A6. Individual stewardship activities such as pumping your septic system, growing a buffer of native plants next to the water bodies, and reducing erosion from shoreline properties and runoff into the lake will help to maintain lake health by reducing nutrient and sediment loading to the lake. Visiting boats should be inspected to reduce the risk of new invasive species, since nearby lakes harbor several invasive plants not presently found in the lake.

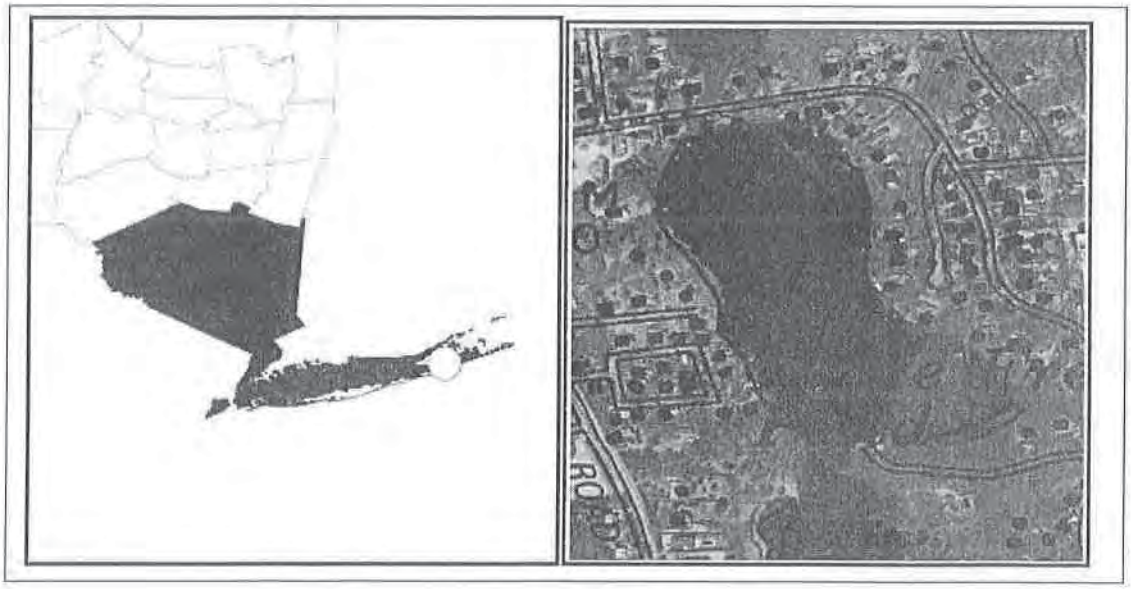


CSLAP 2015 Lake Water Quality Summary: Little Fresh Pond

General Lake Information

Location	Town of Southampton
County	Suffolk
Basin	Long Island Sound/Atlantic Ocean
Size	7.8 hectares (19.3 acres)
Lake Origins	Natural
Watershed Area	224 hectares (553 acres)
Retention Time	0.4 years
Mean Depth	3 meters
Sounding Depth	6 meters
Public Access?	no
Major Tributaries	no named tribs
Lake Tributary To…	no named outlet
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	40.916
Lake Outlet Longitude	-72.408
Sampling Years	1989-1994, 1997, 2002-2015
2015 Samplers	Ann Barzola and Scott Frank
Main Contact	Ann Barzola

Lake Map



Background

Little Fresh Pond is a 19 acre, class B lake found in the Town of Southampton in Suffolk County on Long Island. It has been sampled as part of CSLAP since 1989.

It is one of six CSLAP lakes among the nearly 750 lakes and ponds found in Suffolk County, and one of seven CSLAP lakes among the more than 1150 lakes and ponds in the Long Island Sound / Atlantic Ocean drainage basin.

Lake Uses

Little Fresh Pond is a Class B lake; this means that the best intended use for the lake is for contact recreation—swimming and bathing, non-contact recreation—boating and fishing, aquatic life, and aesthetics. The lake is used by lake residents and invited guests for non-power boating and swimming, via a lake association beach. There is no public access to the lake.

It is not known whether Little Fresh Pond has been stocked through any state fisheries stocking programs, or if any private stocking has occurred.

General statewide fishing regulations may be applicable in Little Fresh Pond (it is not known by the report authors if the Southampton charter precludes the applicability of statewide fishing regulations).

There are no lake-specific fish consumption advisories on Little Fresh Pond.

Historical Water Quality Data

CSLAP sampling was conducted on Little Fresh Pond from 1989 to 1994, 1997, and 2002 to 2015. The CSLAP reports for each of the past several years can be found on the NYSFOLA website at http://nysfola.mylaketown.com. The most recent CSLAP report and scorecard for Little Fresh Pond can also be found on the NYSDEC web page at http://www.dec.ny.gov/lands/77836.html.

Little Fresh Pond was not sampled by the NYSDEC as part of any of the major regional or statewide monitoring programs, and it is unlikely that the lake was sampled as part of fisheries management efforts at the lake, due to the charter governing activities at the lake.

None of the unnamed ephemeral tributaries, nor the outlet of the lake have been monitored through the NYSDEC Rotating Intensive Basins (RIBS) program or the state stream macroinvertebrate monitoring program. The lake has not been sampled by DEC fisheries staff in support of fish stocking activities or any other statewide monitoring programs.

Lake Association and Management History

Little Fresh Pond is served by the Little Fresh Pond Association. Lake management activities are governed by the association and the Southampton Trustees.

It is not known if the lake association maintains a web site.

Summary of 2015 CSLAP Sampling Results

Evaluation of 2015 Annual and Monthly Results Relative to 1989-2014

The summer (mid-June through mid-September) average readings are compared to historical averages for all CSLAP sampling seasons in the "Lake Condition Summary" table, and are compared to individual historical CSLAP sampling seasons in the "Long Term Data Plots –Little Fresh Pond" section in Appendix C.

Evaluation of Eutrophication Indicators

Phosphorus readings were much higher than usual in 2015. It is not known if these are non-representative results (due to bottle contamination at the factory, as may have occurred with some CSLAP lakes in 2015). However, the lake experiences periodic spikes in nutrients (1991, 2003 and 2010) and algae (1990, 2004) with both indicators dropping for several years afterwards. These spikes may be due to unusual weather, with the tailing off period associated with lake "recovery". In 2015, water clarity readings were slightly lower than usual, but algae levels were close to normal.

Algae levels typically increase from early to late summer, due to a slight increase in nutrient levels, although water clarity levels do not change seasonally in a similar manner. Lake productivity increased during the summer of 2015, as seen in decreasing water clarity and increasing algae levels. .

The lake can be characterized as *eutrophic,* or highly productive, based on water clarity, total phosphorus readings, and chlorophyll *a* readings (typical of *eutrophic* lakes). An evaluation of trophic state indices (TSI) shows that water clarity is slightly lower than expected given the nutrient and (in some years) algae levels in the lake, suggesting that turbidity, "natural" color, or other eroding materials may be affecting water clarity. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels are at times high enough to render the lake susceptible to taste and odor compounds, algal toxins, or elevated DBP (disinfection by product) compounds that could affect the potability of the water, although the lake is not used for drinking water. Little Fresh Pond is weakly stratified, and deepwater phosphorus and ammonia readings are similar to those measured at the lake surface (and were close to normal in 2015). This suggests that elevated algae levels throughout most depths of the lake may affect this use. Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

Color readings were lower than normal in each of the last three years, and these readings have dropped since the early 2000s. pH has increased over the last 10-15 years, and these readings were slightly higher than usual in 2015. Total nitrogen and calcium levels were also slightly higher than normal, but neither of these indicators has changed significantly since the early 2000s. It is likely that the small changes in each of the other limnological indicators have been within the normal range of variability in the lake.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, ranged from 14 to 58 mg/l- additional data will help to determine if either number better represents normal conditions in the lake. These values fall within the range for "moderate" to "major" road salt runoff levels cited by the New Hampshire DES. These readings are well below the state potable water quality standard of 250 mg/l, but within the typical range of values found in most NYS lakes. These readings suggest a moderate to high likelihood of biological impacts from road salt. Additional data will help to determine if these represent normal readings for the lake

Overall limnological conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Biological Condition

The fluoroprobe screening samples analyzed by SUNY ESF in the last three years indicated relatively low algae levels in most samples, but an increasing percentage of blue green algae when algae levels are higher later in the summer. The algae community appears to be comprised of a mix of algae species during most of the summer. A small shoreline blue green algae bloom was reported (and verified) in early fall of 2015, while a larger bloom earlier in the summer was not comprised of high levels of blue green algae.

Macrophyte surveys have been conducted through CSLAP and the 2009 biomonitoring study in Little Fresh Pond. At least 27 aquatic plant species have been found, including at least four protected plant species (*Elatine minima,* small waterwort; *Myriophyllum pinnatum,* cutleaf watermilfoil; *Stuckenia filiformis,* fineleafed pondweed; and *Utricularia radiata,* little floating bladderwort) and one exotic plant species (*Cabomba caroliniana,* fanwort). The modified floristic quality index (FQI) for the lake indicates that the quality of the aquatic plant community is "excellent", although the extent of the aquatic plant coverage and perhaps the germination of individual plant species are highly variable from year to year.

The macroinvertebrate results from the 2009 biomonitoring survey of the lake are not yet available.

The composition of the fish community is comprised of at least four warmwater fish species, and at least one coolwater fish species. This suggests that the lake can most likely be characterized as a warmwater fishery, although the inventory of fish species in the lake is no doubt incomplete.

Zooplankton have not been evaluated through CSLAP in Little Fresh Pond.

Biological conditions in the lake are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Lake Perception

Water quality assessments were more favorable than normal in 2014 but less favorable than usual in 2015; both are consistent with algae levels or water clarity at that time. This led to an improvement in recreational assessments in 2014. However, despite higher plant coverage in 2015, recreational assessments were close to normal. Water quality and recreational assessments improved from the mid-2000s until a few years ago. Lake perception degrades slightly in late

summer into the fall in most years, and similar patterns were apparent in 2015. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

Air temperatures in the summer index period were slightly higher than normal in 2015, but this did not translate to higher water temperatures, and neither air nor water temperature readings has exhibited any long-term trends. It is not known if this is an indication of the lack of local climate change or if these changes cannot be well evaluated through CSLAP.

Evaluation of Algal Toxins

Algal toxin levels can vary significantly within blooms and from shoreline to lake, and the absence of toxins in a sample does not indicate safe swimming conditions. Fluoroprobe readings have consistently been below the thresholds for harmful algal blooms (HABs) in the open water, although a shoreline bloom in September of 2015 showed high blue green algae levels. Toxin levels in all samples- open water and shoreline- have been below the safe swimming threshold, although at times these readings are detectable. An analysis of algae samples by Dr. Christopher Gobler in some previous years indicated toxin levels close to but below the levels needed to support safe swimming.

Lake Condition Summary

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.50	1.82	5.00	1.41	Eutrophic	Within Normal Range	No Change
	Chlorophyll *a*	0.42	20.70	199.40	20.89	Eutrophic	Within Normal Range	No Change
	Total Phosphorus	0.005	0.026	0.069	0.048	Eutrophic	Higher than Normal	No Change
Potable Water Indicators	Hypolimnetic Ammonia	0.00	0.03	0.15	0.03	Close to Surface NH4 Readings	Within Normal Range	Not known
	Hypolimnetic Arsenic							Not known
	Hypolimnetic Iron							Not known
	Hypolimnetic Manganese							Not known
Limnological Indicators	Hypolimnetic Phosphorus	0.013	0.036	0.194	0.081	Close to Surface TP Readings	Higher than Normal	Not known
	Nitrate + Nitrite	0.00	0.03	0.66	0.01	Low NOx	Within Normal Range	No Change
	Ammonia	0.00	0.04	0.53	0.03	Low Ammonia	Within Normal Range	No Change
	Total Nitrogen	0.18	0.52	1.24	0.67	Intermediate Total Nitrogen	Higher than Normal	No Change
	pH	5.20	7.02	9.09	7.43	Circumneutral	Within Normal Range	No Change
	Specific Conductance	14	56	111	56	Softwater	Within Normal Range	Decreasing Slightly
	True Color	11	52	203	31	Colored	Within Normal Range	No Change
	Calcium	1.0	1.9	5.8	2.7	Not Susceptible to Zebra Mussels	Within Normal Range	No Change
Lake Perception	WQ Assessment	1	1.8	4	2.1	Not Quite Crystal Clear	Within Normal Range	No Change
	Aquatic Plant Coverage	1	2.4	4	3.0	Subsurface Plant Growth	Less Favorable than Normal	No Change
	Recreational Assessment	1	1.8	4	1.6	Excellent	Within Normal Range	No Change

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Biological Condition	Phytoplankton					Open water-low blue green algae biomass; Shoreline-high blue green algae in bloom	Not known	Not known
	Macrophytes					Excellent quality of the aquatic plant community	Not known	Not known
	Zooplankton					Not evaluated through CSLAP	Not known	Not known
	Macroinvertebrates					2009 survey results not yet analyzed	Not known	Not known
	Fish					Warmwater fishery?	Not known	Not known
	Invasive Species					Fanwort	Not known	Not known
Local Climate Change	Air Temperature	11	24.7	34	27.6		Higher Than Normal	No Change
	Water Temperature	15	24.4	31	25.3		Within Normal Range	No Change
Harmful Algal Blooms	Open Water Phycocyanin	0	44	368	16	Most readings indicate low risk of BGA	Not known	Not known
	Open Water FP Chl.a	1	6	51	13	Few readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	4	47	9	Few readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	<DL	0.9	<DL	Low to undetectable open water microcystins	Not known	Not known
	Open Water Anatoxin a	<DL	<DL	<DL	<DL	Open water Anatoxin-a consistently not detectable	Not known	Not known
	Shoreline Phycocyanin					No shoreline blooms sampled for PC	Not known	Not known
	Shoreline FP Chl.a	13	510	1008	510	Most readings indicate high algae levels	Not known	Not known
	Shoreline FP BG Chl.a	5	506	1008	506	Most readings indicate high BGA levels	Not known	Not known
	Shoreline Microcystis	<DL	<DL	<DL	<DL	Shoreline bloom MC-LR consistently not detectable	Not known	Not known
	Shoreline Anatoxin a	<DL	<DL	<DL	<DL	Shoreline bloom Anatoxin-a consistently not detectable	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Little Fresh Pond is presently among the lakes listed on the 2015 Long Island Sound Priority Waterbody List (PWL) as *impaired* for recreation and *stressed* for public bathing due to excessive algae and nutrients. The PWL listing for Little Fresh Pond is listed in Appendix B.

Potable Water (Drinking Water)

The CSLAP dataset at Little Fresh Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, is inadequate to evaluate the use of the lake for potable water, and the lake is not used for this purpose. The high algae levels suggest that "unofficial" surface potable water use may be impacted.

Public Bathing

The CSLAP dataset at Little Fresh Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if conducted at a public bathing beach, may be *stressed* by excessive algae, algal toxins, (occasionally excessive) weeds, and poor water clarity. Additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Recreation (Swimming and Non-Contact Uses)
The CSLAP dataset on Little Fresh Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation is *impaired* due to excessive algae and shoreline algae blooms, and this use may be *threatened* by excessive weeds and the presence of fanwort.

Aquatic Life
The CSLAP dataset on Little Fresh Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life has at times been *stressed* by depressed pH and *threatened* by road salt runoff and invasive species, but no impacts have been apparent in recent years. Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

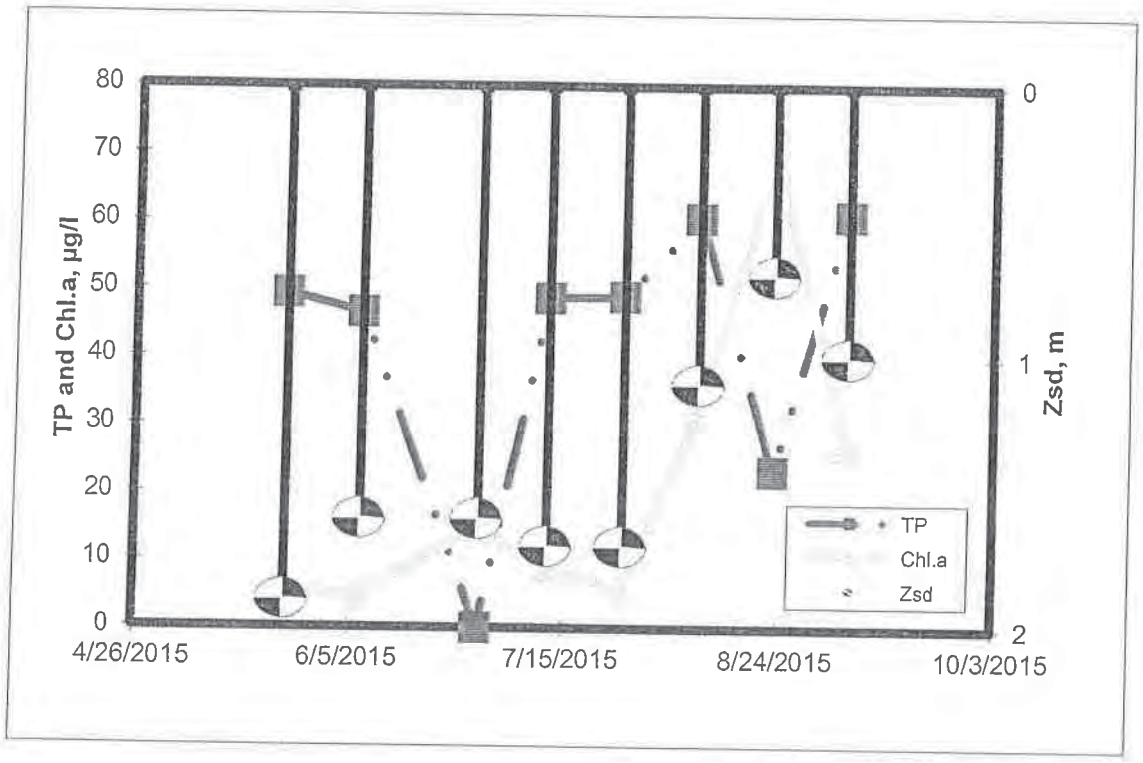
Aesthetics and Habitat
The CSLAP dataset on Little Fresh Pond, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *fair* due to nuisance plants, excessive algae and shoreline blue green algae blooms, although this was not apparent in the last several years. Habitat may be *fair* due to invasive plants, although it is not known if habitat was impacted in 2015.

Fish Consumption
There are no fish consumption advisories posted for Little Fresh Pond.

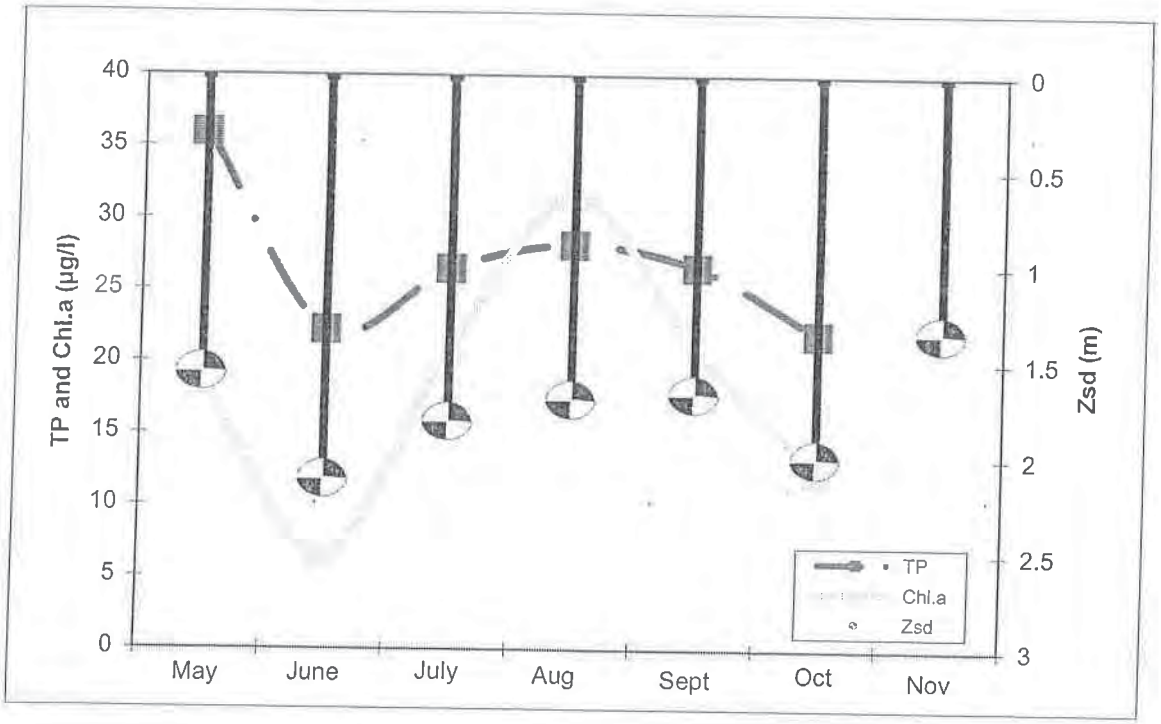
Additional Comments and Recommendations
The continuing evaluation of the 2009 lake biomonitoring results will help to determine if any impacts to aquatic life can be detected in the nearshore sediments in the lake. Lake residents are advised to report (and avoid exposure to) any shoreline algae blooms. On-going nutrient control measures may have reduced algae levels in the lake in recent years; these actions and any other nutrient control measures should be continued.

Aquatic Plant IDs-2015
None submitted for identification in 2015.

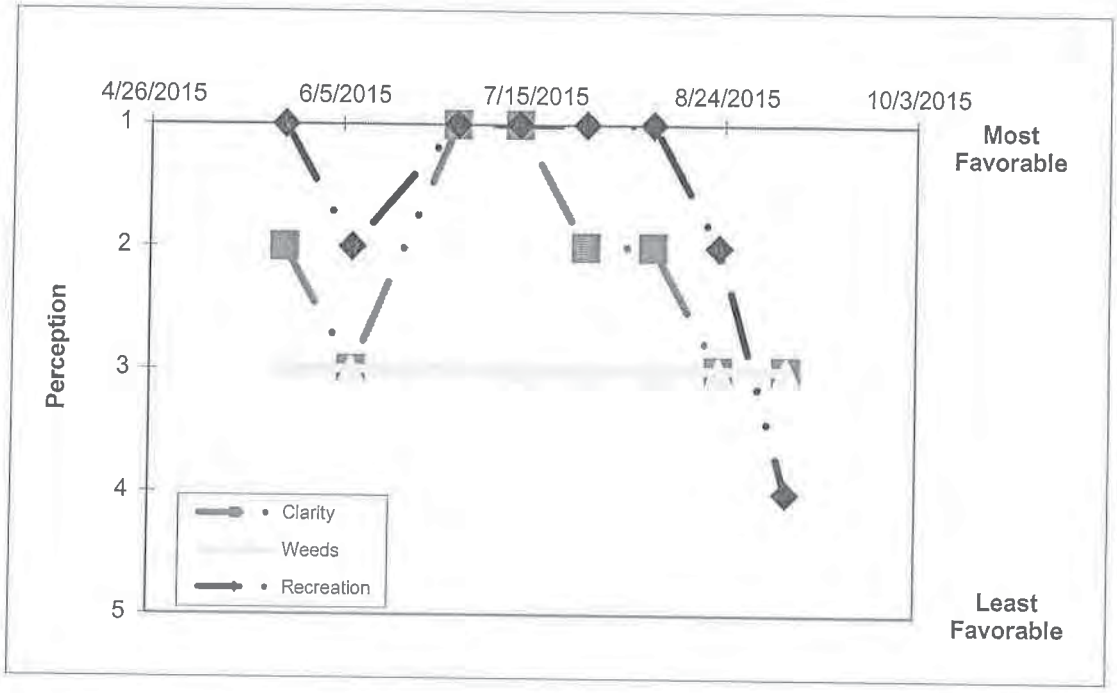
Time Series: Trophic Indicators, 2015



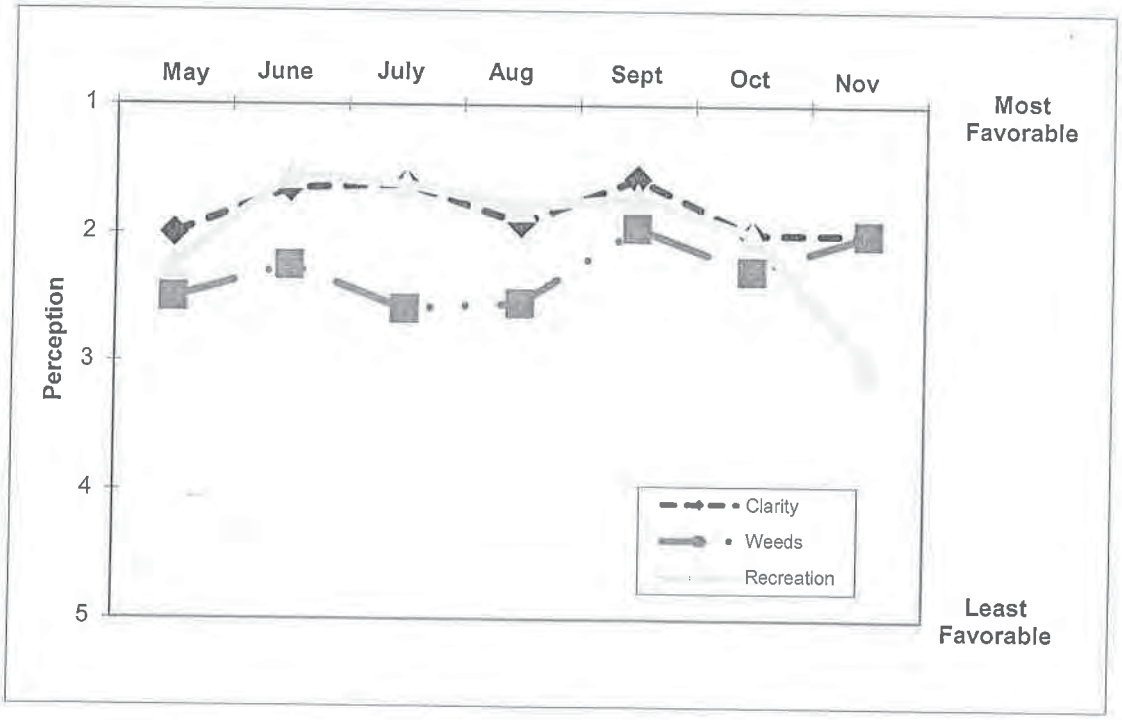
Time Series: Trophic Indicators, Typical Year (1989-2015)



Time Series: Lake Perception Indicators, 2015



Time Series: Lake Perception Indicators, Typical Year (1989-2015)



Appendix A- CSLAP Water Quality Sampling Results for Little Fresh Pond

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
58	Little Fresh P	7/7/1989	6.5	1.23	1.5	0.015	0.05				55	6.24	60		1.79	
58	Little Fresh P	7/22/1989	6.5	1.15	1.5	0.035	0.01				58	7.17	58		72.20	
58	Little Fresh P	8/5/1989	5.5	1.53	1.5	0.028	0.01				65	7.45	59		40.00	
58	Little Fresh P	8/19/1989	6.2	1.65	1.5	0.028	0.01				62	7.04	56		20.70	
58	Little Fresh P	9/1/1989	6.3	1.25	1.5	0.024	0.01				65	6.50	57		25.30	
58	Little Fresh P	9/16/1989	6.1	1.03	1.5	0.027	0.01				60	7.24	60		26.60	
58	Little Fresh P	9/30/1989	6.4	0.86	1.5	0.023	0.01				62	6.80	61		22.30	
58	Little Fresh P	10/13/1989	6.2	0.99	1.5	0.024	0.03				60	7.27	61		13.00	
58	Little Fresh P	7/7/1990	6.5	1.55	1.5	0.046					55	6.12	62		113.00	
58	Little Fresh P	7/21/1990	6.1	1.50	1.5	0.023	0.01				50				32.60	
58	Little Fresh P	8/4/1990	6.0	1.90	1.5	0.032					55	6.22	62		12.70	
58	Little Fresh P	8/18/1990	6.1	0.70	1.5	0.026	0.01				55	7.56	61		52.80	
58	Little Fresh P	9/1/1990	6.3	1.55	1.5	0.034	0.01				50	7.06	58		35.20	
58	Little Fresh P	9/15/1990	6.0	0.83	1.5	0.021					45	7.77	91		99.00	
58	Little Fresh P	9/30/1990	6.3	1.70	1.5	0.025	0.04				49	7.22	59		43.20	
58	Little Fresh P	6/30/1991		3.15	1.5	0.012	0.01				30	7.05	62		3.79	
58	Little Fresh P	7/13/1991	5.8	2.45	1.5						29				4.77	
58	Little Fresh P	7/27/1991	6.0	2.19	1.5	0.029	0.01				29	6.40	64		99.00	
58	Little Fresh P	8/10/1991	6.1	1.95	1.5	0.032					29	7.00	65		9.30	
58	Little Fresh P	8/24/1991	6.0	2.00	1.5	0.046	0.01				31	5.20	68		8.97	
58	Little Fresh P	9/7/1991	6.1	1.65	1.5	0.038					30	7.25	63		7.90	
58	Little Fresh P	9/21/1991	6.1	1.45	1.5	0.030	0.01				29	7.42	63		22.90	
58	Little Fresh P	10/5/1991	6.3	1.38	1.5	0.035					32	7.41	64		6.04	
58	Little Fresh P	6/6/1992	6.1	2.80	1.5	0.016	0.01				27	7.57	62		5.86	
58	Little Fresh P	6/21/1992	6.1	3.15	1.5	0.012					32	7.25	64		4.12	
58	Little Fresh P	6/30/1992	6.0	2.70	1.5	0.016	0.01				30	6.64	63		5.61	
58	Little Fresh P	7/18/1992	6.1	2.70	1.5	0.017	0.01				35	7.55	63		3.74	
58	Little Fresh P	8/1/1992	5.9	2.20	1.5	0.021					36	7.54	63		16.00	
58	Little Fresh P	8/15/1992	6.1	1.85	1.5	0.030					28	6.89	61		122.00	
58	Little Fresh P	8/29/1992	6.2	1.63	1.5	0.023	0.01				30	7.20	64		95.20	
58	Little Fresh P	9/12/1992	6.1	1.23	1.5	0.025					33	7.39	60		22.30	
58	Little Fresh P	6/19/1993	6.3	2.35	1.5	0.018	0.01				47	7.23	62		6.05	
58	Little Fresh P	7/1/1993	6.2	2.10	1.5	0.021	0.01				45	6.29	63		5.34	
58	Little Fresh P	7/17/1993	6.1	1.80	1.5	0.018	0.01				43	6.74	64		12.60	
58	Little Fresh P	8/1/1993	6.1	2.55	1.5	0.018					35	7.54	64		4.69	
58	Little Fresh P	8/16/1993	5.9	2.75	1.5	0.016	0.01				27	7.57	65		3.78	
58	Little Fresh P	8/30/1993	6.0	2.55	1.5	0.016					32	7.50	65		6.10	
58	Little Fresh P	9/13/1993	6.1	2.05	1.5	0.022	0.01				33	7.32	66		11.10	
58	Little Fresh P	10/6/1993	6.0	1.35	1.5											
58	Little Fresh P	7/2/1994	8.0	1.95	8.0											
58	Little Fresh P	7/9/1994	6.7	2.15	6.7											
58	Little Fresh P	7/22/1994	5.7	2.00	5.7											
58	Little Fresh P	06/14/02		1.70	1.5	0.014	0.00	0.02	0.42	29.98	23	6.25	56		6.31	
58	Little Fresh P	07/01/02	7.3	3.55	1.5	0.009	0.00	0.04	0.47	53.84	25	6.39	56			
58	Little Fresh P	07/14/02	8.0		1.5	0.015	0.01	0.07	0.73	47.80	24	6.20	60		14.01	
58	Little Fresh P	07/27/02	6.5	4.00	1.5	0.010	0.02	0.06	0.51	52.89	18	6.23	58		26.13	
58	Little Fresh P	08/10/02	6.0	4.23	1.5	0.011	0.01	0.06	0.49	45.14	27	6.28	58		8.06	
58	Little Fresh P	08/15/02	5.3	3.90	5.3	0.012	0.02	0.07	0.66	54.57	19	6.33	60		0.82	
58	Little Fresh P	09/12/02	6.0	2.25			0.00	0.02	0.50						0.42	
58	Little Fresh P	09/28/02				0.027	0.00	0.03	0.60	22.30	25	6.29	59		0.87	
58	Little Fresh P	10/17/02	6.0	5.00	1.5	0.015	0.00	0.07	0.48	31.63	26	6.32	60		12.16	
58	Little Fresh P	6/14/2003	8.0	1.95	8.0	0.018	0.010	0.028	0.45	25.2	71	6.1	56	1.8	2.35	
58	Little Fresh P	7/6/2003	6.7	1.50	6.7	0.036	0.005	0.020	0.40	11.4	86	5.9	57		30.90	
58	Little Fresh P	8/24/2003	6.1	0.90	1.5	0.052	0.006	0.014	0.55	10.5	185	6.0	56		10.53	
58	Little Fresh P	9/7/2003	6.5			0.035	0.056	0.100			131	6.2	59	1.9	5.14	
58	Little Fresh P	9/28/2003	8.5	4.00	1.5	0.039	0.003	0.003	0.35	9.0	110	6.6	59		11.69	
58	Little Fresh P	10/18/2003	6.0	1.00	7.0	0.031	0.012	0.066	0.43	13.9	96	6.4	62		6.29	
58	Little Fresh P	11/1/2003	6.6	1.35												
58	Little Fresh P	6/20/2004	6.0	1.30		0.023	0.01	0.01	0.34	14.9	89			2.0	4.8	
58	Little Fresh P	7/6/2004	6.0	1.10	2.0	0.027	0.05	0.01			115	7.05	66		9.8	
58	Little Fresh P	7/17/2004		1.00		0.047	0.01	0.01	0.37	7.9	83	6.59	63		2.9	
58	Little Fresh P	8/1/2004	6.0	0.50	5.0	0.046	0.17	0.04	0.97	21.1	11	6.97	87		43.3	
58	Little Fresh P	8/15/2004	6.2	2.00		0.028	0.12	0.05	0.61	21.9	71	7.47	64	2.3	199.4	

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
58	Little Fresh P	8/28/2004	6.0	1.00		0.026	0.03	0.01	0.69	26.1	71	6.55	25		108.8	
58	Little Fresh P	9/11/2004		1.00	6.0	0.024	0.06	0.02	0.71	29.8	19	7.36	52		96.7	
58	Little Fresh P	10/2/2004	6.0	3.50	3.0	0.026	0.03	0.16			58	6.88	52			
58	Little Fresh P	6/13/2005	6.4	2.60		0.033	0.01	0.02	0.18	5.51	68	6.81	53	1.9	2.9	
58	Little Fresh P	7/4/2005	6.1	1.05	3.9	0.020	0.02	0.01	0.38	19.33	68	7.21	63		15.5	
58	Little Fresh P	7/16/2005		1.00	1.8	0.029	0.08	0.01	0.28	9.56	93	6.00	58		74.1	
58	Little Fresh P	7/31/2005	6.1	1.40		0.023	0.06	0.05	0.37	16.41	119	6.69	59		1.9	
58	Little Fresh P	8/15/2005	3.0	1.00	6.0	0.038	0.07	0.01	0.37	9.56	58	6.52	63	2.0	17.6	
58	Little Fresh P	8/27/2005	6.1	1.40	6.1	0.036	0.22	0.03	0.37	10.08	92	6.50	61		13.1	
58	Little Fresh P	9/10/2005	5.8	1.00	2.0	0.036	0.01	0.01	0.50	13.99	86	6.75	60		9.0	
58	Little Fresh P	9/23/2005	5.6	1.45	1.8	0.028	0.03	0.01	0.34	12.10	54	6.42	79			
58	Little Fresh P	6/13/2006	6.0	2.00	6.0	0.016	0.05	0.38	0.58	35.79	45	6.74	52	2.9	3.87	
58	Little Fresh P	7/3/2006	6.2	2.00	3.1	0.023	0.01	0.03	0.50	21.73	51	7.55	53		7.84	
58	Little Fresh P	7/14/2006	6.8	2.10		0.028	0.01	0.08	0.67	23.94	203	7.66	32		10.04	
58	Little Fresh P	7/29/2006		1.55	6.0	0.019	0.02	0.02	0.94	49.47	110	7.55	47		3.57	
58	Little Fresh P	8/12/2006		1.00	6.0	0.026	0.03	0.02	0.76	28.66	76	7.32	56	1.6	48.48	
58	Little Fresh P	9/3/2006		1.53	6.6	0.025	0.03	0.04	1.24	50.76	49	6.81	53		25.40	
58	Little Fresh P	9/17/2006		1.58	1.7	0.015	0.02	0.01	0.52	35.87	53	7.98	47		5.78	
58	Little Fresh P	10/3/2006	6.6	1.80	4.0	0.013	0.06	0.11	0.47	36.56	55	6.50	52		3.74	
58	Little Fresh P	7/8/2007	5.0	1.65	5.0	0.020	0.01	0.02	0.54	58.7	62	8.16	51	1.5	5.09	
58	Little Fresh P	7/22/2007	6.5	1.60	2.0	0.022	0.01	0.01	0.60	59.8	67	6.94	48		15.82	
58	Little Fresh P	8/12/2007	6.0	1.00	6.0	0.027	0.01	0.02	0.48	39.1	87	6.30	58		28.84	
58	Little Fresh P	8/25/2007	6.0	1.60	6.0	0.023	0.02	0.02	0.67	65.7	53	7.90	44		6.77	
58	Little Fresh P	9/9/2007		1.50	5.7	0.019	0.01	0.03	0.78	92.7	49	7.55	14	1.8	13.80	
58	Little Fresh P	9/23/2007	6.5	2.00	6.5	0.018	0.01	0.02	0.78	97.8	43	6.56	53		6.94	
58	Little Fresh P	10/7/2007	5.5	1.90	2.0	0.015	0.03	0.02	0.55	83.9	41	7.99	45		4.87	
58	Little Fresh P	10/21/2007		1.95	5.6	0.016	0.01	0.03	0.63	89.8	58	6.61	60		19.45	
58	Little Fresh P	6/15/2008	5.0	3.50	2.0	0.022	0.03	0.02	0.54	54.95	26	7.00	97		3.72	
58	Little Fresh P	6/22/2008	6.0	1.52	6.0	0.018	0.07	0.02	0.55	68.70	31	7.00	44		5.93	
58	Little Fresh P	7/5/2008	5.7	2.10	1.5	0.019	0.01	0.03	0.47	54.08	36	7.72	50	1.5	11.81	
58	Little Fresh P	7/19/2008	6.9	2.43	1.5	0.027	0.02	0.03	0.37	30.13	37	6.42	42			
58	Little Fresh P	8/3/2008	6.0	2.65	1.5	0.019	0.03	0.03	0.41	47.52	32	6.68	33	1.4	8.20	
58	Little Fresh P	8/16/2008	5.5	2.75	3.0	0.014	0.00	0.02	0.26	39.89	34	6.10	38		3.67	
58	Little Fresh P	9/1/2008				0.016	0.01	0.03	0.53	71.51	32	7.52	51		4.04	
58	Little Fresh P	9/21/2008	5.5	1.50		0.017	0.01	0.10	0.48	61.87	46	7.79	50		2.43	
58	Little Fresh P	6/14/2009				0.022	0.02	0.03	0.43	42.14	67	6.40	49	1.4	0.65	
58	Little Fresh P	6/29/2009	6.0	1.55		0.030	0.01	0.02	0.31	22.95	68	6.62	48		18.83	
58	Little Fresh P	7/12/2009	6.8	1.35		0.005	0.01	0.01	0.40	170.82	125	6.53	44		37.54	
58	Little Fresh P	7/27/2009		1.35	1.5	0.023	0.01	0.01	0.28	27.40	96	7.88	37		3.33	
58	Little Fresh P	8/9/2009	6.2	1.45	1.5	0.035	0.01	0.01	0.41	25.17	89	6.42	46	1.1	47.70	
58	Little Fresh P	8/22/2009	6.2	1.40		0.020	0.01	0.01	0.43	46.72	107	6.90	41		18.10	
58	Little Fresh P	9/13/2009	7.0	1.90		0.018	0.02	0.02	0.34	40.51	72	7.94	32		6.20	
58	Little Fresh P	10/1/2009	5.8	1.15	1.5	0.024	0.03	0.01	0.43	38.64	86	6.71	50		33.36	
58	Little Fresh P	5/17/2010	6.5	1.05	1.5	0.031	0.03	0.02			117	7.09	59	1.3	18.30	
58	Little Fresh P	5/31/2010	6.1	1.60	1.5	0.030	0.01	0.03	0.63	46.97	59	6.88	67		46.70	
58	Little Fresh P	6/12/2010	7.0	0.90	1.5	0.044	0.02	0.03			81	6.59	62		1.00	
58	Little Fresh P	6/27/2010	6.9	0.95	1.5	0.041	0.02	0.03	0.82	43.79	132	6.43	60		39.60	
58	Little Fresh P	7/11/2010	6.7	1.00	1.5	0.069	0.01	0.02	0.49	15.75	67	6.99	64	1.8	48.60	
58	Little Fresh P	7/24/2010	6.7	1.20	1.5	0.039	0.01	0.05	0.77	42.99	75	6.69	30		8.80	
58	Little Fresh P	8/8/2010	6.6	0.95	1.5	0.040	0.02	0.02			80	6.81	31		15.70	
58	Little Fresh P	8/21/2010		0.95		0.029	0.03	0.06	0.66	50.12	58	6.78	60		25.90	
58	Little Fresh P	5/22/2011	6.0	1.70	1.5	0.034	0.66	0.53	0.43	27.77	54	6.33	61	1.1	4.20	
58	Little Fresh P	6/5/2011	5.8	1.70	1.5	0.026	0.02	0.05	0.35	29.53	44	7.00	59		7.30	
58	Little Fresh P	6/15/2011	6.0	2.00	1.5	0.024	0.02	0.03	0.30	27.59	46	6.18	89		2.80	
58	Little Fresh P	7/4/2011	5.9	1.85	1.5	0.048	0.02	0.02	0.34	15.56	47	9.09	78		0.80	
58	Little Fresh P	7/19/2011	5.9	1.70	1.5	0.035	0.03	0.03	0.49	30.50	56	6.68	69	5.8	8.20	
58	Little Fresh P	7/31/2011	5.4	1.33	1.5	0.030	0.05	0.02	0.66	48.71	46	7.75	52		24.00	
58	Little Fresh P	8/13/2011	5.8	1.30	1.5	0.041	0.03	0.02	0.78	41.44	62	7.29	57		19.70	
58	Little Fresh P	9/11/2011	5.6	0.73	1.5	0.054	0.04	0.04	1.14	46.31	36	7.82	34		54.00	
58	Little Fresh P	fall 2011														
58	Little Fresh P	6/21/2012	5.1	1.90	1.5	0.024	0.01	0.04	0.52	47.39	26	7.50	25	1.0	2.10	
58	Little Fresh P	7/8/2012	5.1	2.02	1.5	0.020	0.01	0.03	0.30	33.90	31	7.98	41		6.50	
58	Little Fresh P	7/22/2012	5.7	2.30	1.5	0.024	0.02	0.03	0.41	37.34	33	7.44	39		15.20	
58	Little Fresh P	8/5/2012	5.7		1.5	0.018	0.01	0.02	0.41	49.08	21	8.66	34		6.60	
58	Little Fresh P	8/12/2012	5.6	1.70	1.5	0.024	0.01	0.33	0.39	35.44	22	7.31	54	1.2	17.10	
58	Little Fresh P	9/2/2012	5.7	2.15	1.5	0.021	0.01	0.04	0.47	49.06	25	7.10	47		12.30	

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
58	Little Fresh P	9/17/2012	5.6	3.10	1.5	0.019	0.01	0.03	0.41	46.96	24	7.63	56		5.50	
58	Little Fresh P	9/30/2012	5.2	2.30	3.7	0.020	0.02	0.04	0.33	36.29	30	7.36	49		11.90	
58	Little Fresh P	6/16/2013	6.2	2.25	1.5	0.013	0.02	0.04	0.53	91.46		6.66	41		7.80	
58	Little Fresh P	7/1/2013	6.0	1.90	1.5	0.018			0.35	41.42	42	6.54	60		28.20	
58	Little Fresh P	7/15/2013	6.3	2.05	1.5	0.020	0.05	0.01	0.26	28.48	37	7.80	33		6.60	
58	Little Fresh P	7/29/2013	6.3	1.85	1.5	0.030			0.58	42.35	45	6.62	63			
58	Little Fresh P	8/11/2013	6.2	2.15	1.5	0.022	0.01	0.02	0.46	45.58	29	7.35	60		12.00	
58	Little Fresh P	8/25/2013	6.0	1.55	1.5	0.024					23	7.58	27		19.70	
58	Little Fresh P	9/8/2013	6.1	1.60	1.5	0.021	0.01	0.01	0.49	50.25	30	6.64	56		12.80	
58	Little Fresh P	9/22/2013		2.65	1.5	0.016			0.50	69.57	30	7.60	80		3.70	
58	Little Fresh P	6/1/2014	5.8	2.80	1.5	0.014	0.02	0.06	0.73	112.79	38	6.23	58	1.7	1.70	
58	Little Fresh P	6/15/2014	5.7	2.70	1.5	0.011			0.46	89.95	28	6.90	35		1.90	
58	Little Fresh P	6/29/2014	6	2.15	1.5	0.021	0.03	0.05	0.39	41.56	37	7.74	53		5.60	
58	Little Fresh P	7/13/2014	6	2.30	1.5	0.022			0.49	48.04	28	7.24	60		4.00	
58	Little Fresh P	7/27/2014	6.1	1.70	1.5	0.028	0.01	0.03	0.45	35.61	35	6.75	58	1.8	15.00	
58	Little Fresh P	8/11/2014	6	2.05	1.5	0.032			0.50	34.49	28	8.49	59		21.50	
58	Little Fresh P	8/24/2014	6	2.10	1.5	0.024	0.01	0.01	0.37	34.43	28	7.48	60		6.00	
58	Little Fresh P	9/7/2014	6	1.65	1.5	0.029			0.39	29.23	28	7.19	60		15.60	
58	Little Fresh P	5/24/2015	6.5	1.90	1.5	0.049	0.00	0.01	0.38	7.77	28	7.25	55	2.5	5.30	
58	Little Fresh P	6/7/2015	6	1.60	1.5	0.047			0.35	7.61	28	7.91	52		4.60	
58	Little Fresh P	6/29/2015	5.8	1.60	1.5		0.03	0.02	0.58		26	7.75	59		14.90	57.6
58	Little Fresh P	7/12/2015	6.2	1.70	1.5	0.049			0.53	10.92	22	7.30	111		8.90	
58	Little Fresh P	7/26/2015	6.5	1.70	1.5	0.049	0.02	0.04	0.53	10.84	44	7.20	28	2.8	5.60	
58	Little Fresh P	8/9/2015	6	1.10	1.5	0.061			0.89	14.60	43	7.33	52		31.60	
58	Little Fresh P	8/23/2015	6	0.70	1.5	0.023	0.00	0.06	1.14	48.93	29	7.35	49		69.00	14.7
58	Little Fresh P	6/7/2015			Bloom											
58	Little Fresh P	9/6/2015			bloom											
58	Little Fresh P	9/6/2015	5.6	1.00	1.5	0.061			0.98	16.11	26	7.37	45		27.20	

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4							NO2	
58	Little Fresh P	6/13/2005				0.040										
58	Little Fresh P	7/4/2005				0.055										
58	Little Fresh P	7/16/2005				0.025										
58	Little Fresh P	7/31/2005				0.023										
58	Little Fresh P	8/15/2005				0.029										
58	Little Fresh P	8/27/2005				0.048										
58	Little Fresh P	9/10/2005				0.042										
58	Little Fresh P	9/23/2005				0.025										
58	Little Fresh P	06/14/2009				0.034		0.03								
58	Little Fresh P	06/29/2009				0.039		0.00								
58	Little Fresh P	07/12/2009			6.2	0.087		0.01								
58	Little Fresh P	07/27/2009				0.026		0.01								
58	Little Fresh P	08/09/2009			6.2	0.083		0.01								
58	Little Fresh P	09/13/2009			7.0	0.024		0.01								
58	Little Fresh P	10/01/2009			5.0	0.033		0.01								
58	Little Fresh P	5/17/2010	6.5			0.058		0.02								
58	Little Fresh P	5/31/2010	6.1			0.044		0.03								
58	Little Fresh P	6/12/2010	7.0			0.035		0.02								
58	Little Fresh P	6/27/2010	6.9		5.0	0.037		0.02								
58	Little Fresh P	7/11/2010	6.7		5.0	0.038		0.03								
58	Little Fresh P	7/24/2010	6.7		5.0	0.040		0.02								
58	Little Fresh P	8/8/2010	6.6			0.048		0.03								
58	Little Fresh P	8/21/2010			5.9	0.063		0.07								
58	Little Fresh P	5/22/2011	6.0		5.0	0.030		0.03							0.01	
58	Little Fresh P	6/5/2011	5.8			0.026		0.02							0.01	
58	Little Fresh P	6/15/2011	6.0			0.025		0.04							0.00	
58	Little Fresh P	7/4/2011	5.9			0.024		0.01							0.01	
58	Little Fresh P	7/19/2011	5.9			0.026		0.03							0.01	
58	Little Fresh P	7/31/2011	5.4			0.024		0.02							0.01	
58	Little Fresh P	8/13/2011	5.8			0.032		0.05							0.01	
58	Little Fresh P	9/11/2011	5.6			0.026		0.04							0.01	
58	Little Fresh P	6/24/2012				0.021		0.06							0.00	
58	Little Fresh P	7/8/2012			5.1	0.014		0.08							0.00	
58	Little Fresh P	7/21/2012			4.5	0.020		0.02							0.00	
58	Little Fresh P	8/5/2012			4.2	0.025		0.03							0.08	
58	Little Fresh P	8/21/2012			4.1	0.029		0.03							0.00	

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4							NO2	
58	Little Fresh P	9/2/2012			4.2	0.041		0.03							0.00	
58	Little Fresh P	9/17/2012			4.2	0.021		0.03							0.00	
58	Little Fresh P	9/30/2012			5.2	0.015		0.15							0.00	
58	Little Fresh P	6/16/2013			5.3	0.018		0.03								
58	Little Fresh P	7/1/2013			5.0	0.022										
58	Little Fresh P	7/15/2013			5.0	0.020		0.01								
58	Little Fresh P	7/29/2013			5.0	0.021										
58	Little Fresh P	8/11/2013			5.0	0.021		0.03								
58	Little Fresh P	8/25/2013			5.0	0.034										
58	Little Fresh P	9/8/2013			5.0	0.015		0.01								
58	Little Fresh P	9/22/2013			5.0	0.016										
58	Little Fresh P	6/1/2014			4.5	0.014		0.04								
58	Little Fresh P	6/15/2014			4.5	0.013										
58	Little Fresh P	6/29/2014			4.5	0.017		0.03								
58	Little Fresh P	7/13/2014			4.5	0.030										
58	Little Fresh P	7/27/2014			5	0.027		0.03								
58	Little Fresh P	8/11/2014			4.5	0.024										
58	Little Fresh P	8/24/2014			4.5	0.023		0.01								
58	Little Fresh P	9/7/2014			4.5	0.020										
58	Little Fresh P	5/24/2015			5	0.047		0.02								
58	Little Fresh P	6/7/2015			5	0.047										
58	Little Fresh P	6/29/2015			4.3	0.194		0.03								
58	Little Fresh P	7/12/2015			5	0.052										
58	Little Fresh P	7/26/2015			5	0.061		0.04								
58	Little Fresh P	8/9/2015			4.5	0.125										
58	Little Fresh P	8/23/2015			4.5	0.065		0.06								
58	Little Fresh P	9/6/2015			4	0.055										

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
58	Little Fresh P	7/7/1989	epi	31	26															
58	Little Fresh P	7/22/1989	epi	23	24															
58	Little Fresh P	8/5/1989	epi	28	26															
58	Little Fresh P	8/19/1989	epi	23	24															
58	Little Fresh P	9/1/1989	epi	24	22															
58	Little Fresh P	9/16/1989	epi	19	22															
58	Little Fresh P	9/30/1989	epi	15	17															
58	Little Fresh P	10/13/1989	epi	16	15															
58	Little Fresh P	7/7/1990	epi	20	25															
58	Little Fresh P	7/21/1990	epi	25	26															
58	Little Fresh P	8/4/1990	epi	21	25															
58	Little Fresh P	8/18/1990	epi	27	25															
58	Little Fresh P	9/1/1990	epi	28	26															
58	Little Fresh P	9/15/1990	epi	24	24															
58	Little Fresh P	9/30/1990	epi	21	22															
58	Little Fresh P	6/30/1991	epi	21	21															
58	Little Fresh P	7/13/1991	epi	21	28															
58	Little Fresh P	7/27/1991	epi	22	28															
58	Little Fresh P	8/10/1991	epi	24	26															
58	Little Fresh P	8/24/1991	epi	22	24															
58	Little Fresh P	9/7/1991	epi	23	25															
58	Little Fresh P	9/21/1991	epi	19	20															
58	Little Fresh P	10/5/1991	epi	20	20															
58	Little Fresh P	6/6/1992	epi	20	21															
58	Little Fresh P	6/21/1992	epi	23	24															
58	Little Fresh P	6/30/1992	epi	26	26	2	3	2												
58	Little Fresh P	7/18/1992	epi	27	27															
58	Little Fresh P	8/1/1992	epi	24	24															
58	Little Fresh P	8/15/1992	epi	20	22															
58	Little Fresh P	8/29/1992	epi	26	27	2	2	2	0											
58	Little Fresh P	9/12/1992	epi	18	20	2	2	2												
58	Little Fresh P	6/19/1993	epi	30	28															
58	Little Fresh P	7/1/1993	epi	27	27															
58	Little Fresh P	7/17/1993	epi	24	26															

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
58	Little Fresh P	8/1/1993	epi	31	29															
58	Little Fresh P	8/16/1993	epi	26	27															
58	Little Fresh P	8/30/1993	epi	27	28															
58	Little Fresh P	9/13/1993	epi	26	24	1	3	1												
58	Little Fresh P	10/6/1993		14	18															
58	Little Fresh P	7/2/1994	epi	23	28	2	3	2	6											
58	Little Fresh P	7/9/1994	epi	33	31	1	3	1												
58	Little Fresh P	7/22/1994	epi	28	29	2	3	1												
58	Little Fresh P	06/14/02	epi	16	21	2	2	3	25											
58	Little Fresh P	07/01/02	epi	27		2	3	3	2											
58	Little Fresh P	07/14/02	epi	23	24	2	3	3	2											
58	Little Fresh P	07/27/02	epi	26	23	2	3	3	2											
58	Little Fresh P	08/10/02	epi	26	27															
58	Little Fresh P	08/15/02	epi	26	26															
58	Little Fresh P	09/12/02	epi	16	21	2	3	3	2											
58	Little Fresh P	10/17/02	epi	11	17	2	3	2	25											
58	Little Fresh P	6/14/2003	epi	23	20	2	1	1	8											
58	Little Fresh P	7/6/2003	epi	27		2	3	2	28											
58	Little Fresh P	8/24/2003	epi	22	23	3	3	3	2											
58	Little Fresh P	9/7/2003	epi	22	21															
58	Little Fresh P	9/28/2003	epi	26	24	2	3	4	2											
58	Little Fresh P	10/18/2003	epi	13	16	2	3	3	2											
58	Little Fresh P	11/1/2003	epi	18	16	2	2	3	126											
58	Little Fresh P	6/20/2004	epi	20	24	3	3	2	1											
58	Little Fresh P	7/6/2004	epi	21	26	2	3	3	12											
58	Little Fresh P	7/17/2004	epi	26	27	3	2	3	1											
58	Little Fresh P	8/1/2004	epi	27	18	4	2	4	3											
58	Little Fresh P	8/15/2004	epi	24	27	3	3	4	2347											
58	Little Fresh P	9/11/2004	epi	22	26	3	3	3	3											
58	Little Fresh P	10/2/2004	epi	21	20	3	3	3	13											
58	Little Fresh P	6/13/2005	epi	32	27	1	2	1	6											
58	Little Fresh P	7/4/2005	epi	29	21	2	3	2	2											
58	Little Fresh P	7/16/2005	epi	27	29	3	3	2	2											
58	Little Fresh P	7/31/2005	epi	24	25	2	2	2	2											
58	Little Fresh P	8/15/2005	epi	28	29	1	1	1	0											
58	Little Fresh P	8/27/2005	epi	27	25	2	2	2	0											
58	Little Fresh P	9/10/2005	epi	24	27	2	4	2	18											
58	Little Fresh P	9/23/2005	epi	29	26	2	1	2	2											
58	Little Fresh P	6/13/2006	epi	24	22	2	1	2	5											
58	Little Fresh P	7/3/2006	epi	33	28	1	3	2	2											
58	Little Fresh P	7/14/2006	epi	26	31	2	1	2												
58	Little Fresh P	7/29/2006	epi	33	28	2	1	2	8											
58	Little Fresh P	8/12/2006	epi	26	24	2	2	3	2											
58	Little Fresh P	9/3/2006	epi	22	22	2	1	2	5											
58	Little Fresh P	9/17/2006	epi	21	22	2	1	2	5											
58	Little Fresh P	10/3/2006	epi	21	19	1	3	1	0											
58	Little Fresh P	7/8/2007	epi	32	18	1	1	2	0											
58	Little Fresh P	7/22/2007	epi	23	26	2	3	2	8											
58	Little Fresh P	8/12/2007	epi	29	22	3	1	3	1											
58	Little Fresh P	8/25/2007	epi	25	25	3	4	3	2											
58	Little Fresh P	9/9/2007	epi	17	17	1	2	2	8											
58	Little Fresh P	9/23/2007	epi	21	21	1	3	1	8											
58	Little Fresh P	10/7/2007	epi	25	23	2	2	2	8											
58	Little Fresh P	10/21/2007	epi	22	18	1	1	1	8											
58	Little Fresh P	6/15/2008	epi	32	27	2	2	1	8											
58	Little Fresh P	6/22/2008	epi	26	26	2	3	2	0											
58	Little Fresh P	7/5/2008	epi	24	27	2	1	2	8											
58	Little Fresh P	7/19/2008	epi	33	30	2	3	1	2											
58	Little Fresh P	8/3/2008	epi	24	27	2	3	1	0											
58	Little Fresh P	8/16/2008	epi	29	26	1	3	1	8											
58	Little Fresh P	9/21/2008	epi	24	21	2	3	2	2											

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
58	Little Fresh P	6/29/2009	epi	20	22	1	2	1	0											
58	Little Fresh P	7/12/2009	epi	23	23															
58	Little Fresh P	7/27/2009	epi	33	28	1	2	1	5											
58	Little Fresh P	8/9/2009	epi	23	24	2	3	2	5											
58	Little Fresh P	8/22/2009	epi	32	25	1	2	1	0											
58	Little Fresh P	9/13/2009	epi	29	27	1	2	1	0			80.5								
58	Little Fresh P	10/1/2009	epi	15	18	3	1	2	5			201.3								
58	Little Fresh P	5/17/2010	epi	24	21	3	2	3	58	0	0									
58	Little Fresh P	5/31/2010	epi	23	24	2	2	1	0	0	0									
58	Little Fresh P	6/12/2010	epi	21	22	2	3	2	5	0	0									
58	Little Fresh P	6/27/2010	epi	27	28	3	3	1	0	0	0									
58	Little Fresh P	7/11/2010	epi	32	29	2	3	1	0	0	0									
58	Little Fresh P	7/24/2010	epi		27	2	2	1	0	0	0									
58	Little Fresh P	8/8/2010	epi	31	28	2	3	1	0	0	0	189.2								
58	Little Fresh P	8/21/2010	epi	30	26	2	2	1	0			292.7								
58	Little Fresh P	5/22/2011	epi	18	20	1	3	4	0	0	0		4.4							
58	Little Fresh P	6/5/2011	epi	22	22	1	3	1	0	0	0		6.3							
58	Little Fresh P	6/15/2011	epi	29	25	1	3	3	0	0	0	10.0	3.7							
58	Little Fresh P	7/4/2011	epi	26	29	1	3	1	0	0	0	11.0	6.5							
58	Little Fresh P	7/19/2011	epi	30	27	1	3	1	0	0	0	21.6	9.8	0.15	<0.902	<0.1				
58	Little Fresh P	7/31/2011	epi	27	29	1	3	1	0	0	0	74.8	9.0							
58	Little Fresh P	8/13/2011	epi	28	26	1	3	1	0	0	0	191.9	8.2	0.35						
58	Little Fresh P	9/11/2011	epi	22	23	3	1	1	0	0	0	367.8	13.4	0.15	<0.4	<0.1			f	
58	Little Fresh P	fall 2011	bloom											0.30	<0.8	<0.1				
58	Little Fresh P	6/21/2012	epi	26	28	1	3	1	0	0	0	2.00	0.60				1.56	0.78	I	
58	Little Fresh P	7/8/2012	epi	32	30	1	3	1	0	0	0	4.60	0.70	0.37	<0.392		2.30	1.02	G	
58	Little Fresh P	7/22/2012	epi	26	26	1	3	1	0	0	0	7.50	0.90	0.40	<0.328		5.50	1.98	G	
58	Little Fresh P	8/5/2012	epi	30	28	1	3	1	0	0	0	10.70	0.60	<0.30	<0.659		5.49	3.33	G	
58	Little Fresh P	8/12/2012	epi	25	26	1	3	1	0	0	0	20.50	1.10	0.59	<0.552		6.04	4.00	G	
58	Little Fresh P	9/2/2012	epi	26	26							16.60	0.90	<0.30	<0.580		5.76	3.60	G	
58	Little Fresh P	9/17/2012	epi	19	22							3.00	0.50	0.84	<3.299		1.76	0.51	G	
58	Little Fresh P	9/30/2012	epi		20	1	3	1	0	0	0	6.80	0.80	0.47	<3.205		2.31	0.76	G	
58	Little Fresh P	6/16/2013	epi	24	23	1	2	2	0	0	0	0.60	1.40	<0.30	<0.440		1.10	0.00	I	I
58	Little Fresh P	7/1/2013	epi	25	26	1	3	1	0	0	0	0.10	0.90	<0.30	<0.510		0.70	0.00	G	G
58	Little Fresh P	7/15/2013	epi	32	27	1	1	1	0	0	0	6.50	1.60	<0.30	<0.910		1.60	0.30		
58	Little Fresh P	7/29/2013	epi	28	27	1	3	1	0	0	0	9.80	2.10	<0.30	<0.380		4.40	1.90	gi	G
58	Little Fresh P	8/11/2013	epi	26	26	1	3	1	0	0	0	32.60	3.90	<0.30	<0.380		10.30	8.00	gi	gi
58	Little Fresh P	8/25/2013	epi	25	26	2	1	2	0	0	0	43.60	2.50	0.38	<0.390		11.20	10.40	gi	gi
58	Little Fresh P	9/8/2013	epi	25	24	1	1	1	0	0	0	24.60	2.80	0.68	<1.240		6.30	3.00	gi	gi
58	Little Fresh P	9/22/2013	epi	22	22	1	1	1	0	0	0	4.20	1.60	0.92	<19.130		2.10	0.60	gi	gi
58	Little Fresh P	6/1/2014	epi	23	23	1	1	1	0	0	0	0.10	0.70	<0.37	<0.09	<0.001	0.80	0.00	I	
58	Little Fresh P	6/15/2014	epi	21	23	1	1	1	0	0	0	0.10	0.20	<0.61	<0.08	<0.002	1.07	0.00	I	
58	Little Fresh P	6/29/2014	epi	24	26	1	1	1	0	0	0	1.00	0.40	<0.48	<0.48	<0.002	0.99	0.00	I	
58	Little Fresh P	7/13/2014	epi	28	26	1	3	1	0	0	0	3.30	0.40	<0.40	<0.21	<0.003	1.28	0.00	G	
58	Little Fresh P	7/27/2014	epi	27	27	1	3	1	0	0	0	4.90	0.70	<0.63	<0.03	<0.001	4.83	0.32	gi	I
58	Little Fresh P	8/11/2014	epi	27	27	1	3	1	0	0	0	6.50	0.40	<0.26	<0.10	<0.002	2.67	0.67	gi	gi
58	Little Fresh P	8/24/2014	epi	22	25	1	3	1	0	0	0	7.00	0.60	<0.26	<0.10	<0.002	2.68	0.45	gi	gi
58	Little Fresh P	9/7/2014	epi	24	26	1	1	1	0	0	0	24.20	0.60	<0.64	<0.03	<0.001	9.19	6.20	gi	gi
58	Little Fresh P	5/24/2015	epi	26	22	2	3	1	0	0	0	5.50	0.70	<1.34	<0.032	<0.080	1.12	0.00	I	I
58	Little Fresh P	6/7/2015	epi	26	22	3	3	2	0	0	0	5.20	0.70	<0.77	<0.126	<1.739	1.76	0.00	D	D
58	Little Fresh P	6/29/2015	epi	24	23	1	3	1	0	0	0	4.80	0.90	<0.63	<0.007	<0.000	2.90	0.00	I	I
58	Little Fresh P	7/12/2015	epi	34	26	1	3	1	0	0	0	17.60	0.90	<1.01	<0.003	<0.011	3.80	0.65	G	I
58	Little Fresh P	7/26/2015	epi	28	27	2	3	1	0	0	0	17.80	1.00	<0.30	<0.002	<0.014	4.18	0.79	G	I
58	Little Fresh P	8/9/2015	epi	27	27	2	3	1	0	0	0	47.50	3.00	<0.18	<0.002	<0.009	21.24	10.09	G	I
58	Little Fresh P	8/23/2015	epi	27	28	3	3	2	1	0	0	12.80	1.00	<0.21	<0.003	<0.010	50.74	47.48	I	I
58	Little Fresh P	6/7/2015	epi											<1.32	<0.252	<3.477	12.97	5.40		
58	Little Fresh P	9/6/2015	epi											<0.43	<0.020	<0.058	1008	1008		
58	Little Fresh P	9/6/2015	epi	29	27	3	3	4	1	4	4			<0.30	<0.007	<0.035	16.83	14.96	C	C
58	Little Fresh P	06/29/2009	hypo		21															
58	Little Fresh P	07/27/2009	hypo		27															
58	Little Fresh P	08/09/2009	hypo		23															

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
58	Little Fresh P	10/01/2009	hypo		17															
58	Little Fresh P	6/27/2010	hypo		16															
58	Little Fresh P	7/11/2010	hypo		26															
58	Little Fresh P	7/24/2010	hypo		25															
58	Little Fresh P	6/16/2013	hypo		23															
58	Little Fresh P	7/1/2013	hypo		23															
58	Little Fresh P	7/15/2013	hypo		27															
58	Little Fresh P	7/29/2013	hypo		26															
58	Little Fresh P	8/11/2013	hypo		25															
58	Little Fresh P	8/25/2013	hypo		24															
58	Little Fresh P	9/8/2013	hypo		23															
58	Little Fresh P	9/22/2013	hypo		21															
58	Little Fresh P	6/1/2014	hypo		22															
58	Little Fresh P	6/15/2014	hypo		20															
58	Little Fresh P	6/29/2014	hypo		22															
58	Little Fresh P	7/13/2014	hypo		25															
58	Little Fresh P	7/27/2014	hypo		25															
58	Little Fresh P	8/11/2014	hypo		25															
58	Little Fresh P	8/24/2014	hypo		22															
58	Little Fresh P	9/7/2014	hypo		27															
58	Little Fresh P	5/24/2015	hypo		19															
58	Little Fresh P	6/7/2015	hypo		17															
58	Little Fresh P	6/29/2015	hypo		20															
58	Little Fresh P	7/12/2015	hypo		22															
58	Little Fresh P	7/26/2015	hypo		25															
58	Little Fresh P	8/9/2015	hypo		26															
58	Little Fresh P	8/23/2015	hypo		27															
58	Little Fresh P	9/6/2015	hypo		25															

Legend Information

Indicator	*Description*	*Detection Limit*	*Standard (S) / Criteria (C)*
General Information			
Lnum	lake number (unique to CSLAP)		
Lname	name of lake (as it appears in the Gazetteer of NYS Lakes)		
Date	sampling date		
Field Parameters			
Zbot	lake depth at sampling point, meters (m)		
Zsd	Secchi disk transparency or clarity	0.1m	1.2m (C)
Zsamp	water sample depth (m) (epi = epilimnion or surface; bot = bottom)	0.1m	none
Tair	air temperature (C)	-10C	none
TH20	water temperature (C)	-10C	none
Laboratory Parameters			
Tot.P	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l (C)
NOx	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
NH4	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
TN	total nitrogen (mg/l)	0.01 mg/l	none
TN/TP	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
TCOLOR	true (filtered) color (ptu, platinum color units)	1 ptu	none
pH	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
Cond25	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
Ca, Cl	calcium, chloride (mg/l)	1 mg/l	none
Chl.a	chlorophyll a (ug/l)	0.01 ug/l	none
Fe	iron (mg/l)	0.1 mg/1	1.0 mg/l (S)
Mn	manganese (mg/l)	0.01 mg/l	0.3 mg/l (S)
As	arsenic (ug/l)	1 ug/l	10 ug/l (S)
AQ-PC	Phycocyanin (aquaflor) (unitless)	1 unit	none
AQ-Chl	Chlorophyll *a* (aquaflor) (ug/l)	1 ug/l	none
MC-LR	Microcystis-LR (ug/l)	0.01 ug/l	1 ug/l potable (C) 20 ug/l swimming (C)
Ana	Anatoxin-a (ug/l)	variable	none
Cyl	Cylindrospermposin (ug/l)	0.1 ug/l	none
FP-Chl, FP-BG	Fluoroprobe total chlorophyll, fluoroprobe blue-green chlorophyll (ug/l)	0.1 ug/l	none
Lake Assessment			
QA	water quality assessment; 1 = crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels		
QB	aquatic plant assessment; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
QC	recreational assessment; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
QD	reasons for recreational assessment; 1 = poor water clarity, 2 = excessive weeds, 3 = too much algae, 4 = lake looks bad, 5 = poor weather, 6 = litter/surface debris, 7 = too many lake users, 8 = other		
QF, QG	Health and safety issues today (QF) and past week (QG); 0 = none, 1 = taste/odor, 2 = GI illness humans/animals, 3 = swimmers itch, 4 = algae blooms, 5 = dead fish, 6 = unusual animals, 7 = other		
HAB form, Shore HAB	HAB evaluation; A = spilled paint, B = pea soup, C = streaks, D = green dots, E = bubbling scum, F = green/brown tint, G = duckweed, H = other, I = no bloom		

Appendix B- Priority Waterbody Listing for Little Fresh Pond

Big/Little Fresh Ponds (1701-0125) — Impaired

Waterbody Location Information

Revised: 10/30/2015

Water Index No:	(MW6.3c) GB..LPB-123..P661.P662	**Drain Basin:**	Atlantic-Long Island Sound
Unit Code:	0203020205 Class: B		Atlantic Ocean
Water Type/Size:	Lake/Reservoir 101.2 Acres	**Reg/County:**	1/Suffolk (52)
Description:	total area of both lakes		

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Pollutants/Sources)

Uses Evaluated	Severity	Confidence
Public Bathing	Suessed	Suspected
Recreation	Impaired	Suspected
Aquatic Life	Fully Supported	Suspected
Fish Consumption	Fully Supported	Unconfirmed
Conditions Evaluated		
Habitat/Hydrology	Unknown	
Aesthetics	Unknown	

Type of Pollutant(s)

Known:	HARMFUL ALGAL BLOOMS
Suspected:	NUTRIENTS (phosphorus), Low D.O./Oxygen Demand
Unconfirmed:	- - -

Source(s) of Pollutant(s)

Known:	- - -
Suspected:	URBAN/STORM RUNOFF
Unconfirmed:	- - -

Management Information

Management Status:	Verification of Sources Needed
Lead Agency/Office:	ext/WQCC
IR/305(b) Code:	Water with Insufficient Data (IR Category 3)

Further Details

Overview

Big/Little Fresh Pond is assessed as having minor impacts – that may rise to the level of impairment – due to recreational uses that are thought to be impaired harmful algal blooms and elevated levels of nutrients. No specific sources have been identified, but nonpoint sources and wildlife/waterfowl sources are thought to contribute to the impacts.

Use Assessment

Big/Little Fresh Ponds is a Class B waterbody, suitable for public bathing, general recreation use and support of aquatic life, but not as a water supply.

Recreation use and public bathing are considered to be stressed/impaired due to periodic occurrence of shoreline

harmful algal blooms and somewhat elevated nutrient levels. Additional bacteriological sampling is needed to more fully evaluate the impact of pathogen levels on public bathing (swimming) use. This waterbody is thought to support a warmwater fishery, although no specific fishery or biological reports are included in this assessment. (DEC/DOW, BWAM/LMAS, July 2013)

There are no health advisories in place limiting the consumption of fish from this waterbody (beyond the general advice for all waters). Fish consumption is considered to be fully supported based on the absence of any waterbody-specific advisory, but is noted as unconfirmed since routine monitoring of contaminants in fish is limited. (NYS DOH Health Advisories and DEC/DOW, BWAM, January 2014)

Water Quality Information
Water quality sampling of Big Fresh and Little Fresh Ponds has been conducted through the NYSDEC Citizens Statewide Lake Assessment Program (CSLAP) from 2010 through 2014. Results of this sampling indicate the Little Fresh Pond is best characterized as mesoeutrophic, or moderately productive, while Big Fresh Pond is a mesotrophic lake. Chlorophyll/algal levels in Little Fresh Pond rarely exceed criteria corresponding to impaired recreational uses, while phosphorus concentrations are typically somewhat high. Occurrences of harmful algal blooms have been documented. Lake clarity measurements indicate water transparency that typically fails to meet the recommended minimum criteria for swimming beaches. In Big Fresh Pond, chlorophyll/algal and phosphorus levels are consistently below impaired water criteria, with clarity that typically meets bathing beach criteria. (DEC/DOW, BWAM/LMAS, May 2006)

Source Assessment
Based on surrounding land use and other knowledge of the waterbody, the most likely sources of pathogens to the waterbody are largely nonpoint runoff from developed urban and residential areas agricultural activity and open space/forest; direct waterfowl/wildlife inputs; and boats and marinas. Relative contributions from each type of source are very site-specific in nature, particularly in localized areas of study. (DEC/DOW, BWRM, September 2015)

Management Actions
This segment is included within the Peconic Estuary Program (PEP) study area, situated between the North and South Forks of eastern Long Island and consisting of more than 100 distinct bays, harbors, embayments, and tributaries, covering more than 128,000 acres of land and 121,000 acres of surface water. As part of the National Estuary Program (NEP), the Peconics were charged with developing and implementing a watershed-based comprehensive management plan. To accomplish this goal the PEP established an innovative partnership of local, state, and federal governments, citizen and environmental groups, businesses and industries, and academic institutions. The PEP Comprehensive Conservation and Management Plan (CCMP) was formally approved by USEPA in 2001. There are over 300 specific management tasks included in the CCMP, with priority topics focusing on Brown Tide, nutrients, habitat and living resources, pathogens, toxic pollutants, and critical lands protection. A vessel waste no discharge zone was established for the entire Peconic Estuary in 2002 to address impacts from boat pollution. (PEP, August 2010)

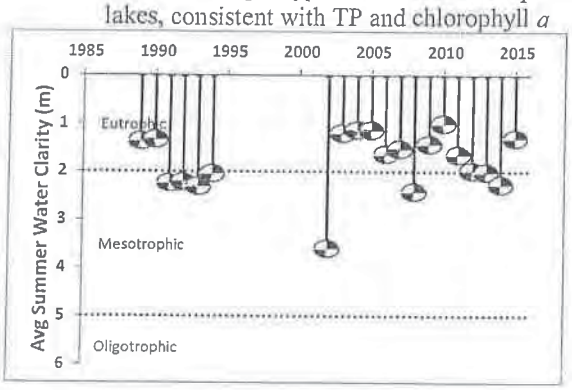
Section 303(d) Listing
Big/Little Fresh Ponds is included on the current (2014) NYS Section 303(d) List of Impaired/TMDL Waters. The waterbody is included on Part 3a of the List as an impaired waterbody requiring verification of an impairment for phosphorus. However this updated assessment suggests that the suspected impacts to water quality and uses may not be sufficient to warrant continued listing. This waterbody should be considered for delisting for phosphorus during the next update of the List. As an alternative, consideration should be given to separating the ponds into two waterbody segments, with Big Fresh Pond being removed from the list. (DEC/DOW, BWAM/WQAS, January 2015)

Segment Description
This segment includes the total area of both Big Fresh (P661) and Little Fresh (P662) Ponds.

Appendix C- Long Term Trends: Little Fresh Pond

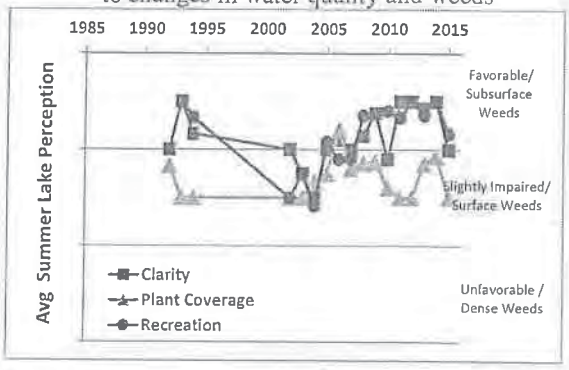
Long Term Trends: Water Clarity

- Highly variable; lower in 2015
- Most readings typical of *mesoeutrophic* lakes, consistent with TP and chlorophyll *a*



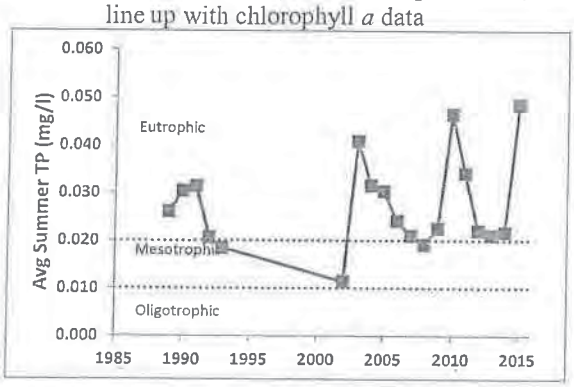
Long Term Trends: Lake Perception

- Improved early 2000s to 2014 but variable
- Recreational perception only slightly linked to changes in water quality and weeds



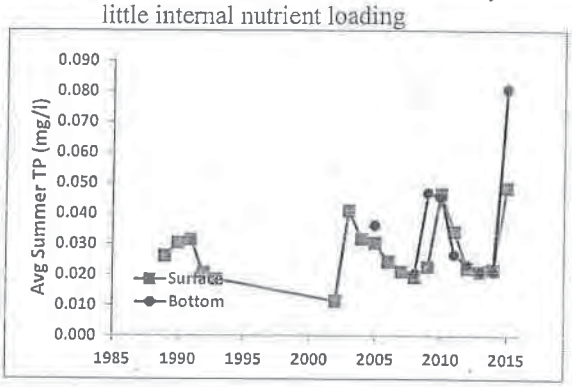
Long Term Trends: Phosphorus

- Spikes in '03',10 and '15, ↓ afterwards
- Most readings typical of *eutrophic* lakes, and line up with chlorophyll *a* data



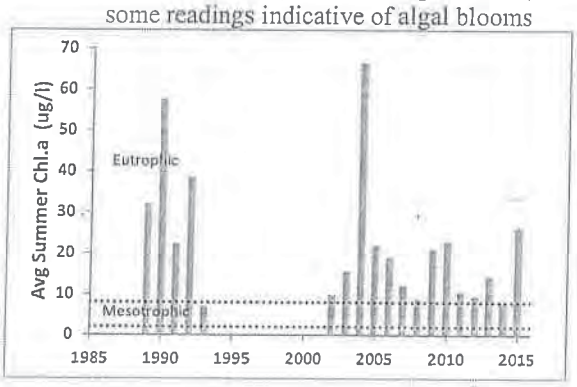
Long Term Trends: Bottom Phosphorus

- Deep TP (trends) similar to surface TP
- Similarity indicates weak thermal layer and little internal nutrient loading



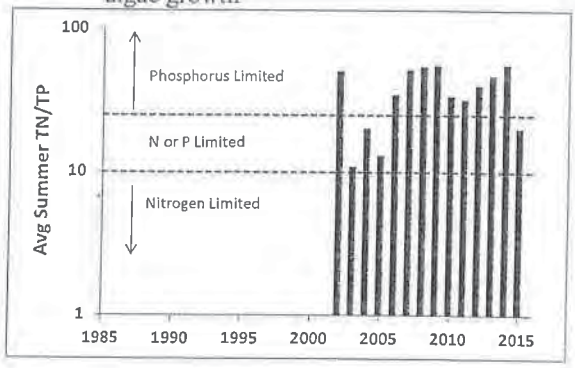
Long Term Trends: Chlorophyll a

- Spikes in '90 and '05, dropping afterwards
- Most readings typical of *eutrophic* lakes, but some readings indicative of algal blooms



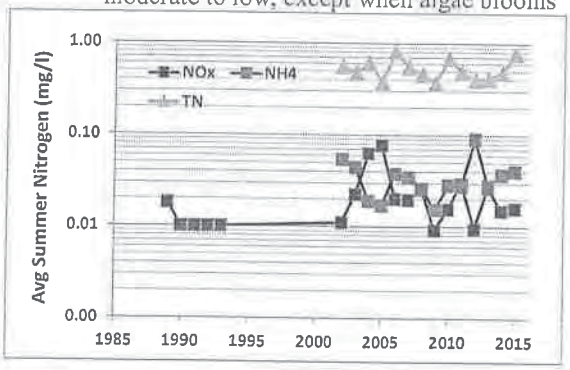
Long Term Trends: N:P Ratio

- No trends apparent
- Most readings indicate phosphorus limits algae growth



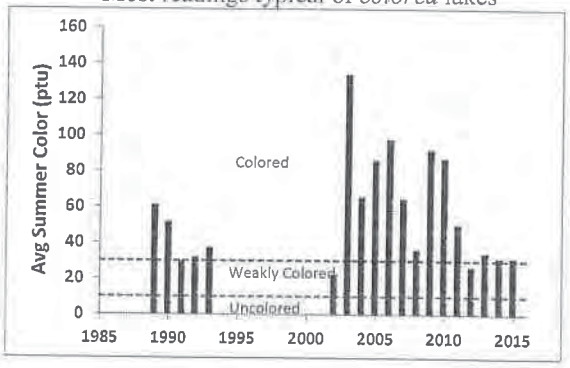
Long Term Trends: Nitrogen

- No trends apparent; all N indictors variable
- Most NOx, ammonia, and TN readings moderate to low, except when algae blooms



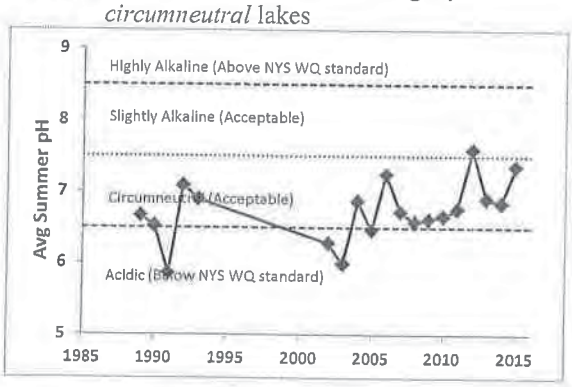
Long Term Trends: Color

- Decreasing since mid-2000s; now in range where color doesn't affect clarity
- Most readings typical of *colored* lakes



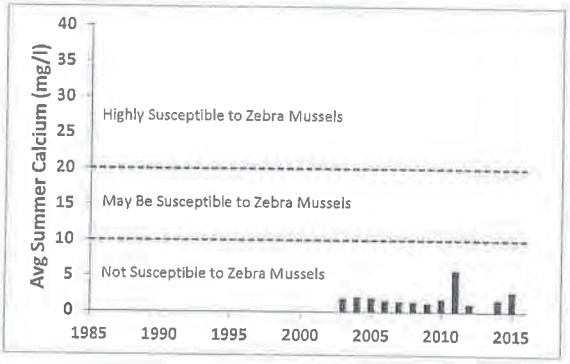
Long Term Trends: pH

- Increase from early 2000s to present
- Most readings typical of *slightly acidic* to *circumneutral* lakes



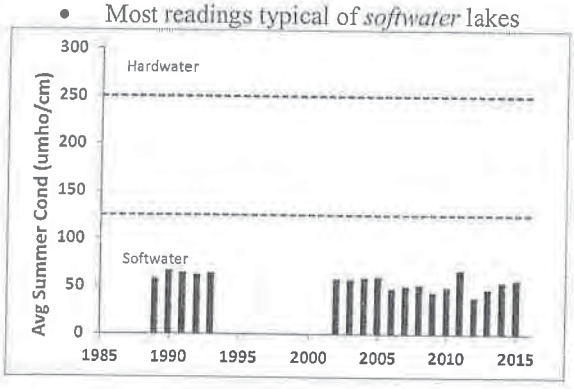
Long Term Trends: Calcium

- No trends apparent
- Data indicates low susceptibility to zebra mussels



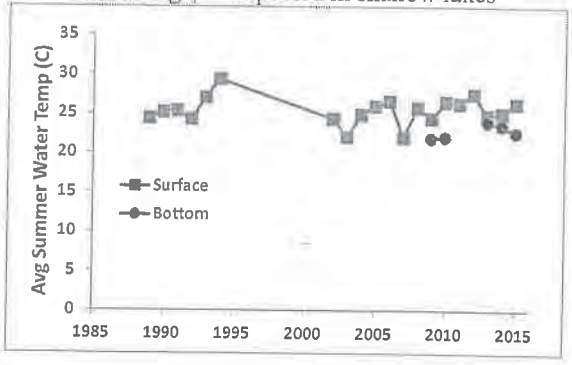
Long Term Trends: Conductivity

- Conductivity fairly stable with slight long-term decrease
- Most readings typical of *softwater* lakes



Long Term Trends: Water Temperature

- No trends apparent in surface readings
- Bottom temperatures close to surface readings, as expected in shallow lakes



Appendix D:
Algae Testing Results from SUNY ESF Study

Most algae are harmless, naturally present, and an important part of the food web. However excessive algae growth can cause health, recreational, and aesthetic problems. Some algae can produce toxins that can be harmful to people and animals. High quantities of these algae are called harmful algal blooms (HABs). CSLAP lakes have been sampled for a variety of HAB indicators since 2008. This was completed on selected lakes as part of a NYS DOH study from 2008-2010. In 2011, enhanced sampling on all CSLAP lakes was initiated through an EPA-funded project that has continued through the current sampling season. This study has evaluated a number of HAB indicators as follows:

- Algae types - blue green, green, diatoms, and "other"
- Algae densities
- Microscopic analysis of bloom samples
- Algal toxin analysis

Some of these results are reported in other portions of these reports. This appendix the seasonal change in blue green algae, other algae types, and the primary algal toxin (microcystin-LR, a liver toxin). Analysis was completed on open water samples and, for some lakes, shoreline samples that were collected when visual evidence of blooms were apparent. Results are compared to the DEC criteria of 25-30 ug/l blue green chlorophyll a and 20 ug/l microcystin-LR (based on the World Health Organization (WHO) threshold for unsafe swimming conditions) and the WHO provisional criteria for long-term protection of treated water supplies (= 1 ug/l microcystin-LR). The data for algae types are drawn from a high end fluorometer used by SUNY ESF. While these results are useful for timely approximation of lake conditions, they are not as accurate as the total chlorophyll results measured as a regular part of CSLAP since 1986 in all open water samples. Therefore these results are used judiciously in the assessment of sampled waterbodies.

Two separate samples are evaluated. A sample is taken at the CSLAP sample point at the deepest point of the lake at every sample session. In addition, shoreline samples can be taken when a bloom is visible. It should be noted that shoreline conditions can vary significantly over time and from one location to another. The shoreline bloom sampling results summarized below are not collected as routinely as open water samples, and therefore represent snapshots in time. It is assumed that sampling results showing high blue green algae and/or toxin levels indicate that algae blooms may be common and/or widespread on these lakes. However, the absence of elevated blue green algae and toxin levels does not assure the lack of shoreline blooms on these lakes. Elevated open water readings may indicate a higher likelihood of shoreline blooms, but in some lakes, these shoreline blooms have not been (well) documented.

The results from these samples are summarized within the CSLAP report for the lake.

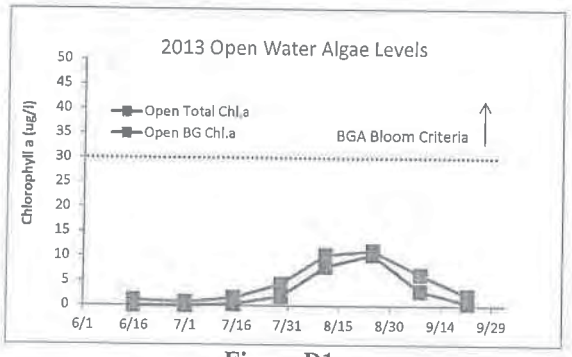


Figure D1:
2013 Open Water Total and BGA Chl.a

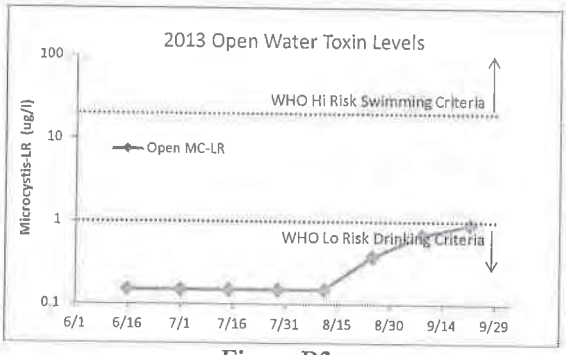


Figure D2:
2013 Open Water Microcystin-LR

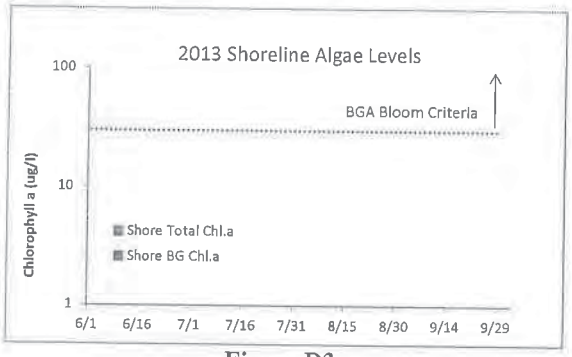


Figure D3:
2013 Shoreline Total and BGA Chl.a

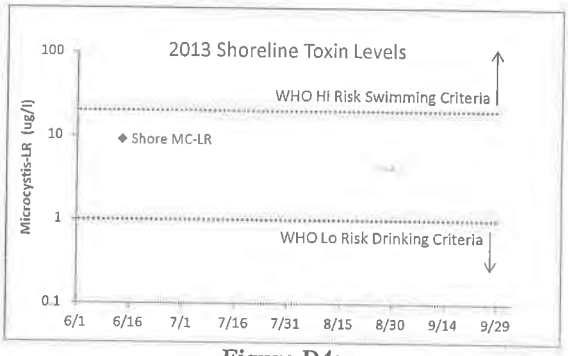


Figure D4:
2013 Shoreline Microcystin-LR

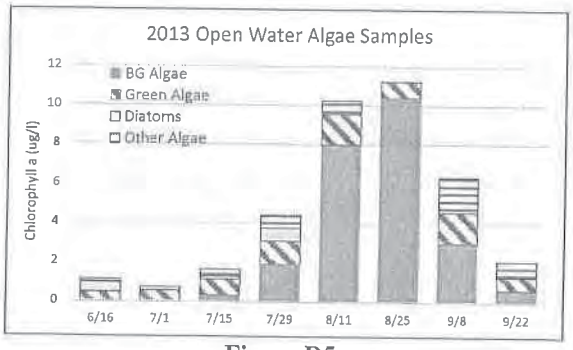


Figure D5:
2013 Open Water Algae Types

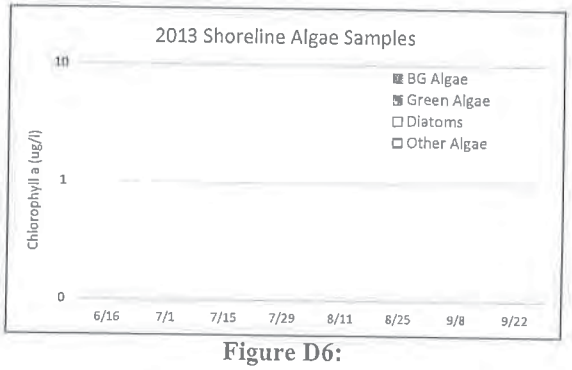


Figure D6:
2013 Shoreline Algae Types

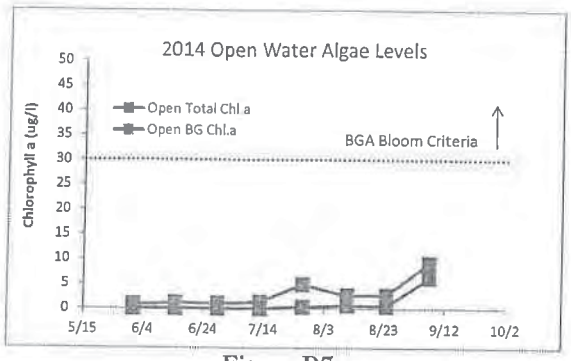


Figure D7:
2014 Open Water Total and BGA Chl.a

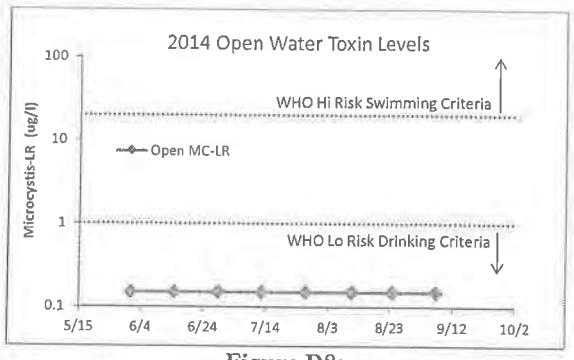


Figure D8:
2014 Open Water Microcystin-LR

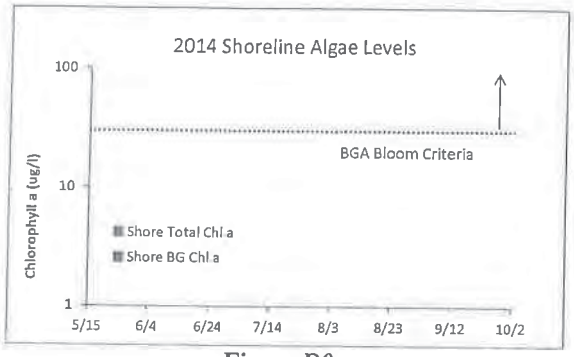


Figure D9:
2014 Shoreline Total and BGA Chl.a

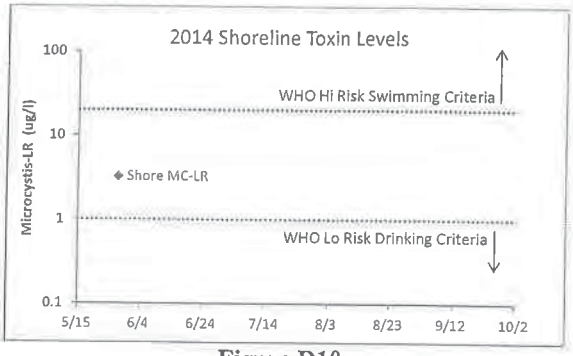


Figure D10:
2014 Shoreline Microcystin-LR

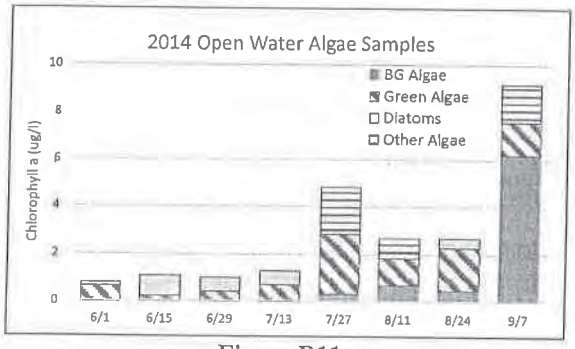


Figure D11:
2014 Open Water Algae Types

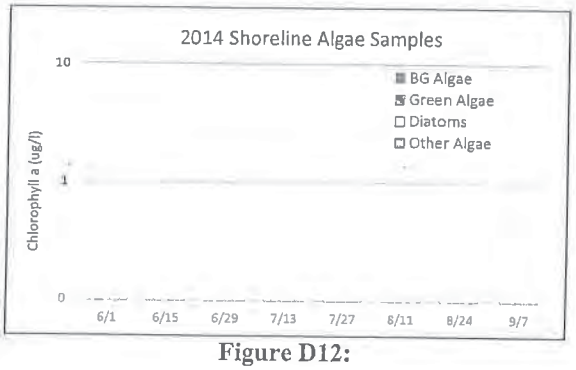


Figure D12:
2014 Shoreline Algae Types

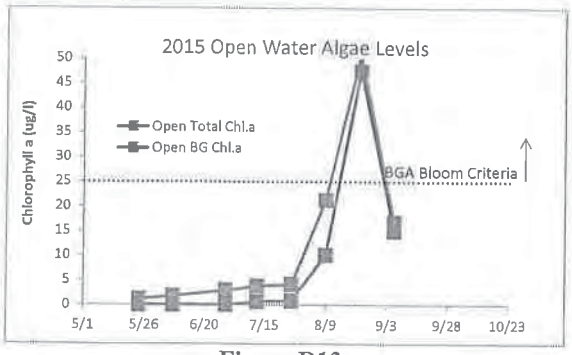


Figure D13:
2015 Open Water Total and BGA Chl.a

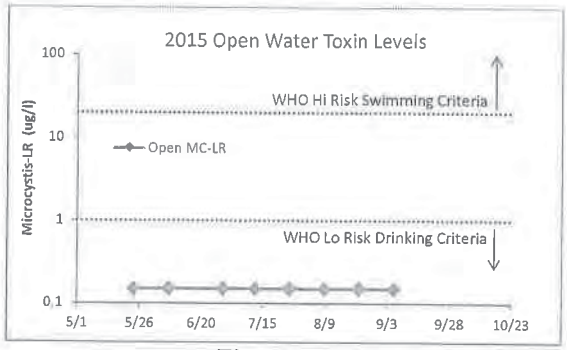


Figure D14:
2015 Open Water Microcystin-LR

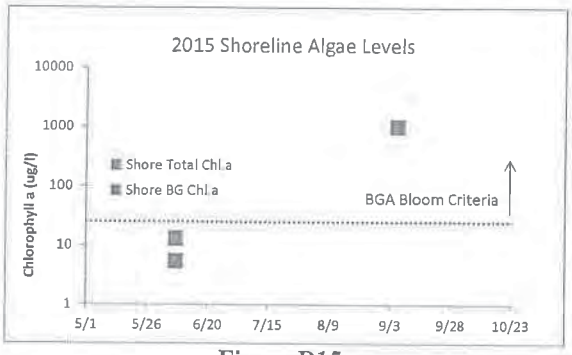


Figure D15:
2015 Shoreline Total and BGA Chl.a

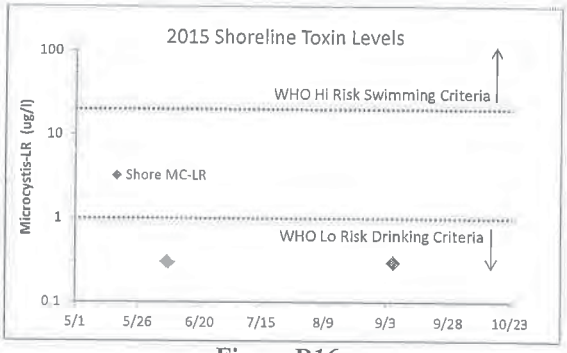


Figure D16:
2015 Shoreline Microcystin-LR

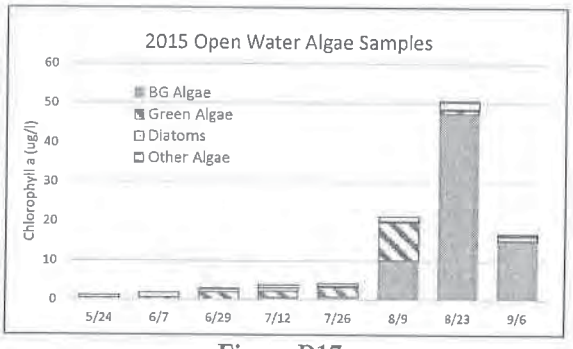


Figure D17:
2015 Open Water Algae Types

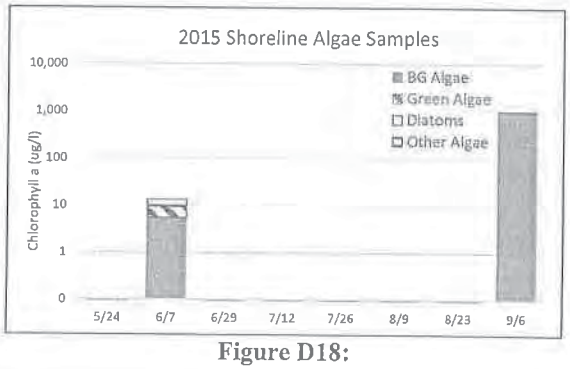


Figure D18:
2015 Shoreline Algae Types

Appendix E:
AIS Species in Suffolk County

The table below shows the invasive aquatic plants and animals that have been documented in Suffolk County, as cited in either the iMapInvasives database (http://www.imapinvasives.org/) or in the NYSDEC Division of Water database. These databases may include some, but not all, non-native plants or animals that have not been identified as "Prohibited and Regulated Invasive Species" in New York state regulations (6 NYCRR Part 575; http://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf).

This list is not complete, but instead represents only those species that have been reported and verified within the county. If any additional aquatic invasive species (AIS) are known or suspected in these or other waterbodies in the county, this information should be reported through iMap invasives or by contacting NYSDEC at dowinfo@dec.ny.gov.

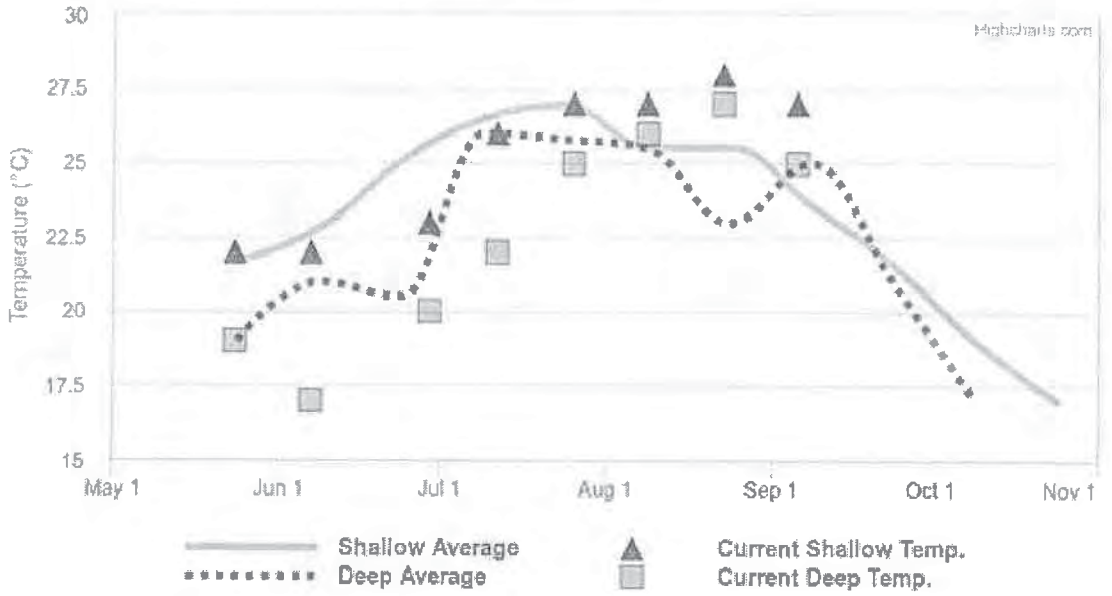
Aquatic Invasive Species – Suffolk County			
Waterbody	**Kingdom**	**Common name**	**Scientific name**
Artist Lake	Plant	Fanwort	*Cabomba caroliniana*
Artist Lake	Animal	Goldfish	*Carassius auratus*
Avon Manor Lake	Plant	Parrot feather	*Myriophyllum aquaticum*
Belmont Lake	Plant	Fanwort	*Cabomba caroliniana*
Belmont Lake	Animal	Common carp	*Cyprinus carpio*
Blydenburgh Pond aka New Mill Pond	Plant	Hydrilla	*Hydrilla verticillata*
Blydenburgh Pond aka New Mill Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Canaan Lake	Plant	Fanwort	*Cabomba caroliniana*
Canaan Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Carlls River - Park Ave	Animal	Asian Clam	*Corbicula fluminea*
Donohue Pond	Plant	Fanwort	*Cabomba caroliniana*
Duck Pond	Plant	Fanwort	*Cabomba caroliniana*
Elda Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Fort Pond	Animal	Common carp	*Cyprinus carpio*
Great Patchogue Lake	Plant	Fanwort	*Cabomba caroliniana*
Great Patchogue Lake	Plant	Brazilian elodea	*Egeria densa*
Great Patchogue Lake	Plant	Hydrilla	*Hydrilla verticillata*
Great Patchogue Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Hards Pond	Plant	Fanwort	*Cabomba caroliniana*
Knapps Lake	Plant	Parrot feather	*Myriophyllum aquaticum*
Lake Ronkonkoma	Animal	Goldfish	*Carassius auratus*
Lake Ronkonkoma	Animal	Common carp	*Cyprinus carpio*
Lake Ronkonkoma	Plant	Hydrilla	*Hydrilla verticillata*

Waterbody	Kingdom	Common name	Scientific name
Lake Ronkonkoma	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Ronkonkoma	Plant	Brittle naiad	*Najas minor*
Little Fresh Pond	Plant	Fanwort	*Cabomba caroliniana*
Little Fresh Pond	Plant	Curly leafed pondweed	*Potamogeton crispus*
Little Long Pond	Plant	Fanwort	*Cabomba caroliniana*
Little Peconic Reservoir	Plant	Fanwort	*Cabomba caroliniana*
Long Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Lotus Lake	Plant	Fanwort	*Cabomba caroliniana*
Lotus Lake	Plant	Hydrilla	*Hydrilla verticillata*
Lotus Lake	Plant	European four leaf clover	*Marsilea quadrifolia*
Lotus Lake	Plant	Parrot feather	*Myriophyllum aquaticum*
Lotus Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Lower Lake	Plant	Fanwort	*Cabomba caroliniana*
Lower Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Lower Vail Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Lower Yaphank Lake	Plant	Fanwort	*Cabomba caroliniana*
Lower Yaphank Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Massapequa Creek - North Soule	Animal	Asian Clam	*Corbicula fluminea*
Mill Pond - Islip	Plant	Curly leafed pondweed	*Potamogeton crispus*
Mill Pond - Oyster Bay	Plant	Water chestnut	*Trapa natans*
Millers Pond	Plant	Hydrilla	*Hydrilla verticillata*
New Millpond	Plant	Hydrilla	*Hydrilla verticillata*
New Millpond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Nissiquoge River - Smithtown	Animal	Asian Clam	*Corbicula fluminea*
Nissiquoge River - Caleb Smith SP	Animal	Asian Clam	*Corbicula fluminea*
Old Ice Pond	Plant	Brittle naiad	*Najas minor*
Peconic Lake	Plant	Fanwort	*Cabomba caroliniana*
Peconic Lake	Plant	Brazilian elodea	*Egeria densa*
Peconic Lake	Plant	European frogbit	*Hydrocharis morsus-ranae*
Peconic Lake	Plant	Floating primrose willow	*Ludwigia peploides ssp. glabrescens*
Peconic Lake	Plant	Parrot feather	*Myriophyllum aquaticum*
Peconic River	Plant	Floating primrose willow	*Ludwigia peploides ssp. glabrescens*
Phillips Mill Pond	Plant	Hydrilla	*Hydrilla verticillata*
Pine Lake	Plant	Brazilian elodea	*Egeria densa*
Pine Lake	Animal	Red-eared slider turtle	*Trachemys scripta elegans*
Randall Pond	Plant	Brazilian elodea	*Egeria densa*
Ross Pond	Plant	Parrot feather	*Myriophyllum aquaticum*
Sans Souci Lake	Plant	Hydrilla	*Hydrilla verticillata*
Sans Souci Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Southards Pond	Plant	Fanwort	*Cabomba caroliniana*
Swan Pond	Plant	Fanwort	*Cabomba caroliniana*

Waterbody	Kingdom	Common name	Scientific name
Swan Pond	Plant	Water chestnut	*Trapa natans*
Swan Pond	Plant	Hydrilla	*Hydrilla verticillata*
Sweezy Pond	Plant	Fanwort	*Cabomba caroliniana*
Tarkill Pond	Animal	Chinese mystery snail	*Cipangopaludina chinensis*
Trout Pond	Plant	Fanwort	*Cabomba caroliniana*
Upper Lake	Plant	Fanwort	*Cabomba caroliniana*
Upper Vail Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Upper Yaphank Lake	Plant	Fanwort	*Cabomba caroliniana*
Vail Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Webster Pond	Plant	Fanwort	*Cabomba caroliniana*
Webster Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
West Brook Pond	Plant	Fanwort	*Cabomba caroliniana*
West Brook Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
West Lake	Plant	Fanwort	*Cabomba caroliniana*
Wildwood Lake	Plant	Fanwort	*Cabomba caroliniana*
Willow Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*

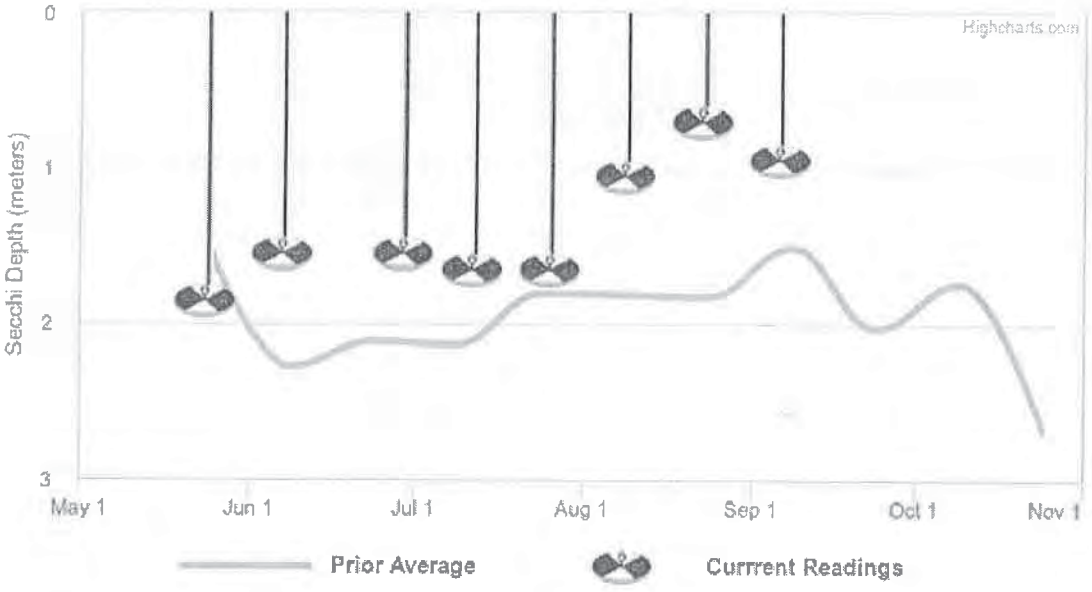
Appendix F: Current Year vs. Prior Averages for Little Fresh Pond

Current Year Water Temperatures vs. Prior Average



This year's shallow water sample temperatures are tending to be higher than normal when compared to the average of readings collected from 1989 to 2014. There are not enough deep water sample temperatures to determine a trend for the current year when compared to the average of readings collected from 2009 to 2014.

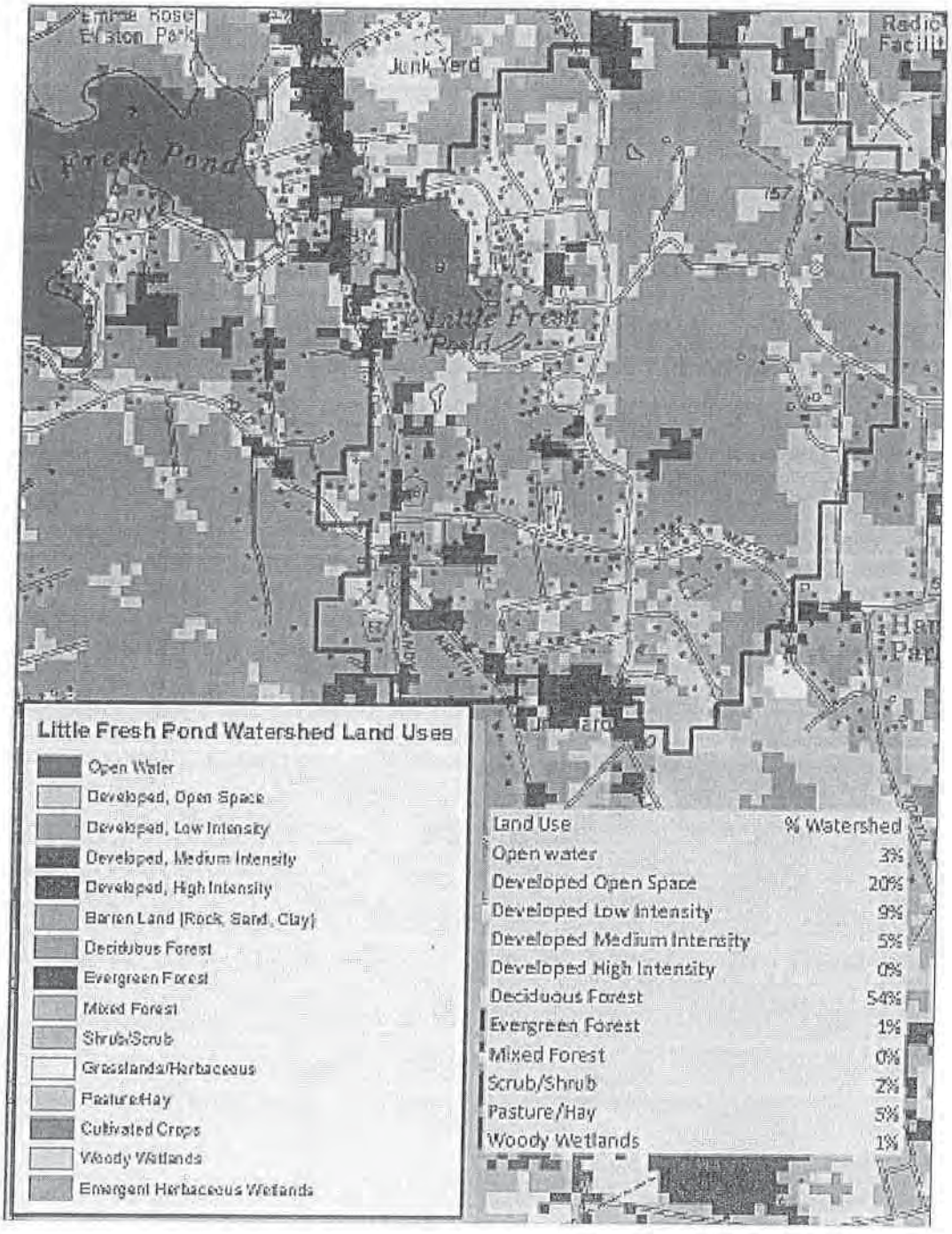
Current Year Secchi Readings vs. Prior Average



This year's session Secchi readings are tending to be lower than normal when compared to the average of readings collected from 1989 to 2014

Appendix G: Watershed and Land Use Map for Little Fresh Pond

This watershed and land use map was developed using USGS StreamStats and ESRI ArcGIS using the 2006 land use satellite imagery. The actual watershed map and present land uses within this watershed may be slightly different due to the age of the underlying data and some limits to the use of these tools in some geographic regions and under varying flow conditions. However, these maps are intended to show the approximate extent of the lake drainage basin and the major land uses found within the boundaries of the basin.



TO: MR. FINNERTY, CHAIRMAN, SOUTHAMPTON TOWN PLANNING BOARD

FROM: LARRY PENNY, ENVIROMEASUREMENTS, LLC

RE: COMMENTS ON THE SOUTHAMPTON DAY CAMP DEIS (second set)

DATE: MARCH 7, 2017

Dear Mr. Finnerty

Attached are my comments regarding the Southampton Day Camp DEIS status. Please distribute to the other members of the Planning Board, which you chair. These are in addition to a previous set which I submitted during your Board's first hearing held in 2016.

Thank you

Larry Penny
3662 Noyac Road
Sag Harbor, N.Y. 11963

Cc: Southampton Town Trustees, Jimmy Silber, Little Fresh Pond Association; Jeff Bragman, Esq.

SOPHIE and BRUCE NADELL

P.O. BOX 165

Southampton, NY 11969

C8

January 16, 2017

Mr. Dennis Finnerty

Chairman of the Southampton Planning Board

116 Hampton Road

Southampton, NY 11968

JAN 19 2017

Ref: Major's Path Day Camp

Dear Mr. Finnerty,

We know that Mr. Jacobs plans to expand the club, as he has expressed that intention very clearly in the DEIS report : the maximum projected future enrollment would consist of 360 campers, 90 staff (65 overnight) in addition to the 90 tennis club members. If permitted, there is no restriction on further increasing the number of campers and staff in the future. C8-1

He also said he has no intention of using the lake however he has advertised recreational activities on the pond. Mr. Jacobs already has broken his initial commitment not to use direct water activities on two other properties he owns and has broken this promise by going ahead anyway. Mr. Jacobs has been cited with a number of zoning violations by the Town of East Hampton. He already has violated the original Town of Southampton ZBA ruling. He has made it a habit to violate town rules and regulations and cannot be trusted to stop there. C8-2

The environmental impact of increased activity in the camp will undoubtedly impact Little Fresh Pond. In conjunction with the New York State DEC the Little Fresh Pond Lake Association has been monitoring the lake for decades, to check the quality of the water in the pond and continues to do so every year. Of course, there are natural occurrences like algae blooms and some run-offs. Residents around the pond are very aware that the use of fertilizers have a harmful impact and do not use chemical fertilizers. None of the residents who live directly on the pond have a pool. Many of the residents enjoy swimming in the pond. C8-3

The Lombardo Associates' reports, one (ordered by the camp) states that the wastewater discharge from the camp flows away from the pond. Another report by Lombardo Ass. (ordered by the Little Fresh Pond Association) states that "the SCDC site wastewater discharge will likely flow into Little Fresh Pond", and finally the Lombardo current report states that there is "insufficient data to determine the ground water flow patterns in and out of Little Fresh Pond". C8-4

There are so many inaccuracies, inconsistencies and contradictions in the DEIS report, it is dizzying !

If Mr. Jacobs is allowed to go ahead with his expansion, there will be no limit to what he will do with the camp and the resulting environmental impact will be disastrous.

Thank you for your consideration of this matter. Sincerely,

Bruce Nadell

Nadell

C8

SOPHIE and BRUCE NADELL

P.O. BOX 165

Southampton, NY 11969

Residence address: 30 Little Fresh Pond Road

C9

FEB - 1 2017

January 31, 2017

Mr. Dennis Finnerty

Chairman of the Southampton Planning Board

116 Hampton Road

Southampton, NY 11968

Ref: Major's Path Day Camp

Dear Mr. Finnerty,

The Southampton Country Day Camp is proposing a future expansion to accommodate eventually up to 500 campers and approximately 100 counselors and other support staff. The camp borders on Little Fresh Pond, a fresh water lake, in a residential area. The day camp use would cause more than a tenfold increase in the activity in the area, which Little Fresh Pond cannot sustain, because of inevitable increase in pollutants, debris and waste. The town of Southampton will end up using people's tax dollars to clean it up like they did for Mill Pond, Agawam Lake and others in the area. C9-1

Little Fresh Pond is a body of water that is on the endangered list of lakes and ponds. The delicate ecosystem of this lake would undeniably be negatively affected by the enormous increase of activity. This lake has until now been able to maintain its health due to constant, careful monitoring by the Little Fresh Pond Lake Association members, as per Fred Havemayer's testimony at the January 26th Planning Board meeting. Mr. Havemeyer always diligently worked with our Association and we are very grateful to him for that. C9-2

The increase in vehicular traffic is not sustainable for the area. The noise to the surrounding residences is already unbearable, as explained to you by immediate neighbors to the camp. Major's Path has already become a heavily traveled road due to the recycling center that is nearby and also to having become a shortcut to Noyac Road, going East. The transportation to and from the day camp by buses for 500 children is neither realistic nor safe, as mentioned by other residents and a safety consultant. C9-3

Mr. Jacobs has been cited with a number of zoning violations by the Town of East Hampton. He **already has violated the original Town of Southampton ZBA ruling**. He has made it a habit of violating town rules and regulations and cannot be trusted to stop here, to further his profit. If an expansion of the camp is permitted he will continue to violate these rules and regulations and make the situation more intolerable. He has so far proven that this is exactly the way he operates. His plan for the expansion of the day camp must be stopped ! C9-4

Thank you for your thoughtful consideration in this matter.

Very truly yours,

Sophie Nadell

Bruce Nadell

cc P/B

Patricia Boudreau-Sullivan

From: Sophie Nadell [sophienadell@gmail.com]
Sent: Saturday, February 04, 2017 6:51 PM
To: Patricia Boudreau-Sullivan
Subject: Major's Day Camp

C10

FEB - 3 2017

Dear Mr. Finnerty and Planning Board Members,

Since when did **Not Caring for the Environment** become an accepted thing? There were so many testimonies from residents of Little Fresh Pond who are deeply worried about the life of the pond they have been caring for during many years. Mr. Havemeyer, as per his testimony at the last Planning Board meeting on January 26th, was the Trustee in charge of Little Fresh Pond. He witnessed all the work and efforts its residents put in to keep the pond in good condition and their dedication so future generations can enjoy the pond as much as we are. The Little Fresh Pond Lake Association has been a member of the New York State Lake Association which requires its members to take samples of the water and ship it to Albany where the DEC evaluates its condition. These tests are paid for by the Lake Association and its members who volunteer to do the testing every other week during the summer months. Also, annually, the Lake Association does an additional test for coliform in four separate areas of the lake, as part of its monitoring process. This has been going on for decades, not just a year or two. The residents around the pond are very diligent about not using chemical fertilizers or sprays for that very purpose, which cannot be said of the day camp: use of chemicals containing nitrogens and phosphates are regularly used on the camp property. C10-1

In a further effort to protect Little Fresh Pond, the Lake Association worked with the Southampton Highway Dept. to limit run-offs into the pond, by installing drainage metal grids wherever needed on the peripheral roads around the pond.

Allowing the camp expansion, by intensifying its use, creating excessive amounts of wastewater, will affect wetlands around the pond and the pond itself. We all know the detrimental impacts that excess nitrogen has on water quality and cannot ignore the fact that groundwater and surface water will be impacted as well. The current experts report show that there is insufficient data to determine the groundwater flow into Little Fresh Pond, contrary to what is reported in the DEIS report, and as underlined by a representative of the Group for the East End who attended the January 26th meeting. I urge the Planning Board therefore to use diligence, make an informed and responsible decision and take into consideration that Little Fresh Pond is already on the list of endangered bodies of water. The impact of uncontrolled, additional wastewater generated by the camp will be irreversible and disastrous for all of the Little Fresh Pond community and North Sea residents. C10-2

Thank you for your thoughtful consideration.

Sincerely yours,

Bruce Nadell

1

Patricia Boudreau-Sullivan

From: Sophie Nadell [sophienadell@gmail.com]
Sent: Sunday, February 26, 2017 5:42 PM
To: Patricia Boudreau-Sullivan
Subject: Day camp - Little Fresh Pond

C11

Dear Planning Board members,

After many testimonies from concerned residents around Little Fresh Pond and the surrounding area, it is obvious that the DEIS report presented by M. Jacobs and his day camp is lacking in real, accurate information. Therefore, we urge you not to allow the camp expansion to occur.

The noise impact from the camp property on abutting properties of the residents who suffer from very loud noises from the camp during the summer months, as has been demonstrated at the December 8th and January 26th hearings, has not been addressed (measurements of noise were taken by the camp on the last day of camp in August of 2013 when the camp was not in full operation, which appears to have been purposely done to distort the noise levels). C11-1

Other negative noise and littering from the young counselors looking for entertainment and drinking at the North Sea tavern late at night, walking up and down Little Fresh Pond Road, loud and drunk, flashing their lights, and at times leaving some broken glass bottles - We found such glass bottles on the dirt road leading to our driveway ! That is not acceptable in our quiet residential neighborhood. C11-2

Finally and most importantly, the general concern raised by all residents on the environmental damaging impact of an expanded camp with more waste waters discharged into Little Fresh Pond (from septic pools, phosphates, fertilizers and other sprays on the camp property) which the pond cannot sustain, should be taken into serious consideration. C11-3

Please, help us save our precious, beautiful pond now and for future generations to enjoy.

We thank you for your thoughtful consideration.

Sophie Nadell Bruce Nadell

Residing at 30 Little Fresh Pond Road.

FEB 27 2017

Patricia Boudreau-Sullivan

From: Heather Frayne [heatherfrayne@gmail.com]
Sent: Monday, February 27, 2017 6:53 PM
To: Patricia Boudreau-Sullivan
Subject: Saving Little Fresh Pond

C12

As a long-time homeowner on Little Fresh Pond Road, Southampton, I ask you not to allow Jay Jacobs to proceed with the full build-out of the camp on North Sea Road.

* It will destroy and pollute the lake. The septic system drains right into the lake.
* It will allow 500 children and 100 counselors too use this fragile body of water for summertime recreation, without regard to its fragility. C12-1
* Additionally, the noise and pollution from commuter buses and vans will be dangerous, even hazardous to this area. C12-2

Jacobs has already shown no regard for this environment by razing the trees lakeside, which is forbidden according to the town's ordinances.

RECEIVED
FEB 27 2017
TOS PLANNING DIVISION

I know that other residents of this area have already submitted independent studies that support what I have written.

While Jacobs is a rich and politically powerful individual, please do not be swayed by his well-connected lawyers, specious reports, or his self-serving donations to town services.

Please support the people who live here and who love the pond we fight to protect .

Thank you.
Heather Frayne
230 Little Fresh Pond Road

--

C13

My name is Barbara Marsh. I have lived on Little Fresh Pond for over 60 years.
At the last meeting I talked about my concerns that water from toilet flushing, food preparation and pool runoff could make its way to the pond. Tonight I would like to bring your attention to a statement on page xiii of the DEIS in which the camp claims it will not use the lake. I quote:

There is no use of the pond related to the existing facility operations, with the potential exception of supervised nature walks near the pond, and no changes are proposed.

In the DEIS, the Camp makes reference to existing conditions for 2016 of 342 campers and staff and proposed increases to 446 people (page 107 of the total report, /page 60 Ground Water Resources).
Even if the size of the camp were to stay as it is now, this number of children using the lake on a regular basis would be disastrous. Think of the effect of sun screen, bug lotion, and urination on the water quality of the lake. In addition, the noise would be overwhelming.

As was noted last time, once the camp is given the requested change of use permit, there is no legal way to limit the size to which it grows. In addition, there is nothing to prevent the Camp from changing its mind and deciding to use the lake in the future. A 2012 brochure mentions "refreshing water fun in Little Fresh Pond" and an ad for the camp in the Southampton Patch in May 2013, states:

C13-1

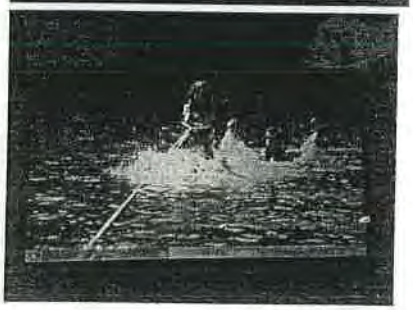
"Located on the property is also a private beach that can be used for kayaking, swimming, and other leisure activities."

Furthermore, if the camp really did not intend to use the lake at some point, why did it choose to include the following statement in the DEIS (page xiii)? Little Fresh Pond has historically been used by the existing tennis club and/or tennis camp facility for various purposes. By the way, I mentioned I have lived on the lake for over 60 years and I have **NEVER** seen **ANY USE** of the lake or beach AT ANY TIME since the location has been used as a tennis club.

JAN 26 2017

In an article in the Southampton Press Dec 6, Jacobs stated "In no day camp of mine do I take children to freshwater. I use swimming pools -- they are safer." Actually that's because the other day camps don't *have* fresh water lakes. However, Jacobs' 3 upstate New York and Pennsylvania sleep over camps *do* have fresh water lakes that are prominently highlighted on their website. Their videos show children boating, swimming, and using lake trampolines at those facilities.







In addition, I would like to address an observation from the last meeting.

Many (perhaps all?) of the families who spoke on behalf of the camp are able to have their children attend the Southampton Day Camp because of the "generosity" of the camp.

There is a clear conflict of interest here: It is easy for them to overlook the long-term environmental issues in exchange for free camp experiences for their children. There are other camps in the area (such as Future Stars Camp or Sandy Hollow Day Camp), but they are not free. How many of those speakers would support the camp, if they did not receive free tuition? Perhaps then they would notice the noise and traffic and consider the potential long-term cost to the environment and the community.

The Planning Board needs to consider the long-term environmental issues for the **whole neighborhood**. Once the pond is dead, there is no bringing it back. That result will last long after the youngest of these campers have graduated high school.

OUR RESIDENT CAMPS

TLC TIMBER LAKE CAMP

TYLER HILL

CAMP TIMBER LAKE WEST

OUR DAY CAMPS

North Shore Day Camp

Hampton COUNTRY DAY CAMP

Southampton CAMP & CLUB

OUR DAY SCHOOL

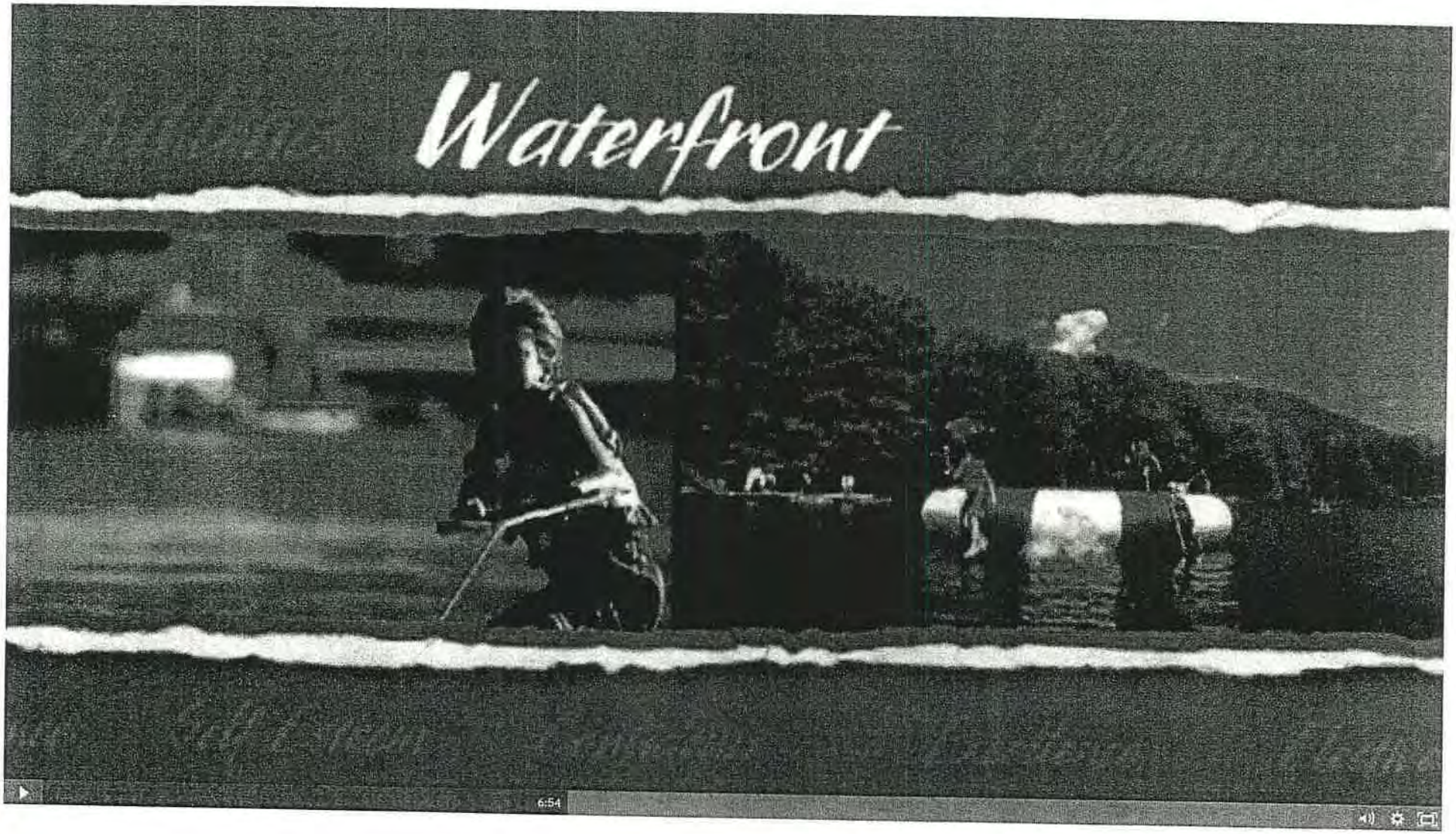
NORTH SHORE day school

TLC FOUNDATION

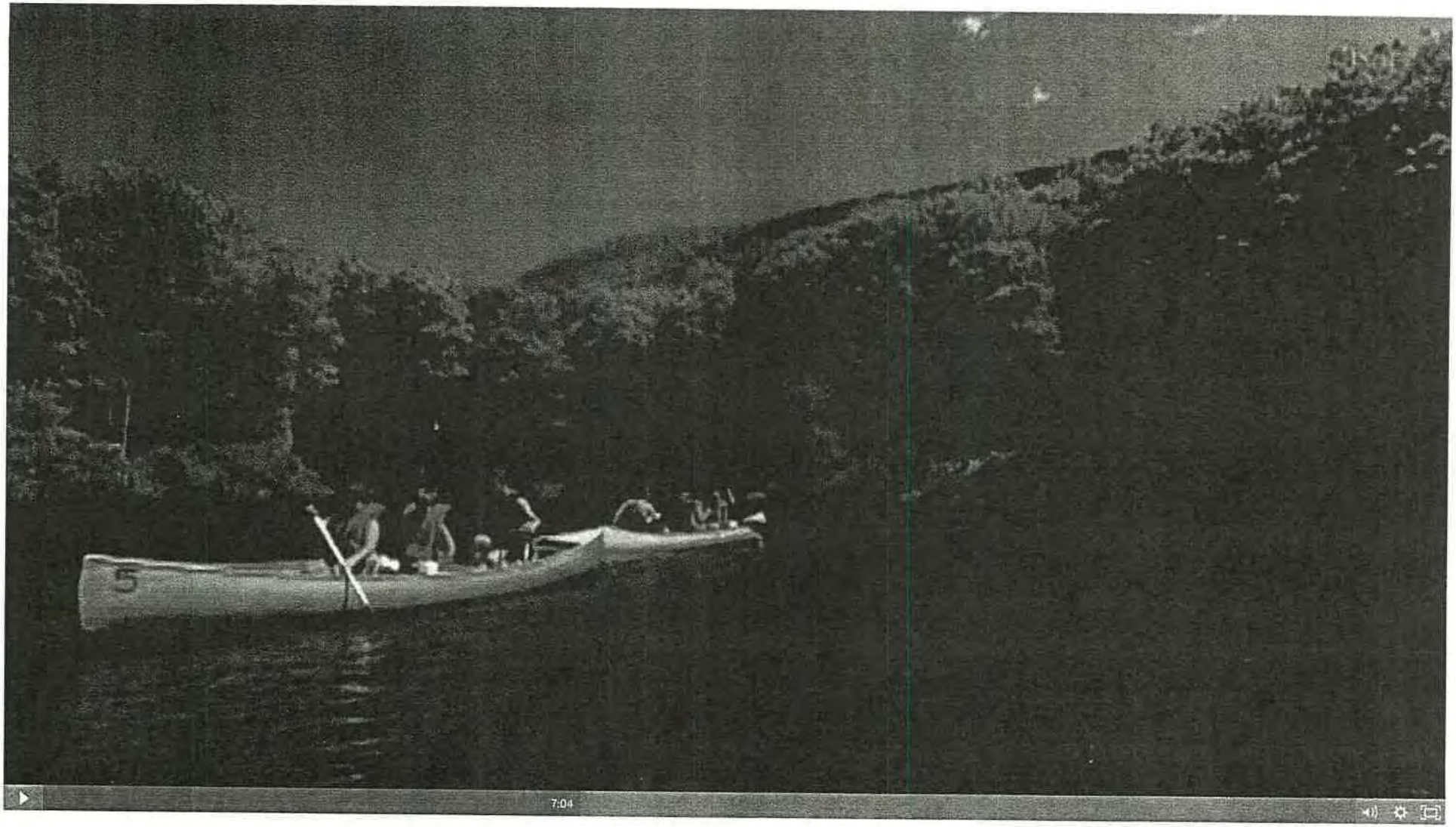


FACILITY RENTAL

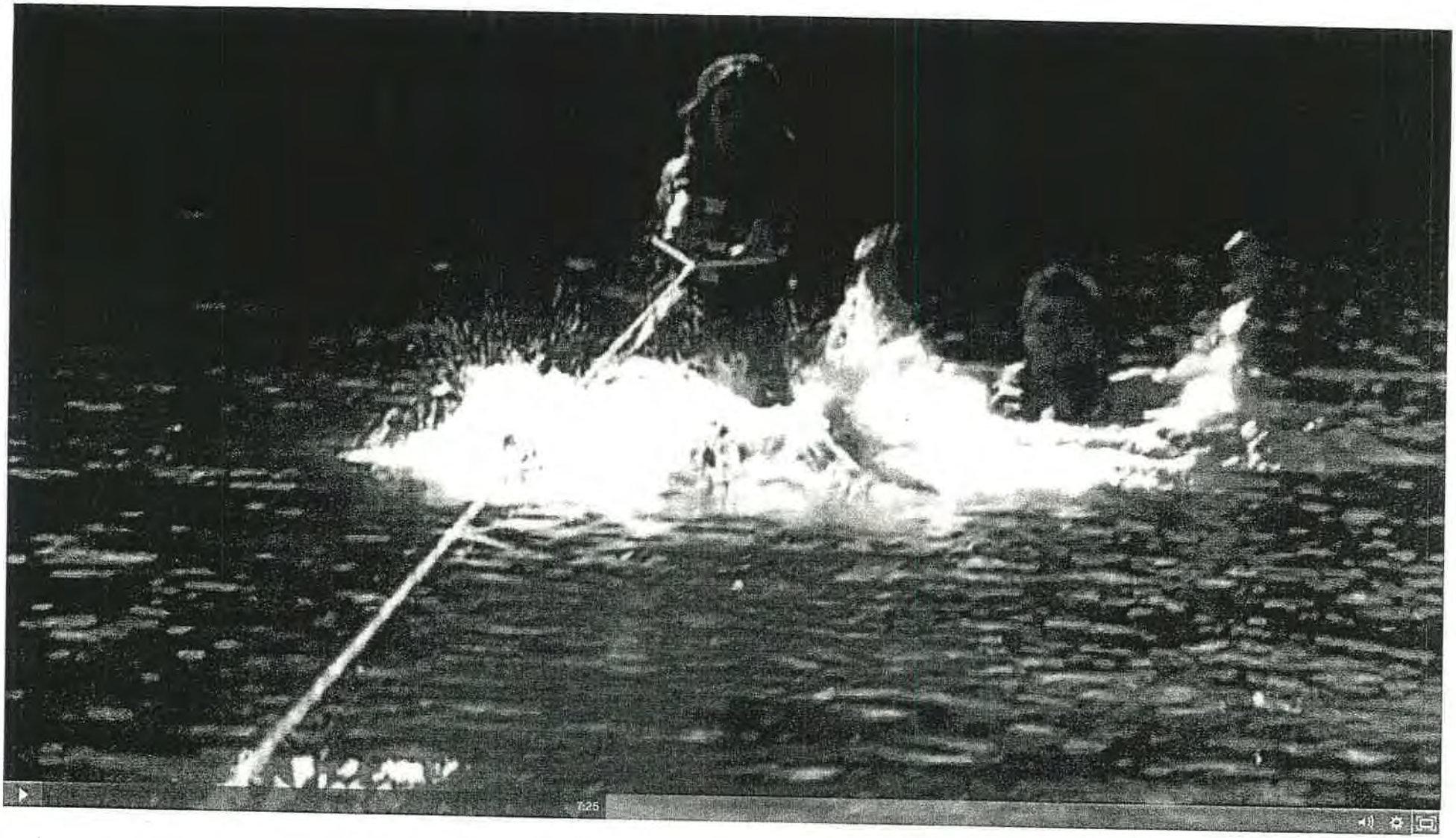




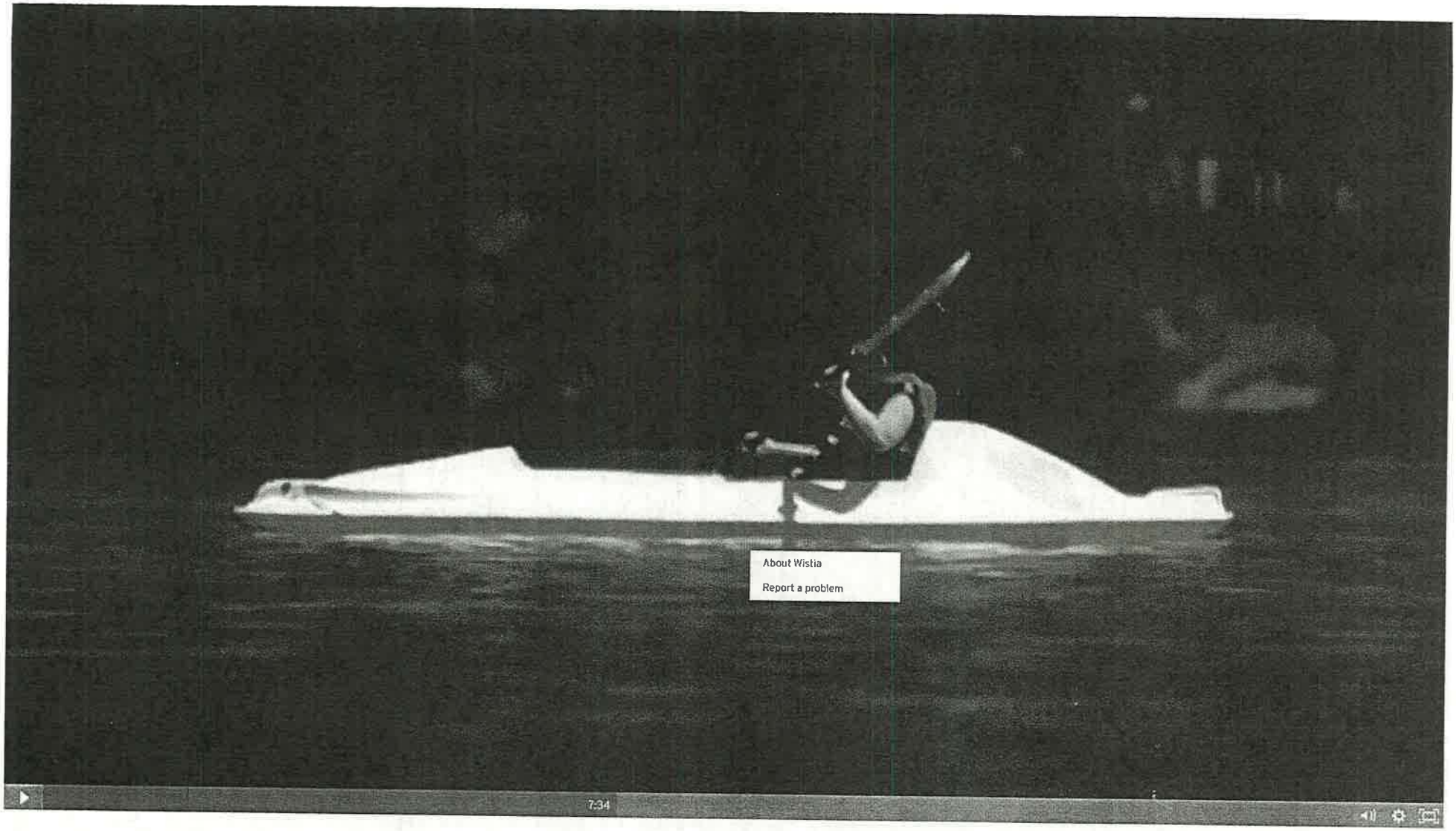
Timber Lake video minute 6:54



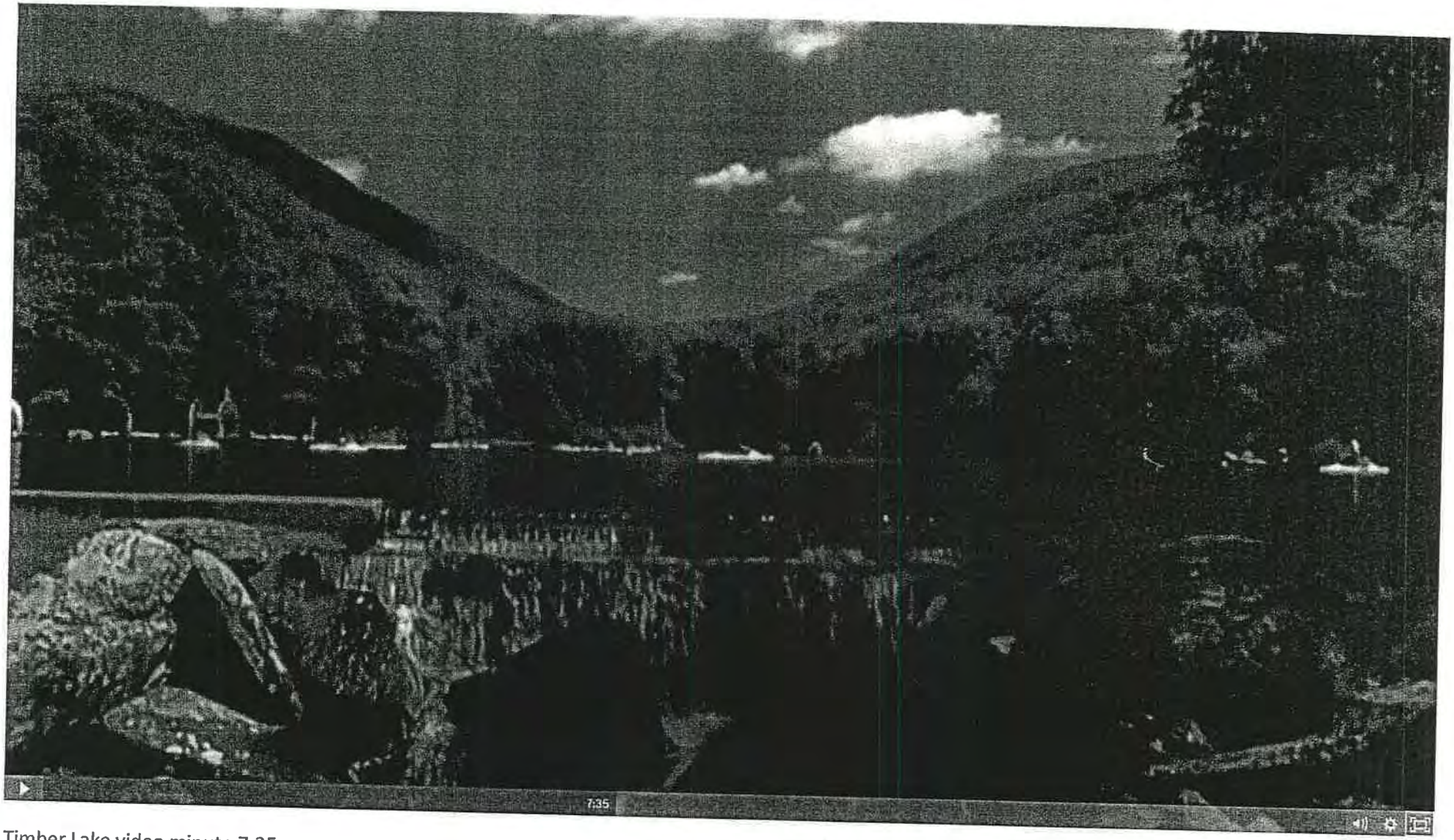
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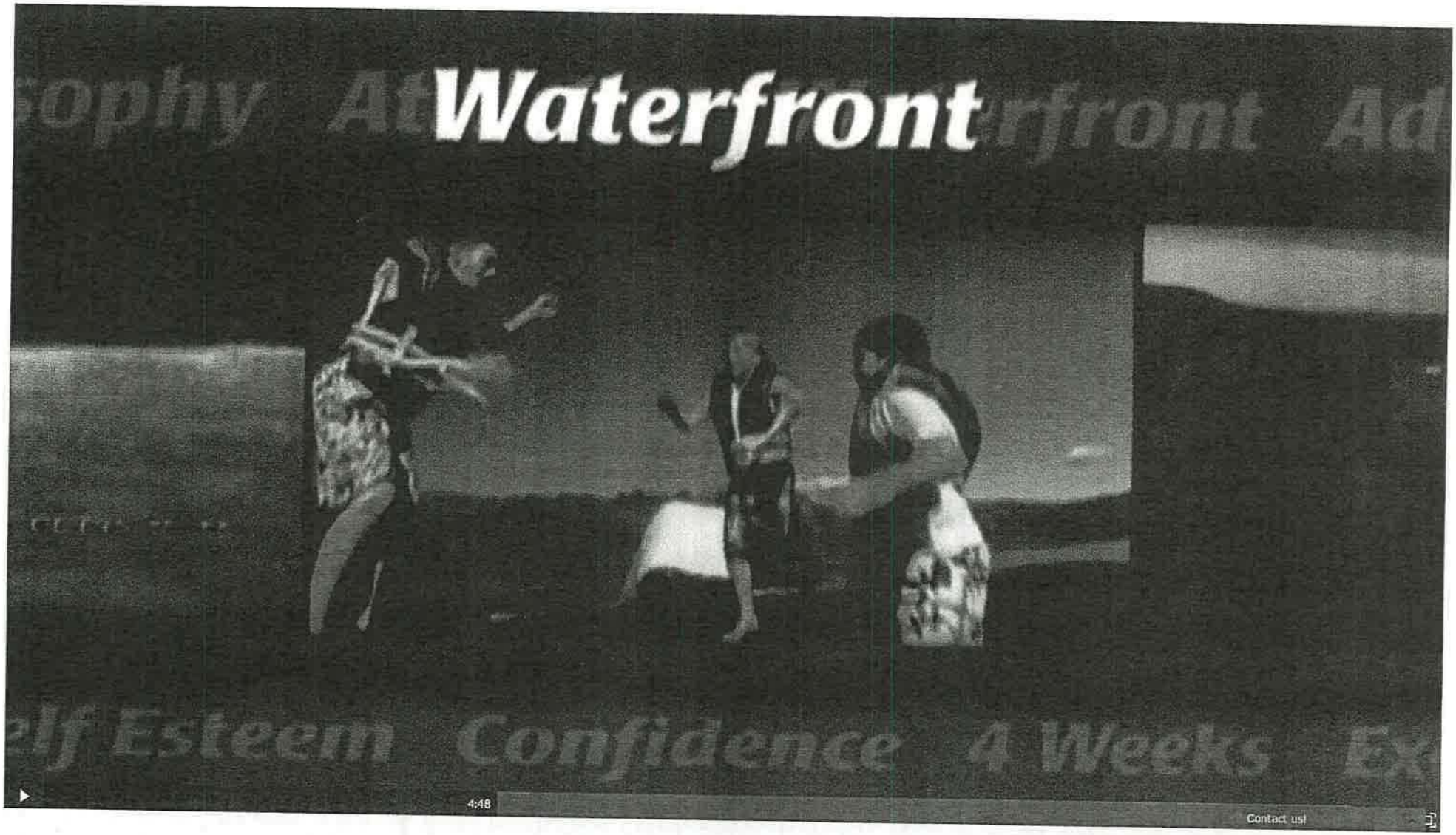
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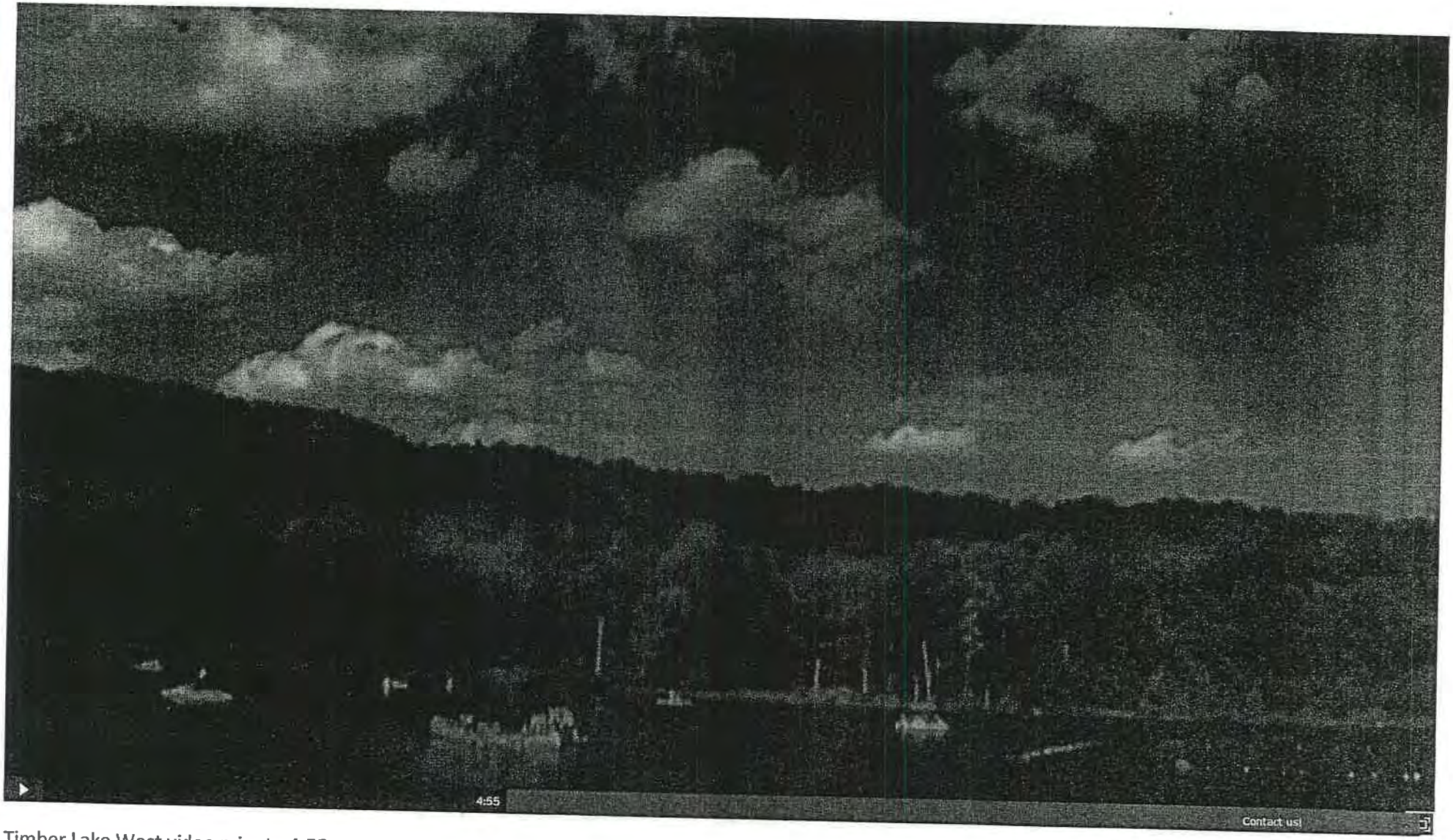
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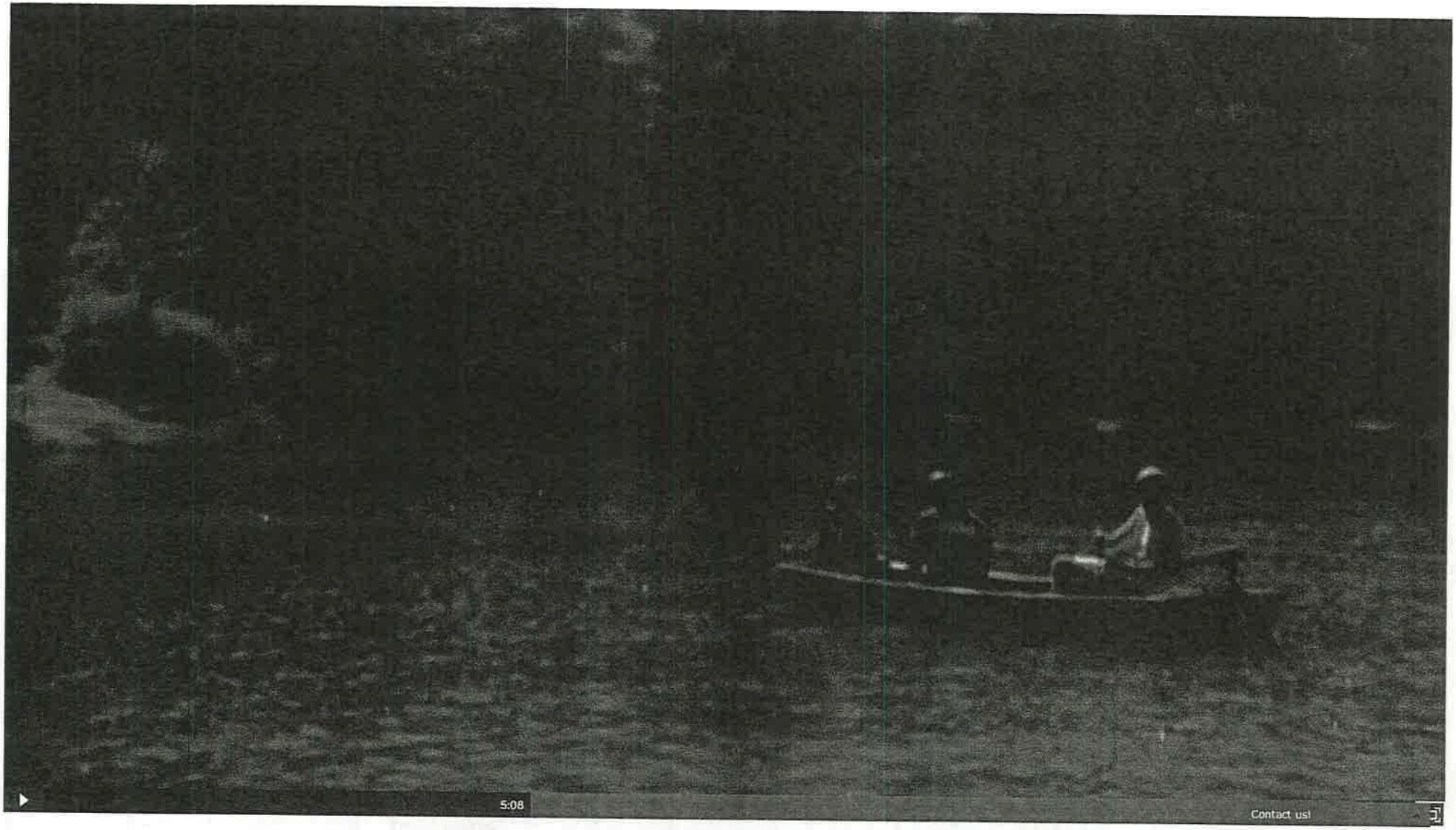
Timber Lake video minute 7:35



Timber Lake West video minute 4:48



Timber Lake West video minute 4:55



Timberlake West video minute 5:08



Timber Lake West video minute 5:40

The subject property is currently supplied potable water by the SCWA. There are three SCWA community supply well fields near Little Fresh Pond, the closest of which is located 0.6 mile east of the subject property (Edge of Woods Road well field). No influence on the water table elevation or direction of flow is expected in the vicinity of the subject property due to the operation of these supply wells. The minimal incremental increased demand for potable water that would result upon reaching the maximum anticipated future occupancy of the proposed day camp and tennis club would not be expected to result in a significant adverse impact upon community water supplies, and no new connections are proposed.

Analyses of potential groundwater-related impacts of swimming pool water, including increased pool water discharge due to the addition of two new pools, conclude that the continued use of calcium hypochlorite (a chlorine derivative) for pool disinfection and normal maintenance in accordance with all relevant regulations (e.g., New York State Department of Heath Sanitary Code Part 6, Subpart 6-1) would not be expected to adversely affect the environment. With respect to the potential impacts of fertilizers, pesticides and other chemicals, the applicant would closely monitor the landscaping subcontractors to incorporate the relevant requirements and restrictions of New York State law with respect to fertilization practices, and the continued treatment of the property with a cedar oil-based pesticide for mosquito and tick control would not be expected to produce any harmful effect on the regional or local groundwater quality.

Three low flow water wells are located at the subject property. Any use of these wells would not be expected to produce any significant effect on the regional or local groundwater flow or direction.

Overall, no significant adverse impacts upon groundwater resources, including groundwater-related impacts to Little Fresh Pond, are expected to result upon implementation of the proposed action.

Surface Waters

Little Fresh Pond is a 19.3±-acre surface water body located adjacent to the northwest of the subject property. Little Fresh Pond has historically been used by the existing tennis club and/or tennis camp facility for various purposes. There is no use of the pond related to the existing facility operations, with the potential exception of supervised nature walks near the pond, and no changes are proposed. No improvements are proposed within the pond, associated wetlands, or the regulated 100-foot buffer surrounding same. The pond has no surface water contributors (e.g., streams) and its surface level is directly influenced by rainwater and runoff from the watershed. It is designated as a Class B wetland, identified as wetland "SH-4" on the NYSDEC Freshwater Wetland Map. The USFWS NWI Map identifies Little Fresh

on a future expected occupancy of the site by 360 campers and 90 staff (including 65 overnight staff), the proposed sanitary flow would be 6,800 GPD (see calculations in Table 8).

Table 8 – Existing and Proposed Density Flow Calculation

EXISTING CONDITIONS (i.e., 2016 Occupancy)[A]				
STRUCTURE USE	SF, # SEATS, OR # UNITS	POPULATION DENSITY LOAD		
		GPD/SEAT/UNIT		
CAMPERS + DAY STAFF	293	5	1,465	GPD
OVERNIGHT STAFF	49	75	3,675	GPD
RESIDENCE / DWELLING	1 (4 OVERNIGHT STAFF)	300	300	GPD
		TOTAL	**5,440**	**GPD**
PROPOSED CONDITIONS				
STRUCTURE USE	SF, # SEATS, OR # UNITS	POPULATION DENSITY LOAD		
		GPD/SEAT/UNIT		
CAMPERS + DAY STAFF	385	5	1,925	GPD
OVERNIGHT STAFF	61	75	4,575	GPD
RESIDENCE / DWELLING	1 (4 OVERNIGHT STAFF)	300	300	GPD
		TOTAL	**6,800**	**GPD**

Note: (A) Existing sanitary waste generation could increase, even absent the proposed action, while remaining compliant with the SCDHS grandfathered flow of 9,450 GPD.

The current density flows match the current SPDES discharge permit. The proposed density flow is less than the "grandfathered" flow. The subject site is currently served by multiple on-site sanitary systems that were upgraded in 2013 to meet current design standards.

The camp activities occur only during the summer months (80 days per year). As such, the total annual discharge of the current facility and the proposed site improvements would be significantly lower than that allowed by Article 6 (see Table 9).

2012 CLINICS & JUNIOR SCHEDULE

May 19th - June 15th
&
September 1st - September 28th
Morning Clinics: Friday thru Sunday at 11a
Afternoon Clinics: Friday at 5p

June 16th - August 31st
Morning Clinics: Monday thru Saturday at 11a
Afternoon Clinics: Friday at 5:00pm

JUNIOR TENNIS & ACADEMY CAMP

June 16th - August 31st
Monday thru Friday from 9:00a-3:00p (full day) or 9:00a - 12:00p (half day) daily

Tennis Camp Program (ages 5-15) includes:
- Tennis Drills & Latest Tour Techniques
- Team Competitions
- Refreshing Water Fun in Little Fresh Pond
- Games & Activities
- Awards & Prizes

Academy Program (available for high school and/or tournament level juniors) includes:
- Tennis Drills, Tactics & Strategy
- Latest Tour Techniques
- Match Play and Coaching
- Fitness
- Refreshing Water Fun in Little Fresh Pond





YOUR TENNIS STAFF:

Director of Tennis: Robert "Reza" Tompsett



Reza is an Australian national with exceptional talent as a tennis player and coach. While in Australia, Tompsett worked with the Tennis ACT and National Sports Club in both the US and Australia. Reza has served head coach of various tennis academies, programs, and manager of junior state league teams, primary school tennis teams and interstate teams. Reza currently serves as the seasonal Director of Tennis at the Drysdale-managed Weston Tennis Center in Florida, a position he has held since 2009.

Assistant Director of Tennis: Grant Murphy



A native from Melbourne, Grant grew up in the immediate vicinities of Melbourne Park, host of the Australian Open, where legend says he was already serving at 2 months old! An Aussie level 1 & 2 certified coach, Grant was one of the top juniors in Australia before becoming a professional tennis coach. A former Southampton teaching professional, Grant is excited to return to NY to bring you the Ultimate Tennis Experience!

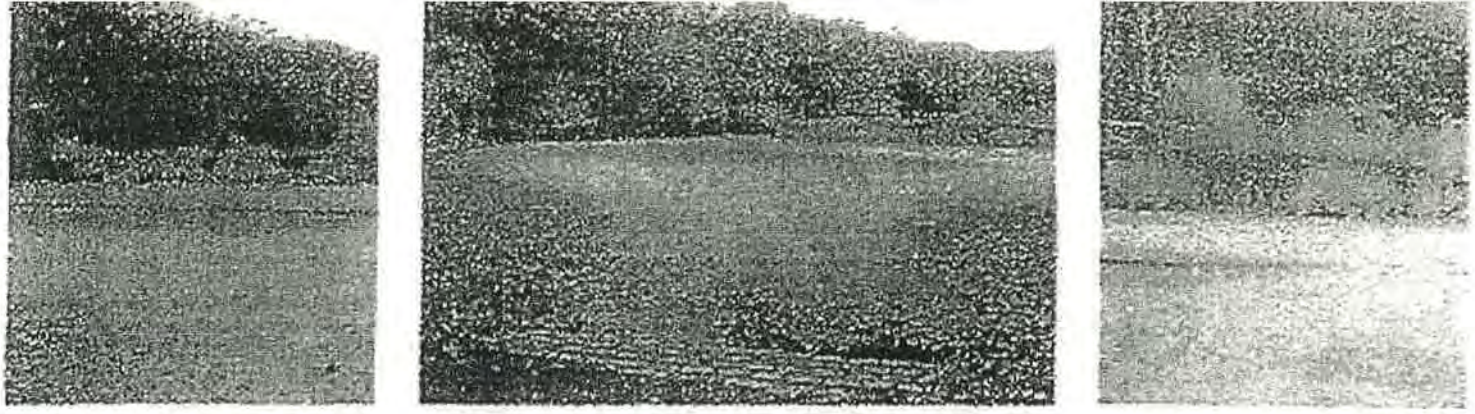
Southampton Racquet Club and Camp
665 Majors Path
Southampton, NY 11968
PH: 631.488.4700
E: r.tompsett@southamptonrcc.com
Visit our web site at southamptonrcc.com

Southampton
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Southampton Racquet Club and Camp

Southampton Racquet Club and Camp is situated on 18 acres of land. It offers members a place to brush up on their game or relax and play with friends. Located on the property is also a private beach that can be used for kayaking, swimming and other leisure activities. In addition to membership, the club also offers private lessons as well as summer camps for children.

665 Majors Path, Southampton, NY11968
(631) 488-4700

Hours: Mon-Fri: 8am - 9pm. Business email:

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Southampton Racquet Club and Camp

Southampton Racquet Club and Camp is situated on 15 acres of land. It offers members a place to brush up on their game or play and play with friends. Located on the property is also a private beach that can be used for kayaking, swimming and other leisure activities. In addition to membership, the club also offers private lessons as well as summer camps for children.

665 Majors Path, Southampton, NY11968
(631) 488-4700

Hours: Mon-Fri: 8am - 9pm, Sat & Sun: 8am-6pm
Accessible: true

Business email: proshop@southamptonrcc.com

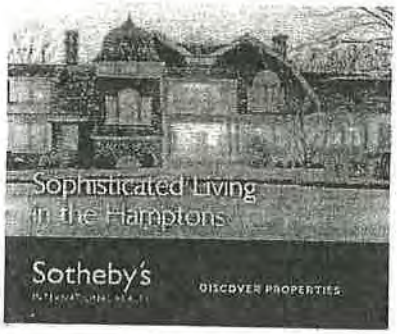
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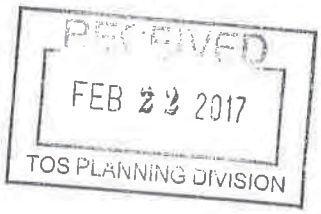
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C14

10 Justan Avenue
Southampton NY 11968
February 18, 2017



Planning Board of Southampton
116 Hampton Road,
Southampton, NY 11968

RE: Southampton Day Camp DEIS

Dear Planning Board Members,

In the Southampton Press on February 1, Mr. Dennis Finnerty is quoted saying "They're operating legally," in reference to the Southampton Day Camp. I do not understand how this can be the case when all of these requirements are not being met:

- Town code requires 100 feet between active camp areas and the edge of the property. Many structures and fields are closer than 100 feet.
- Town code requires those 100 feet to be landscaped to act as a visual and sound buffer to protect neighboring properties. There is little or no such landscaping.
- The day camp is supposed to be a camp in conjunction with and ancillary to the tennis camp. However, the number of children at the camp has increased each year, and I would venture that the majority of the campers have no relation to the tennis members.
- Last summer 53 counselors were housed at the camp (page 60 of the DEIS, page 107 of the electronic version). However, the law controlling day camps states that there should be no more than one person as caregiver on the property overnight.
- The camp was instructed not to make changes, yet it has rebuilt the main house changing the use from a residential structure to a dining facility.

C14-1

In the DEIS (section 4.4 "100-foot setback alternative, page 174 of the DEIS, page 221 of the electronic version), they list the structures and fields that are currently **not** in compliance with the 100- foot buffer rule including 3 buildings, a tennis court, a basketball court, and 16 parking spaces. Their proposal would put an **additional** 23 parking spaces, part of a swimming pool and another building in the required buffer area! **Furthermore, they state that they do not intend to bring the camp into compliance because it is too costly** (see attached). Isn't that just a cost of doing business?

In addition to these legal issues, there are a quite a few sections in the DEIS (such as those regarding water flow, site lines for buses, sewage treatment, noise levels, housing, benefits to the community, etc.) that need further data and analysis before this project should be considered.

Why is the town not enforcing its own laws? How can we expect Mr. Jacobs to operate the camp in good faith when he has repeatedly shown his willingness to break any rules that suit him, as he has done in Southampton as well as in East Hampton?

The variance should not be approved until **all** these issues are resolved.

Respectfully,

Barbara Sobotka Marsh

Barbara Sobotka Marsh

4.4 100-Foot Setback Alternative

The existing camp and tennis club at the subject property is an established non-conforming use that has occupied the site for decades. The proposed action does not contemplate the need for a Special Exception permit from the Town of Southampton. Accordingly, the provisions of the Town Code that apply to "campgrounds, summer camps, day camps or health camps" are not applicable to the proposed action. As required by the Final Scope, this alternative involves rearranging the improvements at the subject property in attempt to reflect two selected special exception standards for campgrounds, summer camps, day camps or health camps (as set forth in §330-162.12 of the Town Code. Subsections B and C of §330-162.12), to wit:

> *B. All buildings shall be set back at least 100 feet from any property line, and in no case shall the setback be less than that required in the applicable district.*
> *C. A minimum one-hundred-foot landscape buffer shall be provided adjacent to any property line.*

In order to adhere to these requirements, a substantial amount of overall site disturbance would be necessary, as several of the existing and proposed site improvements fall within the 100-foot setback (see *100' Setback Plan* in Appendix I). Specifically, the following would require relocation or removal:

- Cottages 9, 10, 11 and the proposed Cottage 14;
- The existing tennis court (proposed basketball court) on the north side of the subject property;
- The existing basketball court on the north side of the subject property;
- Three of the seven existing tennis courts on the south side of the subject property;
- 16 parking spaces in the existing southern gravel parking lot;
- 23 proposed gravel parking spaces (including existing parking) in front of the residence; and
- A portion of one of the two pools proposed to replace the existing tennis court north of the tennis club gravel parking lot.

The various amenities that would require relocation out of the 100-foot buffer would likely be moved to areas that are currently vegetated, including wooded areas that currently buffer the site from adjacent residential development and Little Fresh Pond.

The above-listed improvements, including removing and relocating the existing facilities would, likely at a considerable financial cost. Further, subsequent planting would be required along the northern, eastern and southern property boundaries, and a small area near the southwest corner of the existing improvements, adding to the costs. From a vegetation standpoint, the planting that would be necessary to provide a 100-foot landscape buffer around the subject property would be offset by the additional clearing on the interior of the site, which would be needed to maintain the current level of amenities.

As the nature and level of activity of the use of the subject property would be the same under this alternative as under the proposed action, this alternative would have similar impacts associated with traffic generation, water use, sanitary waste discharge, etc., as identified within this DEIS.

Due to the extensive site disturbance **(and cost)** that would be involved in establishing a 100-foot landscaped buffer around the perimeter of the subject property, while maintaining a high standard of day camp and tennis club amenities, it is not feasible for the project sponsor to implement this alternative. *

*I have added the highlighting and bold type.

C15

Letter to the Editor - February 5, 2017
mailbag@pressnewsgroup.com
Re: Tennis Club expansion and change of use to Day Camp – North Sea

Please correct your article dated February 1st that states there is currently no capacity restrictions on the number of campers at the Tennis Club.

Five years ago the Town's Zoning Board of Appeals refused to allow the conversion of the property's permitted use as a family run tennis club, with its 40 tennis players on its ten courts, into a 400-500 person day camp. Instead it required the owner to obtain the ZBA's permission to change the property's permitted use. In that decision, the ZBA addressed the issue of who and how many can attend the day camp under its current permitted use.

FEB – 7 2017

The ZBA held that the only children who could attend the day camp were the children of the members of the Tennis Club that has continued to operate on the property for decades, with a current enrollment of roughly 90 members. I agree with that decision. The camp, which claimed 280 campers in 2016, has not disclosed how many of those campers are the children of Tennis Club members. Could those 90 Tennis Club members be the parents of all 280 children? That would seem impossible…

C15-1

The push to drive enrollment at the Tennis Club upwards of 500 would place the facility on par with several of Long Island's largest Public Schools; it would be a stain on the environmental health of Little Fresh Pond, elevate traffic congestion and be a vastly different experience for the kids that use it today.

After changing ownership in 2011 the Town of Southampton ruled that the new owner had to seek a change of use in order to operate as a day camp. The camp developer has systematically avoided town codes and made piecemeal improvements that all together amount to the change in use he is actually seeking the variance for. Whereby the developer has made changes while in the process of seeking the approved variance, not after the variance has been determined – thereby giving the appearance of these improvements as de facto property assets. No 'Change of Use' plans have been approved to date yet he has cleared fields, added pools, altered structures and added to the scale and scope of the facility – and in so doing diverted the very process set up by Town Governance.

Please realize the devastation that would ensue for the environment should any part of this application be fully realized. Please help save Little Fresh Pond.

Lincoln Palsgrove IV, North Sea - Southampton

C16

Town Planning Board – Southampton
Testimony Submitted February 21st , 2017
Re: Tennis Club expansion and change of use to Day Camp – North Sea

I respectfully submit this testimony as a passionate environmental advocate and local resident on Little Fresh Pond, with gratitude for your time in reviewing the public comments related to the Camp application and DEIS.

Enrollment Capacity:

Five years ago the Town's Zoning Board of Appeals refused to allow the conversion of the property's permitted use as a family run tennis club, with its 40 tennis players on its ten courts, into a 400-500-person day camp. Instead it required the owner to obtain the ZBA's permission to change the property's permitted use. In that decision, the ZBA addressed the issue of who and how many can attend the day camp under its current permitted use.

RECEIVED
FEB 21 2017
TOS PLANNING DIVISION

The ZBA held that the only children who could attend the day camp were the children of the members of the Tennis Club that had continued to operate on the property for decades, with a current enrollment of roughly 90 members. I agree with that decision. The camp, which claimed (but not proven) 280 campers in 2016, has not disclosed how many of those campers are the children of Tennis Club members. Could those 90 Tennis Club members be the parents of all 280 children? That would seem impossible...

C16-1

Within the Change of Use application before you, the push to drive enrollment at the Tennis Club upwards of 500 would place the facility on par with several of Long Island's largest Public Schools; it would be a stain on the environmental health of Little Fresh Pond, elevate traffic congestion and be a vastly different experience for the kids that use it today.

After changing ownership in 2011 the Town of Southampton ruled that the new owner (Jacobs) had to seek a change of use in order to operate as a day camp. The camp developer has systematically avoided following town codes by making piecemeal improvements that all together amount to the change in use he is actually seeking the variance for.

Whereby the developer has made changes while in the process of seeking the approved variance, not after the variance has been determined – thereby giving the appearance of these improvements as de facto property assets. No - 'Change of Use' plans have been approved by the Town yet he has cleared fields, added pools, altered structures and added to the scale and scope of the facility – and in so doing diverted the very process set up by Town Governance.

C16-1
cont'd

Without the support of regular inspections this becomes an issue of enforcement, and without enforcement situations unfortunately run amuck.

Development & Environment:

Interestingly enough the Southampton Press recently published an article, February 15th, 2017 "Town Ready to Dump PPD's" by Jen Newman. I cannot help but think of the similarities to this Change in Use application as developers seek to maximize land use and investment in ways that may provide a short term cash return on their investment while causing irreparable harm in the long term for surrounding communities, the environment and residents.

> Excerpted from the article; "Mr. Burke said eliminating the PDD legislation and, in turn, the community benefits negotiation would get rid of the idea that developers can "buy" allowances in zoning. He said code updates would still allow for the town to place conditions on applications. "Quite frankly, I see that as a positive thing," he said.
>
> As an example, if an application was expected to have an impact on traffic, the town's planning and zoning departments could approve changes with the condition that the traffic concerns be mitigated—through turning lanes or other safety measures. Mr. Burke noted that, if the legislation were repealed, simultaneous changes in the code would preserve the town's "flexibility" with such applications.
>
> Mr. Bouvier also said he thought the PDD law is heading toward a repeal—and he is in favor it.
>
> "I think most people are feeling that way," he said. "I feel that's where it's headed—I think it's a good thing. I think we can do most of the things we need to do without it and could create special exceptions."
>
> He added that details are still being discussed and officials are still combing through the town code to ensure there are no duplications with any code changes that might accompany the repeal.
>
> Town Board member Julie Lofstad said she would wait until after a public hearing to make a final decision, but she, likewise, currently leans toward supporting a repeal of the PDD rules. The community benefits portion of the law, she said, makes it seem that developers can keep "throwing money" at the town to get what they want, rather than having a strong project.

"My opinion on the legislation is, perhaps it started out as something different than it morphed into," she said. "It changed into something that really divided communities."

What you have before you in the Change of Use application has elicited an outpouring of concern over the environmental impacts and incomplete assertions made on the developer's behalf that simply don't provide a complete analysis within the submitted DEIS. If you have even a shred of doubt I implore you to vote negatively for this Change of Use.

As noted in the recent Southampton Press article on February 15th, 2017 "Gobler to Study Acidity" by Greg Whener;

"Rain runoff carrying nitrogen from fertilizers and septic systems into local bays, as well as the groundwater, has contributed to the formation of toxic tides that have harmed fish populations on the East End for the past three decades. Finding the connection between acidity and nitrogen pollution is one of the things the task force wants to accomplish, officials said.

Dr. Gobler explained that when CO_2 enters the ocean, it lowers pH levels and reduces the amount of carbonate—a salt of carbonic acid—that is present. "Carbonate is needed to make calcium carbonate, which is what bivalve shells, coral reefs and many other forms of marine life are made of," he said.

The issue of affected groundwater, and any possible impact on Little Fresh Pond is at the crux of this Change of Use application. To add dry wells and new septic systems are required by Town code yet the DEIS claims there will be no impact to the Pond with this increased level of activity therefore new equipment would not be necessary – the report is deficient on issues that you truly need to make an informed decision. C16-2

Additionally, given the latest article from January 17th, 2017 in the Southampton Press, "Judge Upholds East Hampton Town Occupancy Limits Challenged By Camp Dormitories" by Michael Wright – how can we find confidence in the applicants integrity given his attempt to stuff 25 counselors in to a 4 bedroom dwelling in East Hampton?

A state court has issued an order upholding an injunction that bars an East Hampton summer camp operator from using a house he owns to board more than two dozen camp counselors in the summertime.

The injunction bars the owner of Hampton Country Day Camp, Jay Jacobs, from using any of three houses he owns in East Hampton as dormitories.

East Hampton Town is seeking a permanent injunction barring Mr. Jacobs from housing more than four unrelated employees in his houses.

Attorneys for the camp owner had filed a motion challenging the town's limits on occupancy by unrelated individuals as unconstitutional.

Earlier this month State Supreme Court Justice Gerard Asher disagreed with the unconstitutionality claim and left the injunction in place while a trial on whether to permanently enjoin the use of the houses as dormitories is held, beginning next month.

In the summer of 2015 town code enforcement officials discovered 25 camp counselors living in what was legally supposed to be a four-bedroom house at 17 Ocean Boulevard, off Springs-Fireplace Road, but that had been converted without building permits into eight separate bedrooms.

The town issued some 60 violations for illegal alterations to the house and safety shortcomings.

Traffic:

American Association of State & Highway Transportation Officials (AASHTO) standards are **505 feet and 506 feet respectively required for safe turns at the Camp, 665 Majors Path.** As presented during the December 2016 Town hearing the departure sight distance as measured by *Schneider Engineering* for busses leaving the two revised driveways (as described in the proposed application) in the DEIS are as follows:

Northern Exit

Right turn looking north on Majors Path
Actual **335 feet**
Required by AASHTO ***505 feet***

Left turn looking south on Majors Path
Actual **370 feet**
Required by AASHTO ***560 feet***

Southern Exit

Right turn looking north on Majors Path
Actual **435 feet**
Required by AASHTO ***505 feet***

left turn looking south on Majors Path
Actual **435 feet**
Required by AASHTO ***560 feet***

C16-3

. From their data as stated above there is insufficient departure sight distance for any size bus loaded with children to make a **SAFE** turn from any of the 2 driveways turning onto Majors Path in either direction, North or South. Departure sight distance is the distance needed for the bus to exit the camp driveway without causing the oncoming traffic on Majors Path from braking to slow down or to actually stop so that the bus can exit safely.
This cannot be mitigated because of the winding turns on Majors Path. Please also note that the DEIS traffic report mentions *nothing* about departure sight distances.

The DEIS only measured stopping sight distance which is the distance required for a car actually on Majors Path to be able to stop to avoid an accident with a vehicle exiting the camp. The DEIS is silent on how much distance would be require for the vehicle already in the driveway to make a safe exit.

As a concerned resident of North Sea, I wish to convey the recent data that shows the proposed exit driveways from 665 Majors Path do not meet the required departure sight distances for busses as required by AASHTO. As a result, any size bus that leaves this property with children on board is at serious threat to be involved in an accident with an approaching vehicle driving on Majors Path. I would like to state my deep concerns about this as I view it as an accident waiting to happen, and I want to put the Town of Southampton on alert that there is potential peril for the children leaving these premises by any size bus if this plan is approved by the Planning Board.

C16-3 cont'd

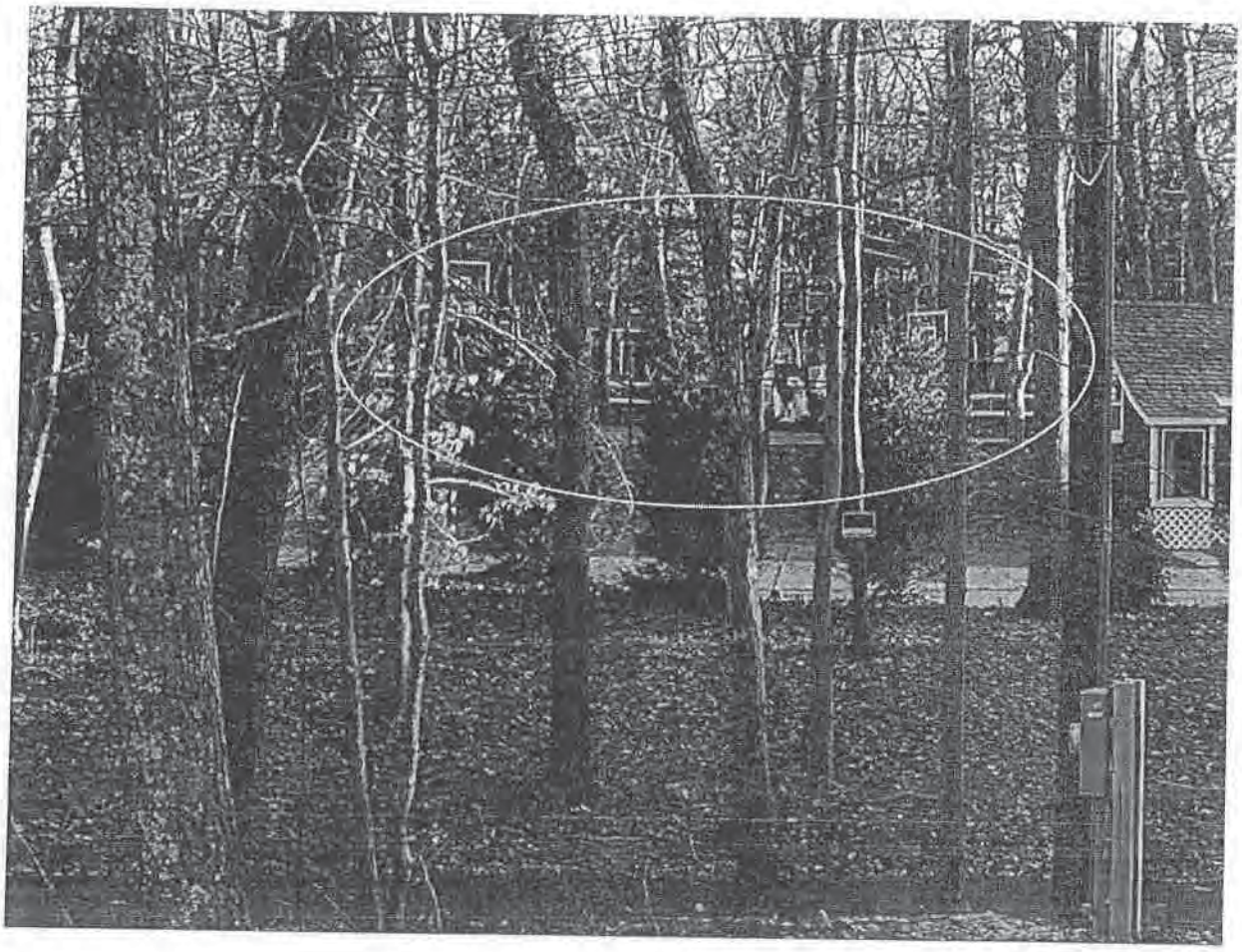
Impact Study:

With a 73 decibel reading today – I am in disbelief the proposed DEIS does not address how the increased sound would be mitigated. No berms, no required setbacks, nothing. Having worked on sound studies with ARUP in my professional life building concert venues in New York, there are many basic elements missing or suppressed in the DEIS sound study and analysis.

I reside on a boundary of the subject day camp; in fact, from my home I can clearly see and hear the activities in question on the fields and courts less than 50 feet from my driveway and living room.

C16-4

As shown in **the following images** the existing North Courts and my driveway photographed in 2017 from my living room window at the North property boundary;



C16-4
cont'd

1) In the DEIS mitigation elements are incomplete and totally absent from the application. How could this be? Daily I hear chanting, hooting, bullhorns and motorized trolley rides that makes rounds throughout the property - bells, whistles, and all – pushing the sustained daily noise well past the permitted 65 decibels maximum.

Existing North Tennis Court extending over the property line at my driveway, as photographed from my living room in 2017.



C16-4 cont'd

2) This North Tennis Court is being touted as increasing in size from 37 x 57 feet to 55 x 90 feet – a 5000 SF Basketball court according to the application, rebuilt over this North tennis court sitting at the property line, no buffer or 100' setback reported as being part of this new construction. From 7 campers to 32 noted on page 153 of DEIS adding 5db to the existing condition totaling 73db – well above permitted levels.

The applicant has stated within the DEIS installation of buffers as required by Town code are cost prohibitive to his organization – although they somehow have the funds to make other sweeping changes that would allow for multiplying enrollment? This makes no sense. Any Change in Use would require the applicant upgrade to current code requirements in order to substantially mitigate environmental impacts.

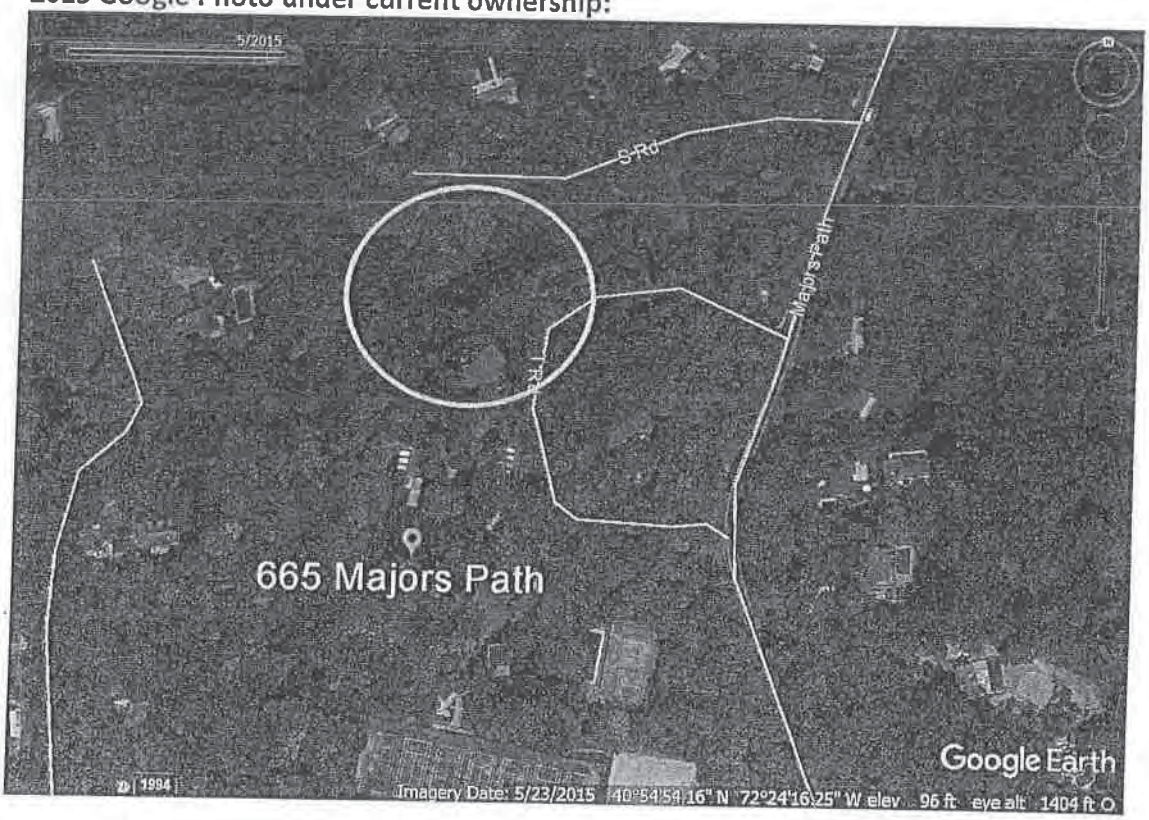
3) The provided Noise Study contained in the DEIS is missing data and negligent in providing evidence of any evidence of receptors studied at the North Field; as shown in the following Google photo. C16-5

   a. Since new (Jacobs) ownership in 2012 the north field was cleared as shown, currently in active use for largest gatherings but oddly omitted from the noise study. ***Note image below taken in 2015 and 2007, respectively.**

4) NYS DEC notes on page 10 summer time noise has the greatest potential for annoyance – **therefore a *windows open vs. windows closed* study should be conducted to obtain a valid assessment.** No receptors were placed to study the sound at each house on the North boundary, but identified in the DEIS as where they *would be if* a comprehensive study actually takes place in the future. C16-6

5) The DEIS framed activities as being over 73 decibels while omitting mention of noise *duration, length of sustained day long activities*. This missing information is crucial to convey a *complete* picture of environmental impact. C16-7

2015 Google Photo under current ownership:



2007 Gooogle Photo – previous owners, as tennis camp only



Enrollment must be capped and if a change in use is sought, followed by enforcement of current required codes to meet Town regulations today. There are no sanctions that provide for 'grandfathered' uses – if a change in use is sought then current applicable code standards for the new use must be upheld. This study is loaded with inconsistencies and assumes multiple exemptions that if actually were permitted are completely contradictory to the Codes that Southampton enforces.

The last sound study was taken August 14th and 18th of 2015 - oddly enough the final days of camp when enrollment slims and daily activities have fewer participants.

C16-8

Such as the Southampton Town zoning code, Section 330-162.12 that provides the following:

1. **All buildings shall be set back at least 100 feet from any property line, and in no case shall the setback be less than that required in the applicable district.**

2. A minimum one-hundred-foot landscape buffer shall be provided adjacent to any property line.

3. No overnight residential building or structure shall be permitted, except for one permanent dwelling for the use of a caretaker or other custodial person.

4. No camp may be occupied by the same person or persons for more than 30 days in any one calendar year.

C16-8 cont'd

I implore The Planning Board to require a noise study be taken during peak summer days, *windows open* with receptors at surrounding homes affected by the proximity of the North Field, new 5000 basketball court, amplified trolley ride and counselor's bullhorns encouraging team chants and cheerleading hoots – when the camp is in FULL session. This quite conveniently was conducted in a way to provide a vague and incomplete analysis.

I implore The Planning Board to mandate any change in use to meet current code regulations, including a 100' FOOT SETBACK as clearly stated in the town zoning code. Furthermore, to limit enrollment as the ZBA stated previously to children of the Tennis Club members only.

Please realize the devastation that would ensue for the environment should any part of this application be realized. Please help save Little Fresh Pond.

Thank you,

Lincoln Palsgrove IV, North Sea - Southampton

Enc. DEC Assessing and Mitigating Noise Impact

Assessing and Mitigating Noise Impacts

New York State
Department of Environmental Conservation

PROGRAM POLICY	Department ID: DEP-00-1	Program ID: n/a
Issuing Authority: Environmental Conservation Law Articles 3, 8, 23, 27 Name: Jeffrey Sama Title: Director Signature: /S/ Date: 10/6/00 Issuance Date: October 6, 2000 Revised: February 2, 2001	**Originating Unit: Division of Environmental Permits** Office/Division: Environmental Permits Unit: Phone: (518) 402-9167 Latest Review Date (Office Use):	

Abstract: Facility operations regulated by the Department of Environmental Conservation located in close proximity to other land uses can produce sound that creates significant noise impacts for proximal sound receptors. This policy and guidance presents noise impact assessment methods, examines the circumstances under which sound creates significant noise impacts, and identifies avoidance and mitigative measures to reduce or eliminate noise impacts.

Related References: See references pages 27 and 28.

I. PURPOSE[1]

This policy is intended to provide direction to the staff of the Department of Environmental Conservation for the evaluation of sound levels and characteristics (such as pitch and duration) generated from proposed or existing facilities. This guidance also serves to identify when noise levels may cause a significant environmental impact and gives methods for noise impact assessment, avoidance, and reduction measures. These methods can serve as a reference to applicants preparing environmental assessments in support of an application for a permit. Additionally, this guidance explains the Department's regulatory authority for undertaking noise evaluations and for imposing conditions for noise mitigation measures in the agency's approval

[1] A Program Policy Memorandum is designed to provide guidance and clarify program issues for Division staff to ensure compliance with statutory and regulatory requirements. It provides assistance to New York State Department of Environmental Conservation (DEC) staff and the regulated community in interpreting and applying regulations and statutes to assure that program uniformity is attained throughout the State. Nothing set forth in a Program Policy Memorandum prevents DEC staff from varying from that guidance as specific circumstances may dictate, provided the staff's actions comply with applicable statutory and regulatory requirements. As this guidance document is not a fixed rule, it does not create any enforceable right by any party using the Program Policy Memorandum.

of permits for various types of facilities pursuant to regulatory program regulations and the State Environmental Quality Review Act (SEQR).

II. BACKGROUND

Noise is defined as any loud, discordant or disagreeable sound or sounds. More commonly, in an environmental context, noise is defined simply as unwanted sound. Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise. The sound generated by proposed or existing facilities may become noise due to land use surrounding the facility. When lands adjoining an existing or proposed facility contain residential, commercial, institutional or recreational uses that are proximal to the facility, noise is likely to be a matter of concern to residents or users of adjacent lands.

A. Sources of Noise Generation

The three major categories of noise sources associated with facilities are (1) fixed equipment or process operations; (2) mobile equipment or process operations; and (3) transport movements of products, raw material or waste. The fixed plant may include a very wide range of equipment including: generators; pumps; compressors; crushers of plastics, stone or metal; grinders; screens; conveyers; storage bins; or electrical equipment. Mobile operations may include: drilling; haulage; pug mills; mobile treatment units; and service operations. Transport movements may include truck traffic within the operation, loading and unloading trucks and movement in and out of the facility. Any or all of these activities may be in operation at any one time. Singular or multiple effects of sound generation from these operations may constitute a potential source of noise.

B. Potential for Adverse Impacts

Numerous environmental factors determine the level or perceptibility of sound at a given point of reception. These factors include: distance from the source of sound to receptor; surrounding terrain; ambient sound level; time of day; wind direction; temperature gradient; and relative humidity. The characteristics of a sound are also

important determining factors for considering it as noise. The amplitude (loudness), frequency (pitch), impulse patterns and duration of sound all affect the potential for a sound to be a noise. The combination of sound characteristics, environmental factors and the physical and mental sensitivity of a receptor to a sound determine whether or not a sound will be perceived as a noise. This guidance uses these factors in assessing the presence of noise and the significance of its impacts. It relies upon qualitative and quantitative sound evaluation techniques and sound pressure level impact modeling presented in accepted references on the subject.

C. Mitigation

Mitigation refers to actions that will be taken to reduce the effects of noise or the noise levels on a receptor. Adverse noise effects generated by a facility can be avoided or reduced at the point of generation thereby diminishing the effects of the noise at the point of reception. This guidance identifies various mitigation techniques and their proper application either at the source of noise generation or on a facility's property. Alternative construction or operational methods, equipment maintenance, selection of alternative equipment, physical barriers, siting of activities, set backs, and established hours of construction or operation, are among the techniques that can successfully avoid or reduce adverse noise effects.

D. Decision Making

When an assessment of the potential for adverse noise impacts indicates the need for noise mitigation, it is preferred that specifications for such measures be incorporated in a noise analysis and in the applicant's work or operational plan necessary for a complete application. Presenting a plan that incorporates effective noise mitigation provisions facilitates the Department's technical and environmental review and minimizes or negates the imposition of permit conditions by the Department. Adherence to these plans becomes a condition of a permit.

Noise avoidance and mitigation measures may also be imposed directly as conditions of permit issuance. This guidance will review the statutory authority under which the Department can require the mitigation of noise effects.

III. Policy

In the review of an application for a permit, the Department of Environmental Conservation is to evaluate the potential for adverse impacts of sound generated and emanating to receptors outside of the facility or property. When a sound level evaluation indicates that receptors may experience sound levels or characteristics that produce significant noise impacts or impairment of property use, the Department is to require the permittee or applicant to employ reasonable and necessary measures to either eliminate or mitigate adverse noise effects. Options to be used to fulfill this guidance should be implemented within the existing regulatory and environmental review framework of the agency.

Regulatory authority for assessing and controlling noise effects are contained in both SEQR and specific Department program regulations. Specific regulatory references are as follows:

Section 3-0301(1)(i) of the Environmental Conservation Law (ECL) states that the commissioner shall have the power to: "i. Provide for prevention and abatement of all water, land and air pollution including but not limited to that related to particulates, gases, dust, vapors, noise, radiation, odor, nutrients and heated liquids."

To comply with Article 8 of the ECL and 6 NYCRR Part 617, State Environmental Quality Review Act, consideration of all relevant environmental issues must be undertaken in making a determination of environmental significance. Noise impact potential is one of many potential issues for consideration in a SEQR review.

Environmental Conservation Law (ECL) Article 23, Title 27, Mined Land Reclamation Law (MLRL), requires applicants for permits to prepare and submit a mined land use plan to the Department for approval. The plan must describe, "the applicant's mining method and measures

to be taken to minimize adverse environmental impacts resulting from the mining operation." The provisions to be incorporated in a Mined Land Use Plan, as specified in 6 NYCRR Section 422.2, include the control of noise as a component of the plan.

The solid waste regulations at 6 NYCRR Subdivision 360-1.14(p), establish A-weighted decibel levels that are not to be exceeded at the property line of a facility.

The Division of Air Resources has regulations in 6 NYCRR Parts 450 through 454 that regulate the allowable sound level limits on certain motor vehicles. The statutory authority for these regulations is found in the New York State Vehicle and Traffic Law, Article 10, Section 386.

This guidance does not supercede any local noise ordinances or regulations.

IV. RESPONSIBILITY

The environmental analyst, acting as project manager for the review of applications for permits or permit modifications and working in concert with the program specialist, is responsible for ensuring that sound generation and noise emanating from proposed or existing facilities are properly evaluated. For new permits or significantly modified permits, there should be a determination as to the potential for noise impacts, and establishment of the requirements for noise impact assessment to be included in the application for permit. Where the Department is lead agency, the analyst is responsible for making a determination of significance pursuant to SEQR with respect to potential noise impacts and include documentation for such determination.

Where impacts are to be avoided or reduced through mitigation measures, the analyst, or where there are program requirements to address noise, the program specialist, should determine the effectiveness and feasibility of those measures and ensure that the permit conditions contain specific details for such measures. It should also be determined if additional measures to control noise are to be imposed as a condition of permitting. Appropriate permit language for the permit conditions should be developed by the program specialist and the analyst. The results of noise impact evaluations and the effectiveness of mitigation measures

shall be incorporated into SEQR documents and, where necessary, permit conditions shall be placed in final permits to ensure effective noise control.

When it is determined that potential noise effects, as well as other issues, warrant evaluation of impacts and mitigation measures in a Draft Environmental Impact Statement (EIS) prepared pursuant to SEQR, the environmental analyst with the Division of Environmental Permits assumes responsibility for determining the level of evaluation needed to assess sound level generation, noise effects, and mitigation needs and feasibility.

For existing facilities, the program specialist will determine the need for additional mitigation measures to control noise effects either in response to complaints or other changes in circumstances such as new noise from existing facilities or a change in land-use proximal to the facility.

The applicant or their agent, in preparing an application for a permit and supporting documentation, is responsible for assessing the potential noise impacts on area receptors. When potential adverse noise impacts are identified, the applicant should incorporate noise avoidance and reduction measures in the construction or operating plans. The applicant's submittal should also assess the effectiveness of proposed mitigation measures in eliminating adverse noise reception. Where noise effects are determined to be a reason in support of a SEQR positive declaration, the applicant shall assess noise impacts, avoidance, and mitigation measures in a Draft EIS using methodologies acceptable to this Department.

V. PROCEDURE

The intent of this section is to: introduce terms related to noise analyses; describe some of the various methods used to determine the impacts of sound pressure levels on receptors; identify some of the various attenuators of noise; and list some of the mitigative techniques that can be used to reduce the effects of noise on a receptor. At the end of the section three levels of analysis are described. The first level determines the potential for adverse noise impacts based on noise characteristics and sound pressure increases solely on noise attenuation over distance between the source and receptor of the noise. The second level factors other considerations such as topography and noise abatement measures in determining if adverse

noise impacts will occur. The third level evaluates noise abatement alternatives and their effectiveness in avoiding or reducing noise impacts.

The environmental effects of sound and human perceptions of sound can be described in terms of four characteristics:

1. Sound Pressure Level (SPL may also be designated by the symbol L_p) or perceived loudness is expressed in decibels (dB) or A-weighted decibel scale dB(A) which is weighted towards those portions of the frequency spectrum, between 20 and 20,000 Hertz, to which the human ear is most sensitive. Both measure sound pressure in the atmosphere.

2. Frequency (perceived as pitch), the rate at which a sound source vibrates or makes the air vibrate.

3. Duration i.e., recurring fluctuation in sound pressure or tone at an interval; sharp or startling noise at recurring interval; the temporal nature (continuous vs. intermittent) of sound.

4. Pure tone which is comprised of a single frequency. Pure tones are relatively rare in nature but, if they do occur, they can be extremely annoying.

Another term, related to the average of the sound energy over time, is the Equivalent Sound Level or $L_{eq.}$ The L_{eq} integrates fluctuating sound levels over a period of time to express them as a steady state sound level. As an example, if two sounds are measured and one sound has twice the energy but lasts half as long, the two sounds would be characterized as having the same equivalent sound level. Equivalent Sound Level is considered to be directly related to the effects of sound on people since it expresses the equivalent magnitude of the sound as a function of frequency of occurrence and time. By its derivation L_{eq} does not express the maximum nor minimum SPLs that may occur in a given time period. These maximum and minimum SPLs should be given in the noise analysis. The time interval over which the L_{eq} is measured should always be given. It is generally shown as a parenthetic; $L_{eq\,(8)}$ would indicate that the sound had been measured for a period of eight hours.

Equivalent Sound Level (L_{eq}) correlates well and can be combined with other types of noise analyses such as Composite Noise Rating, Community Noise Equivalent Level and day-night noise levels characterized by L_{dn} where an $L_{eq(24)}$ is measured and 10 dBA is added to all noise levels measured between 10 pm and 7 am. These different types of noise analyses

basically combine noise measurements into measures of cumulative noise exposure and may weight noise occurring at different times by adding decibels to the actual decibel level. Some of these analyses require more complex noise analysis than is mentioned in this guidance. They may be used in a noise analyses prepared for projects.

Designations for sound levels may also be shown as $L_{(10)}$ or $L_{(90)}$ in a noise analysis. These designations refer to the sound pressure level (SPL) that is exceeded for 10% of the time over which the sound is measured, in the case of $L_{(10)}$, and 90% of the time, in the case of $L_{(90)}$. For example, an $L_{(90)}$ of 70 dB(A) means that 70 dB(A) is exceeded for 90% the time for which the measurement was taken.

A. Environmental Setting and Effects on Noise Levels

1. Sound Level Reduction Over Distance - It is important to have an understanding of the way noise decreases with distance. The decrease in sound level from any single noise source normally follows the "inverse square law." That is, SPL changes in inverse proportion to the square of the distance from the sound source. At distances greater than 50 feet from a sound source, every doubling of the distance produces a 6 dB reduction in the sound. Therefore, a sound level of 70 dB at 50 feet would have a sound level of approximately 64 dB at 100 feet. At 200 feet sound from the same source would be perceived at a level of approximately 58 dB.

2. Additive Effects of Multiple Sound Sources - The total sound pressure created by multiple sound sources does not create a mathematical additive effect. Below Table A is given to assist you in calculating combined noise sources. For instance, two proximal noise sources that are 70 dBA each do not have a combined noise level of 140 dBA. In this case the combined noise level is 73 dBA. Since the difference between the two sound levels is 0 dB, Table A tells us to add 3 dB to the sound level to compensate for the additive effects of the sound. To find the cumulative SPL assess the SPLs starting with the two lowest readings and work up to the difference between the two highest readings. For several pieces of equipment, operating at one

time, calculate the difference first between the two lowest SPLs, check Table A and add the appropriate number of decibels to the higher of the two sound levels. Next, take the sound level that was calculated using Table A and subtract the next lowest sound level to be considered for the operation. Consult Table A again for the additive effect and add this to the higher of the two sound levels. Follow this process until all the sound levels are accounted for. As an example, let us say that an area for a new facility is being cleared. The equipment to be used is: two chainsaws, one operating at 57 dBA and one at 60 dBA; a front end loader at 80 dBA; and a truck at 78 dBA. Start with the two lowest sound levels: 60 dBA - 57 dBA = 3 dBA difference. Consulting the chart add 2 dBA to the higher sound level. The cumulative SPL of the two chainsaws is 62 dBA. Next, subtract 62 dBA from 78 dBA. 78 dBA - 62 dBA = 16 dBA. In this case, 0 dBA is added to the higher level so we end up with 78 dBA. Lastly, subtract 78 dBA from the 80 dBA. 80 dBA - 78 dBA = 2 dBA a difference of 2 dBA adds 2 dBA to the higher SPL or 82 dBA. The SPL from these four pieces of equipment operating simultaneously is 82 dBA.

Table A

Approximate Addition of Sound Levels

Difference Between Two Sound Levels	Add to the Higher of the Two Sound Levels
1 dB or less	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0 dB

(USEPA, Protective Noise Levels, 1978)

3. Temperature and Humidity - Sound energy is absorbed in the air as a function of temperature, humidity and the frequency of the sound. This attenuation can be up to 2 dB over 1,000 feet. Such attenuation is short term and, since it occurs over a great distance, should not be considered in calculations. Higher temperatures tend to increase sound velocity but does

not have an effect on the SPL. Sound waves bend towards cooler temperatures. Temperature inversions may cause temporary problems when cooler air is next to the earth allowing for more distant propagation of sound. Similarly, sound waves will bend towards water when it is cooler than the air and bounce along the highly reflective surface. Consequently large water bodies between the sound source and the receptor may affect noise attenuation over distance.

4. Time of Year - Summer time noises have the greatest potential for causing annoyance because of open windows, outside activities, etc. During the winter people tend to spend more time indoors and have the windows closed. In general, building walls and windows that are closed provide a 15 dB reduction in noise levels. Building walls with the windows open allow for only a 5 dB reduction in SPL.

5. Wind - Wind can further reduce the sound heard at a distance if the receptor is upwind of the sound. The action of the wind disperses the sound waves reducing the SPLs upwind. While it is true that sound levels upwind of a noise source will be reduced, receptors downwind of a noise source will not realize an increase in sound level over that experienced at the same distance without a wind. This dispels the common belief that sound levels are increased downwind due to wind carrying noise.

6. Land forms and structures - In certain circumstances, sound levels can be accentuated or focused by certain features to cause adverse noise impacts at specified locations. At a hard rock mine, curved quarry walls may have the potential to cause an amphitheater effect while straight cliffs and quarry walls may cause an echo. Buildings that line streets in cities can cause a canyon effect where sound can be reflected from the building surfaces similar to what might happen in a canyon. Consideration of noise impacts associated with these types of conditions may require specialized expertise to evaluate impact potential and to formulate suitable mitigation techniques.

Consideration of existing noise sources and sound receptors in proximity to a proposed activity can be important considerations even when the activity under review is not a noise source. Topography, vegetation, structures and the relative location of noise receptors and sources to these features are all aspects of the environmental setting that can influence noise impact potential. As such, land alteration may also indirectly create an adverse noise impact where natural land features or manmade features serve as a noise barrier or provide noise attenuation for existing sources of noise, i.e. highway, railroads, manufacturing activity. Removal of these features, i.e. hills, vegetation, large structures or walls, can expose receptors to increased sound pressure levels causing noise problems where none had previously existed.

B. Impact Assessment

1. Factors to Consider

Factors to consider in determining the impact of noise on humans, are as follows:

a. Evaluation of Sound Characteristics

(1) Ambient noise level - A noise can only intrude if it differs in character or SPL from the normal ambient sound. Most objective attempts to assess nuisance noise adopt the technique of comparing the noise with actual ambient sound levels or with some derived criterion.

(2) Future noise level - The ambient noise level plus the noise level from the new or proposed source.

(3) Increase In Sound Pressure Level - A significant factor in determining the annoyance of a noise is Sound Pressure Level (SPL). SPLs are measured in decibels.

(4) Sharp and Startling Noise - These high frequency and high intensity noises can be extremely annoying. When initially evaluating the effects

of noise from an operation, pay particular attention to noises that can be particularly annoying. One such noise is the back-up beepers required to be used on machinery. They definitely catch one's attention as they were meant to do. Continual beeping by machinery can be mitigated (see Section V.C. Mitigation - Best Management Practices). Another impulse noise source that can be very annoying is the exhaust from compressed air machinery. This exhaust is usually released in loud bursts. Compressed air exhaust can also be mitigated if it causes a noise problem by using readily available mufflers or specifically designed enclosures.

(5) Frequency and Tone - Frequency is the rate at which a sound source vibrates or makes the air vibrate. Frequency is measured in Hertz (Hz). Frequency can also be classified as high ("sharp"), low ("dull"), and moderate. Pure tones are rare in nature. Tonal sounds usually consist of pure tones at several frequencies. Pure tones and tonal sounds are discerned more readily by the human ear. Pure tones and tonal sounds are compensated for in sound studies by adding a calculated number of dB(A) to the measured sound pressure.

(6) Percentile of Sound Levels - Fluctuations of SPLs can be expressed as a percentile level designated as $L_{(n)}$ where a given decibel level is exceeded *n* % of the time. A designation of $L_{(10)}$ = 70 dBA means the measured SPLs exceeded 70 dBA 10% of the time. A designation of $L_{(90)}$ = 70 dBA means the measured SPLs were exceeded 90% of the time. $L_{(90)}$ is often used to designate the background noise level.

(7) Expression of Overall Sound - Part of the overall assessment of sound is the *Equivalent Sound Level* (L_{eq}) which assigns a single value of sound level for a period of time in which varying levels of sound are experienced over that time period. The L_{eq} value provides an indication of the effects of sound on people. It is also useful in establishing the ambient sound levels at a potential noise source.

In order to evaluate the above factors in the appropriate context, one must identify the following: 1) appropriate receptor locations for sound level calculation or measurement; 2) ambient sound levels and characteristics at these receptor locations; and 3) the sound pressure increase and characteristics of the sound that represents a significant noise effect at a receptor location.

b. Receptor Locations

Appropriate receptor locations may be either at the property line of the parcel on which the facility is located or at the location of use or inhabitance on adjacent property. The solid waste regulations require the measurements of sound levels be at the property line. The most conservative approach utilizes the property line. The property line should be the point of reference when adjacent land use is proximal to the property line. Reference points at other locations on adjacent properties can be chosen after determining that existing property usage between the property line and the reference point would not be impaired by noise, i.e., property uses are relatively remote from the property line. The location of the facility should be shown on a map in relation to each potential receptor. Any future expansion should be described in a narrative as well as depicted on a map. The map and narrative should also include the distance of the operation to each point of reception including the distance at the point in time when an expanding operation will be closest to the receptors.

c. Thresholds for Significant Sound Pressure Level (SPL) Increase

The goal for any permitted operation should be to minimize increases in sound pressure level above ambient levels at the chosen point of sound reception. Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dB may require a closer analysis of impact potential depending on

existing SPLs and the character of surrounding land use and receptors. SPL increases approaching 10 dB result in a perceived doubling of SPL. The perceived doubling of the SPL results from the fact that SPLs are measured on a logarithmic scale. An increase of 10 dB(A) deserves consideration of avoidance and mitigation measures in most cases. The above thresholds as indicators of impact potential should be viewed as guidelines subject to adjustment as appropriate for the specific circumstances one encounters.

Establishing a maximum SPL at the point of reception can be an appropriate approach to addressing potential adverse noise impacts. Noise thresholds are established for solid waste management facilities in the Department's Solid Waste regulations, 6 NYCRR Part 360. Most humans find a sound level of 60 - 70 dB(A) as beginning to create a condition of significant noise effect (EPA 550/9-79-100, November 1978). In general, the EPA's "Protective Noise Levels" guidance found that ambient noise levels • 55 dBA $L_{(dn)}$ was sufficient to protect public health and welfare and, in most cases, did not create an annoyance (EPA 550/9-79-100, November 1978). In non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dB(A) at the receptor. An increase of 6 dB(A) may cause complaints. There may be occasions where an increase in SPLs of greater than 6 dB(A) might be acceptable. The addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dB(A). This would be considered the "upper end" limit since 65 dB(A) allows for undisturbed speech at a distance of approximately three feet. Some outdoor activities can be conducted at a SPL of 65 dB(A). Still lower ambient noise levels may be necessary if there are sensitive receptors nearby. These goals can be attained by using the mitigative techniques outlined in this guidance.

Ambient noise SPLs in industrial or commercial areas may exceed 65 dB(A) with a high end of approximately 79 dB(A) (EPA 550/9-79-100, November 1979). In these instances mitigative measures utilizing best management practices should be used in an effort to ensure that a facility's generated sound levels are at a minimum. The goal in an industrial/commercial area, where ambient SPLs are already at a high level, should be not to exceed the ambient SPL. Remember, if a new source

operates at the same noise level as the ambient, then 3 dB(A) must be added to the existing ambient noise level to obtain the future noise level. If the goal is not to raise the future noise levels the new facility would have to operate at 10 dB(A) or more lower than the ambient.(see Table A)

Table B

HUMAN REACTION TO INCREASES IN SOUND PRESSURE LEVEL

Increase in Sound Pressure (dB)	Human Reaction
Under 5	Unnoticed to tolerable
5 - 10	Intrusive
10 - 15	Very noticeable
15 - 20	Objectionable
Over 20	Very objectionable to intolerable

(Down and Stocks - 1978)

Impact assessment will vary for specific project reviews, but must consist of certain basic components for all assessments. Additional examination of sound generation and noise reception are necessary, where circumstances warrant. Sound impact evaluation is an incremental process, with four potential outcomes:

- exemption criteria are met and no noise evaluation is required;
- noise impacts are determined to be non-significant (after first-level evaluation);
- noise impacts are identified as a potential issue but can be readily mitigated (after second level evaluation); or
- noise impacts are identified as a significant issue requiring analysis of alternatives as well as mitigation (third level evaluation).

All levels of evaluation may require preparation of a noise analysis. The required scope of noise impact analysis can be rudimentary to rather sophisticated, depending on circumstances and the results obtained from initial levels of evaluation. Recommendations for each level of evaluation are presented below.

2. Situations in Which No Noise Evaluation is Necessary

When certain criteria are satisfied, the need for undertaking a noise impact analysis at any level is eliminated. These criteria are as follows:

a. The site is contained within an area in which local zoning provides for the intended use as a "right of use". It does not apply to activities that are permissible only after an applicant is granted a special use permit by the local government; and

b. The applicant's operational plan incorporates appropriate best management practices (BMPs [see Section V.C. Mitigation - Best Management Practices]) for noise control for all facets of the operation.

Where activities may be undertaken as a "right of use", it is presumed that noise has been addressed in establishing the zoning. Any residual noise that is present following BMP implementation should be considered an inherent component of the activity that has been found acceptable in consideration of the zoning designation of the site.

3. First Level Noise Impact Evaluation

The initial evaluation for most facilities should determine the maximum amount of sound created at a single point in time by multiple activities for the proposed project. All facets of the construction and operation that produce noise should be included such as land clearing activities (chain saw and equipment operation), drilling, equipment operation for excavating, hauling or conveying materials, pile driving, steel work, material processing, product storage and removal. Land clearing and construction may be only temporary noise at the site whereas the ongoing operation of a facility would be considered permanent noise. An analysis may be required for

various phases of the construction and operation of the project to assure that adverse noise effects do not occur at any phase.

To calculate the sound generated by equipment operation, one can consult the manufacturers' specifications for sound generation, available for various types of equipment. Another option for calculating the sound to be generated by equipment is to make actual measurements of sound generated by existing similar equipment, elsewhere.

Tables C and D summarize noise measurements from some common equipment used in construction and mining. Table E summarizes the noise level, in decibels (dB[A]), from some common sources. This information can be used to assist Department staff in relating potential noise impacts to sound levels produced by commercial and industrial activities. Use of these tables in the first level of analysis will help determine whether or not noise will be an issue and whether actual measurements should be made to confirm noise levels.

Table C

PROJECTED NOISE LEVELS

Noise Source	Measurements	1,000 feet	2,000 feet	3,000 feet
Primary and secondary crusher	89 dB(A) at 100 ft	69.0 dB(A)	63.0 dB(A)	59.5 dB(A)
Hitachi 501 shovel loading	92 dB(A) at 50 ft	66.0 dB(A)	60.0 dB(A)	56.5 dB(A)
Euclid R-50 pit truck loaded	90 dB(A) at 50 ft	64.0 dB(A)	58.0 dB(A)	54.4 dB(A)
Caterpillar 988 loader	80 dB(A) at 300 ft	69.5 dB(A)	63.5 dB(A)	60.0 dB(A)

(The Aggregate Handbook, 1991)

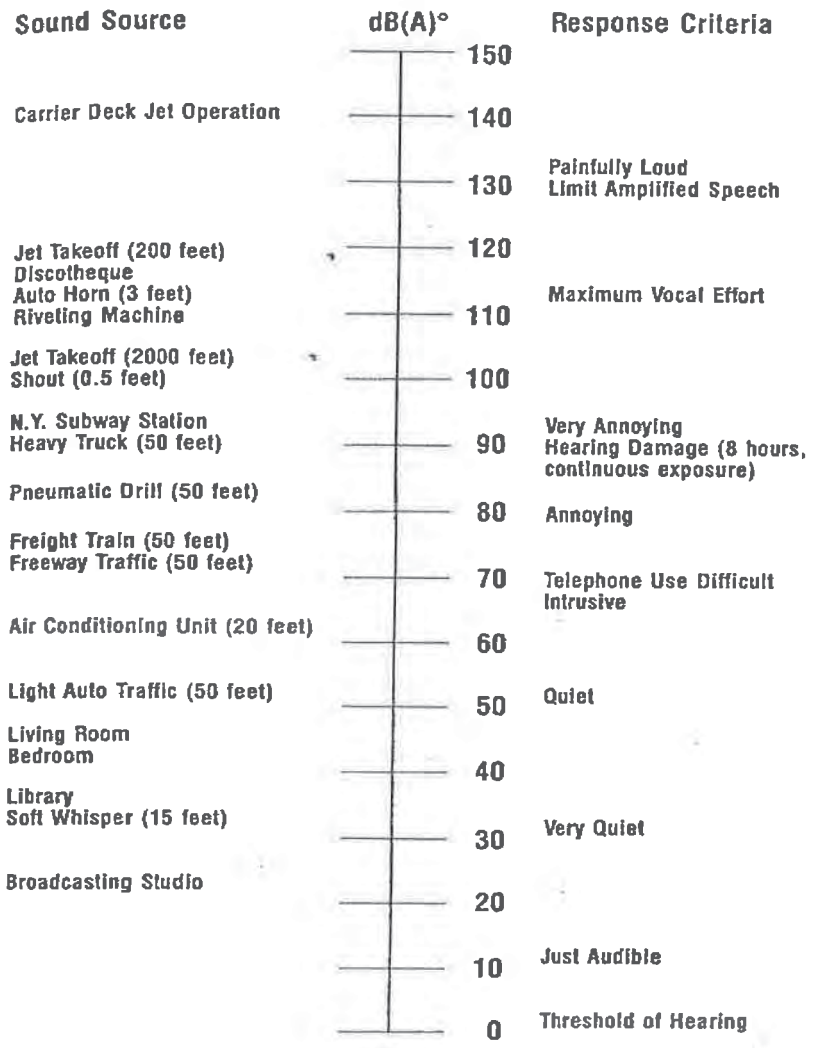
Table D

Common Equipment Sound Levels

EQUIPMENT	**DECIBEL LEVEL**	**DISTANCE** in feet
Augered earth drill	80	50
Backhoe	83-86	50
Cement mixer	63-71	50
Chain saw cutting trees	75-81	50
Compressor	67	50
Garbage Truck	71-83	50
Jackhammer	82	50
Paving breaker	82	50
Wood Chipper	89	50
Bulldozer	80	50
Grader	85	50
Truck	91	50
Generator	78	50
Rock drill	98	50

(excerpt and derived from Cowan, 1994)

Table E



(The Aggregate Handbook, 1991)

The sound level at receptor locations should be calculated using the inverse square rule whereby sound is attenuated over distance. Again, each doubling of the distance from the source of a noise decreases the SPL by 6 dB(A) at distances greater than 50 feet. This calculation should first consider the straight line distance between the point of noise generation and the point of noise reception with the presumption that no natural or manmade features exist along the transect between the two points that would further attenuate sound level. Calculations should be performed for each point of reception in all directions being careful to evaluate the worst case noise impact potential by considering activities at the point where they would be closest to a receptor. The sound level calculated for the point of reception should be related to ambient sound levels. Ambient sound levels can be either measured or assumed based on established references for the environmental setting and land use at the point of reception. For estimation purposes, ambient SPLs will vary from approximately 35 dB(A) in a wilderness area to approximately 87 dB(A) in a highly industrial setting. A quiet seemingly serene setting such as rural farm land will be at the lower end of the scale at about 45 dB(A), whereas an urban industrial area will be at the high end of this scale at around 79 dB(A) (EPA 550/9-79-100, November 1978). If there is any concern that levels based on reference values do not accurately reflect ambient SPL, field measurements should be undertaken to determine ambient SPLs.

Where this evaluation indicates that sound levels at the point of reception will not be perceptible, similar to or only slightly elevated as compared to ambient conditions, no further evaluation is required. When there is an indication from this initial analysis that marginal or significant noise impact may occur, further evaluation is required. In determining the potential for an adverse noise impact, consider not only ambient noise levels, but also the existing land use, and whether or not an increased noise level or the introduction of a discernable sound, that is out of character with existing sounds, will be considered annoying or obtrusive. (see B.1.a Evaluation of Sound Characteristics)

4. Second Level Noise Impact Evaluation

Further refine the evaluation of noise impact potential by factoring in any additional noise attenuation that will be provided by existing natural topography, fabricated structures such as buildings, walls or berms or vegetation located between the point of noise generation and noise reception. This analysis may require consideration of future conditions and the loss of natural noise buffers over time.

Dense vegetation that is at least 100 feet in depth will reduce the sound levels by 3 to 7 dB(A). Evergreens provide a better vegetative screen than deciduous trees. Keep in mind that if a vegetative screen does not currently exist, planting a vegetative screen may require 15 or more years of growth before it becomes effective.

The degree to which topography attenuates noise depends on how close the feature is located to the source or the receptor of the noise. Topography can act as a natural screen. The closer a hill or other barrier is to the noise source or the receptor, the larger the sound shadow will be on the side opposite the noise source. Certain operations such as mining and landfills may be able to use topography to maintain a screen between the operation and receptors as they progress. Mining operations may be able to create screens by opening a mine in the center of the site using and maintaining the pit walls as barriers against sound (Aggregate Handbook, 1991).

If after taking into account all the attenuating features the potential still exists for adverse noise impact, other types of noise analyses or modeling should be used to characterize the source. An Equivalent Sound Level (L_{eq}) analysis or a related type of noise analysis may better define activities or sources that require more mitigation or isolation so that noise emanating from these sources will not cause an adverse impact.

Where it is demonstrated that noise absorbing or deflecting features further attenuate sound reception to a level of no significant increase, no further analysis is necessary. Where it is determined that noise level or the character of the noise may

have a significant adverse effect on receptors, other noise mitigation measures should be evaluated in an expanded noise analysis.

5. Third Level - Mitigation Measures

When the above analyses indicate significant noise effects may or will occur, the applicant should evaluate options for implementation of mitigation measures that avoid, or diminish significant noise effects to acceptable levels (see Section V.C. Mitigation - Best Management Practices). Adequate details concerning mitigation measures and an evaluation of the effectiveness of the mitigative measures through additional sound level calculations should be provided in a noise analysis. These calculations are to factor in the noise reduction or avoidance capabilities of the mitigation measures. In circumstances where noise effects cannot readily be reduced to a level of no significance by project design or operational features in the application, the applicant must evaluate alternatives and mitigation measures in an environmental impact statement to avoid or reduce impacts to the maximum extent practicable per the requirements of the State Environmental Quality Review Act (SEQR).

The noise analysis should be part of the application or a supplement to it, and will be part of the SEQR environmental assessment by reference. Duplicative noise analysis information is not required for the permit application and the assessment of impacts under SEQR. A proper analysis can satisfy information needs for both purposes.

C. Mitigation - Best Management Practices (BMP) for Reducing Noise

Various noise abatement techniques are available for reducing frequency of sound, duration of sound or SPLs at receptor locations. The mitigation techniques given below are listed according to what sound characteristic they mitigate.

1. Reduce noise frequency and impulse noise at the source of generation by:

   a. Replacing back-up beepers on machinery with strobe lights (subject to other requirements, e.g., OSHA and Mine Safety and Health Administration, as applicable). This eliminates the most annoying impulse beeping;

   b. Using appropriate mufflers to reduce the frequency of sound on machinery that pulses, such as diesel engines and compressed air machinery;

   c. Changing equipment: using electric motors instead of compressed air driven machinery; using low speed fans in place of high speed fans;

   d. Modifying machinery to reduce noise by using plastic liners, flexible noise control covers, and dampening plates and pads on large sheet metal surfaces; and

2. Reduce noise duration by:

   a. Limiting the number of days of operation, restricting the hours of operation and specifying the time of day and hours of access and egress can abate noise impacts.

   b. Limiting noisier operations to normal work day hours may reduce or eliminate complaints.

Limiting hours of construction or operation can be an effective tool in reducing potential adverse impacts of noise. The impacts of noise on receptors can be

significantly reduced by effectively managing the hours at which the loudest of the operations can take place.

Implementation of hours of operation does not reduce the SPL emanating from a facility. Determining whether or not hours of operation will be effective, mitigation requires consideration of: public safety, for example road construction at night may reduce traffic concerns and facilitate work; duration of the activity, is it a one time event necessary to meet a short term goal or will the activity become an ongoing operation; and surrounding land use, consider what type(s) of land use is proximal to the activity and at what time(s) might a reduction of noise levels be necessary. There may be other factors to consider due to the uniqueness of a given activity or the type of land use adjacent to the activity. Hours of operation should also consider weekend activities and legal holidays that may change the types of land use adjacent to the permitted activity or increase traffic levels in an area.

The best results from using hours of operation as a mitigative measure will be obtained if the hours are negotiated with the owner or operator of the facility. The less noisy aspects of an operation may not have to be subject to the requirements of hours of operation such as preparing, greasing and maintaining machinery for the upcoming day's operation. The more noisy operations can be scheduled to begin when people in the receptor area are less likely to be adversely effected. Hours of operation should be included in the operation plans for a facility that becomes part of the permit, or in the event that there is no operation plan, can be included as a permit condition.

3. Reduce Noise sound pressure levels by:

   a. Increasing the setback distance.
   b. Moving processing equipment during operation further from receptors.
   c. Substituting quieter equipment (example - replacing compressed air fan with an electric fan could result in a 20 dB reduction of noise level).

d. Using mufflers selected to match the type of equipment and air or gas flow on mechanical equipment.
e. Ensuring that equipment is regularly maintained.
f. Enclosing processing equipment in buildings (example - enclosing noisy equipment could result in an 8-10 dB noise level reduction, a 9 inch brick wall can reduce SPL by 45-50 dB).
g. Erecting sound barriers such as screens or berms around the noise generating equipment or near the point of reception. The angle of deflection also increases as the height of a screen or barrier increases. Screens or barriers should be located as close to the noise source or the receptor as possible. The closer the barrier is located to the source or the receptor, the greater the angle of deflection of the sound waves will be creating a larger "sound shadow" on the side opposite the barrier. Stockpiles of raw material or finished product can be an effective sound barrier if strategically placed.
h. phasing operations to preserve natural barriers as long as possible.
i. altering the direction, size, proximity of expanding operations.
j. Designing enclosed facilities to prevent or minimize an SPL increases above ambient levels. This would require a noise analysis and building designed by a qualified engineer that includes adequate ventilation with noise abatement systems on the ventilation system.

Public notification of upcoming loud events can also be used as a form of mitigation although it doesn't fit easily into the categories above. People are less likely to get upset if they know of an upcoming event and know that it will be temporary.

The applicant should demonstrate that the specific mitigation measures proposed will be effective in preventing adverse noise effects on receptors.

D. Decision Making - Conditioning Permits to Limit Noise Impacts

Preferably, the mitigation measures as outlined in the construction and operational plans should be relied upon to mitigate the effects of noise on receptors. The permit should state that the activity will be conducted in accordance with the approved plan. Otherwise, mitigation measures and BMP's can be imposed within specific permit conditions.

It is not the intention of this guidance to require decibel limits to be established for operations where such limits are not required by regulation. There are, however, instances when a decibel limit may be established for an operation to ensure activities do not create unacceptable noise effects, as follows:

1. The review of a draft and final environmental impact statement demonstrates the need for imposition of a decibel limit;
2. A decibel limit is established by the Commissioner's findings after a public hearing has been held on an application;
3. The applicant asks to have a decibel limit to demonstrate the ability to comply; or
4. A program division seeks to establish a decibel limit as a permit condition, when necessary to demonstrate avoidance of unacceptable noise impact.

Ultimately, the final decision must incorporate appropriate measures to minimize or avoid significant noise impacts, as required under SEQR. Any unavoidable adverse effects must be weighed along with other social and economic considerations in deciding whether to approve or deny a permit.

REFERENCES

1) Cowan, James P., Handbook of Environmental Acoustics, Van Nostrand Reinhold, 1994.

2) Down, C.G. and Stocks, J.; Environmental Impact of Mining. Applied Science Publishers Ltd., ISBN 0853347166, 1978.

3) U.S. Dept of Transportation - Federal Highway Administration Office of Research and Development; Highway Noise-A Manual for Highway Noise and Land Use, Nov. 1974.

4) New York State Motor Vehicle Law, Chapter IV, Subchapter E, 450.2, Part 450, "Noise From Heavy Motor Vehicles," 200.701 CN, February 28, 1997.

5) Beranek, L.A. ed., Noise and Vibration Control. Cambridge, MA: Institute of Noise Control Engineering, 1971, pp. 164-174 and 182-191.

6) Barksdale, R.D., editor, 1991. The Aggregate Handbook: National Stone Association (Washington, DC), 1.V.

7) Norman, David K., Wampler , Peter J., Throop, Allen H., Schnitzer, E. Frank, and Roloff, J., 1996. "Best Management Practices for Reclaiming Surface Mines in Washington and Oregon." Oregon Dept. of Geology and Mineral Industries, Open File Report 0-96-2.

8) United States Environmental Protection Agency, Protective Noise Levels, Condensed Version of EPA Levels document, EPA 550/9-79-100, November 1978, Office of Noise Abatement & Control, Washington, D.C.

9) United States Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA 550/9-74-004, March 1974, Office of Noise Abatement and Control, Washington, D.C.

10) City of Davis General Plan, Appendix E Background Information on Environmental Acoustics, November 1996.

11) The Australian National University, "Physics and Psychophysics of Music", ACAT 1003, David Worrall, http://www.anu.edu.au/ITA/ACAT/drw/PPofM/Intensity2.html, 1998.

12) Danish Wind Turbine Manufacturers Association, Measuring and Calculating Sound Levels, November 18, 1997.

Additional Reading

a. Beranek, Leo L. and Istavan L. Ver, Noise and Vibration Control Engineering, John Wiley & Sons, Inc. New York, 1992.

b. Beranek, Leo L., Noise and Vibration Control, Institute of Noise Control Engineering, Revised Edition, Washington, C.C., 1988.

c. Diehl, George, M., Machinery Acoustics, John Wiley & Sons, New York, 1973.

d. Erwin, J.D., Graf, E. R., Industrial Noise and Vibration Control, Prentice Hall, Englewood Cliffs, New Jersey, 1979.

e. Jensen, Paul, et al, Industrial Noise Control Manual, U.S. Department of Health, Education and Welfare, Public Health Service, Cincinnati, 1978.

Patricia Boudreau-Sullivan

From: Dotti2000@aol.com
Sent: Saturday, February 18, 2017 1:54 PM
To: Patricia Boudreau-Sullivan
Subject: Little Fresh Pond Tennis Camp

C17

Dear Chairman Finnerty and Members of Planning Board:

As preamble to my comments below, I should mention that I served on the Zoning Board of Appeals some years ago, so I still have a rusty knowledge of the Code. It's from that basis that I make my observations.

First, the applicant's historical CO is for a "tennis club and tennis camp." As has been stated to you many times, I'm sure, this was a very low key, low impact use. It is my understanding that the ZBA more recently determined that the addition of a swimming pool was a normal **accessory use** to a tennis club/camp. If I'm correct, those features are the only uses that the applicant now has as a matter of right.

As you know, Town Code Section 330-167 B (3) (a) and (b) provides that to allow a change in a non-conforming use applicant must prove "that such change will be beneficial to the general neighborhood." Certainly, the neighbors and their counsel have argued that no such benefit exists. Quite the contrary, the environmental impact to them is frightening, in terms of traffic, noise, water quality, odors, etc. C17-1

The assumption voiced by the Board that "it will be beneficial if we can restrict the number of campers" ignores that a PRACTICAL LIMIT already exists. Legally, it's a tennis club. Common sense dictates that, generally speaking, the number of members using the facility at one time is limited by the number of tennis courts. C17-2

As you proceed with sizing the scope the project, please consider this as the foundation of any increase in use.

After many years of careful stewardship of Little Fresh Pond by the neighbors, it would be tragic to see irreparable harm to this natural resource by only one landowner. This would certainly not be in the interest of the common good.

Thank you for the opportunity to comment.

Sincerely,
Dorothea Donaldson
PO Box 1226
Southampton NY
Residence: Big Fresh Pond

RECEIVED
FEB 21 2017
TOS PLANNING DIVISION

C18

January 26, 2017

189 Little Fresh Pond Road
Southampton, NY 11968

Please add to the DEIS Public Comment record.

Town of Southampton Planning Board
116 Hampton Road
Southampton, NY 11968

RECEIVED
FEB 16 2017
TC

RE: Southampton Country Day Camp DEIS Public Hearing

Ladies & Gentlemen of the Planning Board,

My name is Elizabeth Seus. I have been a resident of the Town of Southampton since 2002. My home is on Little Fresh Pond Road. I have been an outspoken critic of the plan to develop this property into a large summer day camp for children and I have attended numerous Town of Southampton public hearings on this issue.

I am not able to attend tonight's Public Hearing and have requested that this letter be read into the record.

I am a New York State licensed landscape architect. Based on my work in this area, I am familiar with the type of documents that developers are required to file with the Town of Southampton and the Suffolk County Department of Health Services ("SCDHS") with respect to the development of properties, particularly sanitary/sewage flow issues that are part of these submissions. The average person who is not familiar with the regulatory scheme would not know that such submissions need to be made to the SCDHS. In contrast, submissions to the Town of Southampton Planning Board are subject to public notice and review.

As the Planning Board probably knows, no project, regardless of who approves it, can be built if it does not meet the requirements of the Health Department. It is my contention that this project was reverse engineered through the SCDHS in order to achieve maximum sanitary capacity-far exceeding what existing Statute would allow-before anything was presented to the Town. Then, it is my contention, it was presented to the Town as an already done deal, over which the Town would have no control.

From studying publicly available documents that were submitted and/or generated by this project it is my opinion that a substantial material misrepresentation of the previously approved use of the property was made to the SCDHS. The developer has claimed that the cottages on the property were historically used as dormitories & thus generated, according to New York State Building Code classifications, huge amounts of sanitary waste. Yet, we know from ZBA findings, historical records, and signed affidavits that the real use was rental cottages, historically permitted by SCDHS as a "bungalow colony".

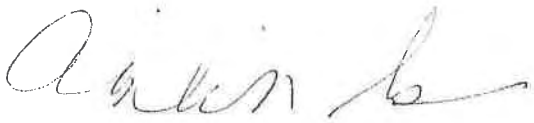
C18-1

This claim that the cottages were actual dormitories resulted in SCDHS agreeing that the property could claim rights to generate 9,450 GPD of sewage on site, and use it in its totality under any future development scheme.

As can be seen in the DEIS document every single one of the six SEQRA mandated Design Alternatives depends entirely on this purported "grandfathered" capacity. Even the "No Action Alternative" was developed under the claim of "grandfathered flow" when the property owner, applied for, and received, a SCDHS permit to both install a commercial capacity sanitary system and to operate a children's camp, contrary to Town Code.

I respectfully ask that the Planning Board give consideration to this matter and determine if, as the lead agency, they are comfortable accepting the method by which the "grandfathered" sanitary flow was arrived at.

Sincerely,



Elizabeth Seus

See the attached, 9 page, June 14, 2011, (date stamped June 17, 2011), Applicant submittal to SCDHS, including Temporary Residence permit, calculating the "grandfathered" sewage flow.

How was the "grandfathered" sewage flow calculated?

C18-1 cont'd

Once the right to grandfather is established, you calculate what that grandfathered quantity is. So you look at the uses that were allowed by your "grandfathered" operation & match them up to current SCDHS requirements for that particular activity. Add up the quantities & that is what you can use to design your new project. The application to SCDHS calls out the cottages as "dormitory buildings".

Then, under the pretense that these are actual dormitories, it proceeds to the *New York State Building Code, Section 10004, Occupant Load*, and uses *Table 1004.1.2 Maximum Floor Area Allowances Per Occupant* to find how much square footage of floor area is required for each person to occupy a "Dormitory". The answer is 50 sq. ft. gross.

The original application then divides the gross square footage of each cottage by 50 to arrive at the maximum possible occupancy. It ranges from 2 to 18 persons, for a total of 124 "occupants". Now they go back to the SCDHS *Table 1-Project Density Loading Rates & Design Sewage Flow Rates* to determine how much sewage flow (density load) must be accommodated for each of these theoretical occupants.

Going to the School classification we move down to Boarding School/Dormitory and the answer is 75 gallons per day. Multiply 124 x 75 and you have just established that your grandfathered quantity is 9,300 gallons per day. Plus a straight 300 gpd for the single family residence shown on the C of O, and you have a total of 9,600 gpd to work with. Far, far in excess of anything that would otherwise be possible. How a SCDHS permitted Cabin/Bungalow Colony transformed into a Boarding School/Dormitory is the mystery.

By striking contrast, if you follow the path that these are actually individual living units permitted as temporary residences, the results are much different. Go straight to SCDHS *Table 1-Project Density Loading Rates & Design Sewage Flow Rates* & find the Residential category. If we know each of the cottages had a kitchenette, go to Housing Unit use. If they did not have a kitchenette, go to Motel/Hotel Unit use, which allows a slightly lower quantity.

C18-1 cont'd

Being generous, we choose Housing Unit & calculate according to the size of the cottage. "Up to 600 sq. ft." = 150 gpd/unit. Between 601 - 1200 sq. ft. = 225 gpd/unit. The SCDHS application shows 11 cottages up to 600 sq. ft. & 2 cottages between 601 and 1200 sq. ft. This adds up to 11 x 150 gpd=1650 gpd + 2 x 225 gpd=450 gpd. Total cottage flow =1650 + 450=2100. Add in the 300 gpd for the single family residence and the true grandfathered amount is 2,400 gpd not 9,600 gpd.

* To further clarify this classification there is a footnote in the table which indicates that "Housing Unit" applies to Motel/Hotel with Kitchenettes, Cottages, Apartments, Condominiums, Mobile Homes, Trailers, or Co-ops.

The original claim for grandfathering was 9,600 GPD. Removal of the smallest cabin from the design plans resulted in a total claimed grandfathering of 9,450 GPD.

Which is the true "grandfathered" sanitary flow - 9,450 GPD or 2,400 GPD?

JEFFREY T. BUTLER, P.E.,P.C.
206 LINCOLN STREET
RIVERHEAD, NEW YORK 11901
631-208-8850
LICENSED PROFESSIONAL ENGINEER
MEMBER NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

June 14, 2011

Jennifer Niemczyk
Suffolk County Department of Health Services
360 Yaphank Avenue
Suite 2C
Yaphank, New York 11980

RECEIVED
JUN 17 2011
SUFF. CO. HEALTH SERVICES
OFFICE OF WASTEWATER

Re: C09-11-0009

Dear Jennifer:

Attached please find the following with respect to this application and your Notice of Incomplete dated May 4, 2011:

- Completed Short Environmental Form
- Certificate of Authorization
- Water Calculations for water supply system
- SCWA Expansion Agreement
- Certificate of Occupancy for Camp
- Temporary Residence Permit for Camp
- Floor plans, area calculations, occupancy load and flow calculation for each building
- Revised plans and details for site
- Survey of complete site

Please note that the existing flow calculation was determined by using Guidance Memorandum # 20, however no component was added in for day campers due to the fact that no reference could be found for the amount allowed on site. In addition, please note that the flow rates in gallons per day, both existing and proposed, are for seasonal use. In fact this application is for a seasonal day camp being used 5 days a week from late June to late August.

Thank you in advance for your attention to this application. Please call me with any questions or concerns.

Sincerely,

Jeffrey T. Butler, P.E.

Southampton Country
Day Camp

SOUTHAMPTON COUNTRY DAY CAMP EXISTING DORMITORY OCCUPANCY CALCULATION AND FLOW RATE

EXISTING DORMITORY BUILDINGS AND OCCUPANCY

BUILDING	GROSS AREA	*OCCUPANCY AT 1/50 SQ. FT. GROSS
Cottage 1	671 → 225 gpd	13
Cottage 2	949 → 225 gpd	18
Cottage 3	511 → 150 gpd	10
Cottage 4	354 → 150 gpd	7
Cottage 5	354 → 150 gpd	7
Cottage 6	597 → 150 gpd	11
Cottage 7	417 → 150 gpd	8
Cottage 8	448 → 150 gpd	8
Cottage 9	485 → 150 gpd	9
Cottage 10	480 → 150 gpd	9
Cottage 11	577 → 150 gpd	11
Cottage 12	596 → 150 gpd	11
Cottage 13	147 → 150 gpd	2
	Total = 2,100 gpd	124 OCCUPANTS

Allowance / Housing Unit

Housing Unit[8] up to 600 sq ft gross floor area = 150 gpd/unit

Housing Unit[8] between 601-1200 sq.ft. gross floor area = 225 gpd/unit

[8] Motel/Hotel with Kitchenettes, Cottages, Apartments, Condominiums, Mobile Homes, Trailers, or Co-Ops.

**DORMITORY HOUSING RATE = 75 GPD/BED

EXISTING FLOW (FROM COTTAGES) = 124 OCCUPANTS X 75 GPD = 9,300 GPD

EXISTING SINGLE FAMILY DWELLING FLOW = 300 GPD

***TOTAL EXISTING FLOW = 9,600 GPD**

(*DOES NOT INCLUDE DAY CAMP COMPONENT)

*FROM BUILDING CODE OF NEW YORK STATE, TABLE 1004.1.2

**FROM TABLE 1-PROJECT DENSITY LOADING RATES-SCDHS 12/1/09

Rates based on Submitted

"Dining Hall" is currently a residence

"Dormitory" rates = 2,300 gpd + 300 gpd

VS. "Housing Unit" rates = 2,100 gpd + 300



SCDHS - Standards for Approval of Plans & Construction For Sewage Disposal Systems For other Than Single Family Residences 12/09

RECEIVED
JUN 17 2011
SUFFOLK CO. HEALTH SERVICES
OFFICE OF WASTEWATER MANAGEMENT

TABLE 1 - PROJECT DENSITY LOADING RATES & DESIGN SEWAGE FLOW RATES

(Based upon gross floor area in square feet (sf) unless otherwise noted)

Structure Use	Density Load	Kitchen/Gray Load	Hydraulic Load
FOOD SERVICE			
Bar (in restaurant)	10 gpd/seat	5 gpd/seat	15 gpd/seat
Bar, Tavern, Disco (no fixed seating)	10 gpd/occupant[1]	5 gpd/occupant[1]	15 gpd/occupant[1]
Bar (outdoor/seasonal)	5 gpd/seat	2.5 gpd/seat	7.5 gpd/seat
Cafeteria (open to public)	See Primary use + 5 gpd/seat	2.5 gpd/seat	Primary use + 7.5 gpd/seat
Cafeteria/Continental Breakfast (not open to public)	See Primary Use	2.5 gpd/seat	Primary use + 2.5 gpd/seat
Snack Bar	See Primary Use	0.12 gpd/sf	Primary use + 0.12 gpd/sf
Juice Bar	See Primary Use	2.5 gpd/seat	Primary use + 2.5 gpd/seat
Catering Hall	5 gpd/seat	2.5 gpd/seat	7.5 gpd/seat
Outside Patio Dining	5 gpd/seat	10 gpd/seat	15 gpd/seat
Restaurant (full service or single services > 16 seats[2])	10 gpd/seat	20 gpd/seat	30 gpd/seat
Wet store w/ food (Deli/take-out with max 16 seats single service[2])	0.03 gpd/sf	0.12 gpd/sf	0.15 gpd/sf
Convenience store/Market/Farm Stand	0.03 gpd/sf	0.02 gpd/sf	0.05 gpd/sf
Commercial Bakery	0.04 gpd/sf	0.02 gpd/sf	0.06 gpd/sf
Wine/Beer Tasting (in a winery/brewery only)	5 gpd/occ	2.5 gpd/occ	7.5 gpd/occ
GENERAL INDUSTRIAL			
General Industrial[3]	0.04 gpd/sf	Industrial process water[4]	0.04 gpd/sf
Greenhouse	0.03 gpd/sf	N/A	0.03 gpd/sf
MEDICAL			
Drug Rehabilitation	75 gpd/bed	See note [5]	75 gpd/bed
Mental Health Residence	75 gpd/bed	See note [5]	75 gpd/bed
Hospital	300 gpd/bed	See note [5]	300 gpd/bed
Nursing Home	150 gpd/bed	See note [5]	150 gpd/bed
Assisted Living	110 gpd/bed	See note [5]	110 gpd/bed
Medical office space	0.10 gpd/sf	N/A	0.10 gpd/sf
Dialysis Center	0.10 gpd/sf	Dialysis process water[4]	0.10 gpd/sf
Veterinary[6]	0.10 gpd/sf + 10 gpd/animal boarding	N/A	0.10 gpd/sf + 10 gpd/animal boarding

MUNICIPAL SERVICES			
Library, firehouse, precinct, museum, art gallery (w/ meeting rooms)	0.03 gpd/sf + 5 gpd/occupant[1] for meeting rooms	2.5 gpd/occupant[1]	0.03 gpd/sf + 5 gpd/occupant[1] + 2.5 gpd/occupant[1]
Library, firehouse, precinct, museum, art gallery (w/o meeting rooms)	0.03 gpd/sf	2.5 gpd/occupant[1]	0.03 gpd/sf + 2.5 gpd/occupant[1]
OFFICE			
Non-medical office space	0.06 gpd/sf		0.06 gpd/sf
RECREATION			
Bath house/comfort station	5 gpd/occupant[1]	5 gpd/shower/occupant[1] + Food service[7]	5 gpd/occupant[1] + 5 gpd/shower/occupant + Food service[7]
Bowling alley/tennis court/racquetball	100 gpd/court or alley	Food service[7]	100 gpd/court or alley+ Food service[7]
Miniature golf	15 gpd/parking space	Food service[7]	15 gpd/parking space + Food service[7]
Ice/roller Skating Rink	15 gpd/skater[1] + 5 gpd/specator[1]	Food service[7]	15 gpd/skater[1] + 5 gpd/specator[1] + Food service[7]
Recreation	15 gpd/parking space	Food service[7]	15 gpd/parking space + Food service[7]
Spa/Fitness Center/ Karate/Dance/etc. (w/ showers & amenities)	0.1 gpd/sf	0.2 gpd/sf + Food service[7]	0.3 gpd/sf + Food service[7]
Spa/Fitness Center/ Karate/Dance/etc. (w/o showers & amenities)	0.1 gpd/sf	Food service[7]	0.1 gpd/sf + Food service[7]
Marina	10 gpd/boat slip	Food service[7]	10 gpd/boat slip + Food service[7]
OTB	5 gpd/person	Food service[7]	5 gpd/person + Food service[7]
Theater	3 gpd/seat	Food service[7]	3 gpd/seat + Food service[7]
Horse Farm[6]	0.04 gpd/sf + 10 gpd/stall		0.04 gpd/sf + 10 gpd/stall
Camp Ground	10 gpd/camper	5 gpd/shower/camper	10 gpd/camper + 5 gpd/shower/camper
Billiard Hall	5 gpd/occ	2.5 gpd/occ	7.5 gpd/occ
RESIDENTIAL			
Single Family Residence	300 gpd		300 gpd
Two Family Residence	600 gpd		600 gpd
Rooming house	75 gpd/bed		75 gpd/bed

Motel/Hotel unit up to 400 sq.ft. gross floor area w/o kitchenette (w/kitchenette see Housing Unit)	100 gpd/unit		100 gpd/unit
Motel/Hotel unit > 400 sq.ft. gross floor area w/o kitchenette (w/kitchenette see Housing Unit)	150 gpd/unit		150 gpd/unit
Housing Unit[8] up to 600 sq.ft. gross floor area	150 gpd/unit		150 gpd/unit
Housing Unit[8] between 601-1200 sq.ft. gross floor area	225 gpd/unit		225 gpd/unit
Housing Unit[8] > 1200 sq.ft. gross floor area	300 gpd/unit		300 gpd/unit
PRC unit up to 600 sq.ft. gross floor area	100 gpd/unit		100 gpd/unit
PRC unit between 600-1600 sq.ft. gross floor area	150 gpd/unit		150 gpd/unit
PRC unit between 1600-2000 sq.ft. gross floor area	225 gpd/unit		225 gpd/unit
PRC unit > 2000 sq.ft. gross floor area	300 gpd/unit		300 gpd/unit
RETAIL			
Dry store	0.03 gpd/sf		0.03 gpd/sf
Wet store w/o Food (Hair salon, nail salon, pet shop w/o animal boarding, etc.)	0.03 gpd/sf	0.07 gpd/sf	0.1 gpd/sf
Car Dealership	0.03 gpd/sf for showroom/offices + 0.04 gpd/sf for maintenance/storage areas		0.03 gpd/sf for showroom/offices + 0.04 gpd/sf for maintenance/storage areas
Massage/Tanning	0.03 gpd/sf		0.03 gpd/sf
Tattoo Parlor	0.03 gpd/sf		0.03 gpd/sf
SCHOOL			
Boarding school/ Dormitory	75 gpd/capita[1]	2.5 gpd/capita[1]	77.5 gpd/capita[1]
Day School	5 gpd/capita[1]	2.5 gpd/capita[1]	7.5 gpd/capita[1]
MISCELLANEOUS			
Car Wash	0.04 gpd/sf	Car wash process water[4]	0.04 gpd/sf
Laundromat	0.03 gpd/sf	Laundromat process water[4]	0.03 gpd/sf

Funeral Home	0.05 gpd/sf	Funeral Home process water[4]	0.05 gpd/sf
House of Worship (w/ meeting rooms)	1.5 gpd/seat + 5 gpd/occupant[1] for meeting rooms	2.5 gpd/occupant[1]	1.5 gpd/seat + 5 gpd/occupant[1] + 2.5 gpd/occupant[1]
House of Worship (w/o meeting rooms)	1.5 gpd/seat	2.5 gpd/occupant[1]	1.5 gpd/seat + 2.5 gpd/occupant[1]
Public Storage[9]	0.04 gpd/sf		0.04 gpd/sf
Animal boarding[6]	0.03 gpd/sf + 10 gpd/animal		0.03 gpd/sf + 10 gpd/animal
Winery/Brewery[1]	0.04 gpd/sf	Winery/Brewery process water[4]	0.04 gpd/sf

1 Occupancy ratings can be determined using New York State Uniform Fire Prevention and Building Code as a guide.
2 Single Service means disposable plates, silverware & cups. Takeout seating is for waiting patrons and is not convertible to full seating or for density credit at full service restaurants.
3 General industrial buildings may contain up to 15% related office space without applying a proportionate office density loading or flow rating to the space. If office space exceeds 15% of gross floor area, then a proportionate office density loading or flow rating must be applied to the entire office space.
4 Process waters require a separate permit and disposal facilities – Consult Department.
5 A grease trap shall be provided for this installation which is sized at 20 gpd/bed.
6 A separate sewage disposal system shall be provided for wastewater generated from animal boarding, horse stalls, or kennel areas.
7 Food (kitchen) flow is added according to the type of food service in the establishment.
8 Motel/Hotel with Kitchenettes, Cottages, Apartments, Condominiums, Mobile Homes, Trailers, or Co-Ops.
9 Public storage density and/or design flow may be reduced if restrictive covenants are recorded on the parcel.

Note: **The above table is subject to amendment from time to time as data becomes available to the Department. The table will be republished as an addendum to these standards if and when revised.**

New York State Uniform Fire Prevention & Building Code

SECTION 1004
OCCUPANT LOAD

1004.1 Design occupant load. In determining means of egress requirements, the number of occupants for whom means of egress facilities shall be provided shall be established by the largest number computed in accordance with Sections 1004.1.1 through 1004.1.3.

1004.1.1 Actual number. The actual number of occupants for whom each occupied space, floor or building is designed.

1004.1.2 Number by Table 1004.1.2. The number of occupants computed at the rate of one occupant per unit of area as prescribed in Table 1004.1.2.

TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

OCCUPANCY	FLOOR AREA IN SQ FT PER OCCUPANT
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal Baggage claim Baggage handling Concourse Waiting areas	 20 gross 300 gross 100 gross 15 gross
Assembly Gaming floors (keno, slots, etc.)	 11 gross
Assembly with fixed seats	See Section 1004.7
Assembly without fixed seats Concentrated (chairs only—not fixed) Standing space Unconcentrated (tables and chairs)	 7 net 5 net 15 net
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net
Business areas	100 gross
Courtrooms—other than fixed seating areas	40 net
Dormitories	50 gross
Educational Classroom area Shops and other vocational room areas	 20 net 50 net
Exercise rooms	50 gross

H-5 Fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Institutional areas Inpatient treatment areas Outpatient areas Sleeping areas	 240 gross 100 gross 120 gross
Kitchens, commercial	200 gross
Library Reading rooms Stack area	 50 net 100 gross
Locker rooms	50 gross
Mercantile Areas on other floors Basement and grade floor areas Storage, stock, shipping areas	 60 gross 30 gross 300 gross
Parking garages	200 gross
Residential	200 gross
Skating rinks, swimming pools Rink and pool Decks	 50 gross 15 gross
Stages and platforms	15 net
Accessory storage areas, mechanical equipment room	300 gross
Warehouses	500 gross

For SI: 1 square foot = 0.0929 m^2.

1004.1.3 Number by combination. Where occupants from accessory spaces egress through a primary area, the calculated occupant load for the primary space shall include the total occupant load of the primary space plus the number of occupants egressing through it from the accessory space.

1004.2 Increased occupant load. The occupant load permitted in any building or portion thereof is permitted to be increased from that number established for the occupancies in Table 1004.1.2 provided that all other requirements of the code are also met based on such modified number and the occupant load shall not exceed one occupant per 5 square feet (0.47 m^2) of occupiable floor space. Where required by the code enforcement official, an approved aisle, seating or fixed equipment diagram substantiating any increase in occupant load shall be submitted. Where required by the code enforcement official, such diagram shall be posted.

Suffolk County Department of Health Services
Bureau of Public Health Protection

PERMIT

To Operate a

Temporary Residence

This is to certify that

Diego Vallone

the operator of

SOUTHAMPTON RACQUET CLUB

at

665 MAJORS PATH

SOUTHAMPTON, NY 11968

Located in the *TOWN* of *SOUTHAMPTON* in *SUFFOLK* County is granted permission to operate said establishment in compliance with the provisions of *Subpart 7-1* of the State Sanitary Code and under the following conditions:

(1) This permit is granted subject to any and all applicable State, Local and Municipal Laws, Ordinances, Codes, Rules and Regulations.

(2) Capacity 16 units.

Effective Date **May 08, 2009**

Permit is NON-TRANSFERABLE

Humayun J Chaudhry, D.O., M.S.

Permit Issuing Official

This permit expires on **June 30, 2011** and may be revoked or suspended for cause.

THIS PERMIT SHOULD BE POSTED CONSPICUOUSLY

Facility Code **51-6447** Permit Number **51-6447**

18-1725: 6/99cg

Patricia Boudreau-Sullivan

From: Clare Shea
Sent: Monday, January 23, 2017 8:22 AM
To: Patricia Boudreau-Sullivan
Subject: FW: Summer camp on majors path

C19

From: Margot [mailto:margot18@yahoo.com]
Sent: Sunday, January 22, 2017 11:38 PM
To: John Blaney; cgandle@southamptontownny.gov; Philip Keith; Jacqui Lofaro; Robin Long; Clare Shea
Subject: Summer camp on majors path

To whom it may concern,

My name is Margot Berwin and I'm a friend of Scott and Celeste Frank. I spent a good part of the summer of 2015 staying with them at their house on Majors Path.

I was excited to be spending my summer in Southampton, sunning, writing, and reading, but much to my dismay my days were filled with screaming children from morning till late afternoon.

The noise coming from the summer camp would start as early as 8:30 in the morning! It was extremely unpleasant, even upsetting, to be woken up by screaming, shouting children day after day, all summer long.

I don't think this is fair to homeowners near the camp as they can never fully relax in their own homes. The camp management does not make any attempt at lowering the noise level. It's upsetting and it completely ruins time spent in beautiful Southampton.

C19-1

Thank you for listening,
Margot Berwin

FEB - 3 2017

CC PB

Patricia Boudreau-Sullivan

From: Paul Schaye [PSchaye@ChestnuthillPartners.com]
Sent: Monday, January 30, 2017 8:48 AM
To: Patricia Boudreau-Sullivan
Subject: Little Fresh Pond

C20

FEB - 3 2017

Southampton Planning Board,

As a concerned resident of North Sea, I have seen recent data that shows the proposed exit driveways from The Southampton Summer Camp, 665 Majors Path, **FAIL**S to meet the required departure sight distances for busses as required by AASHTO. (AASHTO is the American Association of State & Highway Transportation Officials) From this data there is **insufficient departure sight distance** for a bus loaded with children to make a SAFE turn from any of the 2 driveways turning onto Majors Path in either direction, North or South. Departure sight distance is the distance needed for the bus to exit the camp driveway without causing the oncoming traffic on Majors Path from braking to slow down or to actually stop so that the bus can exit safely. This **CANNOT** be mitigated because of the winding turns on Majors Path. C20-1

As a result, every bus that leaves this property with children on board is at serious threat to be involved in an accident with an approaching vehicle driving on Majors Path. I would like to state my deep concerns about this as I view it as an accident waiting to happen, and I want to put the Town of Southampton on notice that there is potential peril for the children leaving these premises by bus if the Camp plan is approved by the Planning Board.

Now is the time to put a stop to the Camp, before a tragedy happens.

Thank you,

Paul L. Schaye
19 Lake View Ct.
Southampton

Paul L. Schaye
Chestnut Hill Partners, LLC
245 Park Avenue, 41st Floor
New York, New York 10167
Tel:212-687-3123 Fax:212-972-2921
PSchaye@ChestnutHillPartners.com
www.chestnuthillpartners.com

M&A Pro Of The Year

C21

My name is Bill Gaden. I am fortunate to own a home on Little Fresh Pond and I am against the change of use for the Southampton Camp.

The owner of the camp is asking you for a change of use only so that he can make more money. It is as simple as that. But on the other side of that request is the very serious risk of long-term harm to Little Fresh Pond and to the safety of the neighborhood. If he is granted this change of use – he will have an unfettered ability to do what he pleases on the property and in Little Fresh Pond – with no governing body to approve what he does in the future. C21-1

I believe that the only way for this board to approve his change of use, is to be 100% confident that his DEIS is absolutely foolproof. And there are far too many doubts to do that. These doubts are risks - serious, long-term risks.

I will cite just 2 examples of the doubt that is found throughout the DEIS: Traffic and Environment.

Number 1: Traffic, The Traffic Impact Study was recorded on dates when the camp was not in session. So all of the traffic analysis is based on traffic levels when there was no camp in session. This must create doubts in all of the resulting traffic findings. C21-2

The DEIS also describes the camp traffic if there were no buses. It states "The volume of traffic could not be readily accommodated on site... [it] would more than double. This scenario does not work". So if the level of bussing decreases in the future, the risk to the kids and the neighborhood increases. The DEIS makes that clear. C21-3

Number 2: The environment: The DEIS states that "the general groundwater flow direction... is to the west/northwest". Yet, just 5 pages later, it states that "During prolonged periods of little or no rainfall..., groundwater inflow is induced to Little Fresh Pond". This clearly states there is risk with Groundwater flow. C21-4

The biggest doubt in the study of the water, however, is that it was performed by Lombardo Associates. The very same consultant whose findings were the exact opposite of his findings, just four years ago. That simple fact makes all of his conclusions about water - in doubt. C21-5

I firmly believe that there is no way that this board can be 100% confident that there will not be adverse effects to the neighborhood, the safety of the children & neighbors, and to the delicate ecology of Little Fresh Pond and its environs. How can we know today that the damage won't happen in 6 months, or in 5 years.

To state unequivocally that the growth of this camp – with no checks and balances – will have no negative effect cannot be true.

This DEIS is filled with doubts. We must not let a commercial operation in a residential neighborhood to grow – with no boundaries - simply for the economic gain of the camp's owner - and risk that Little Fresh Pond and its environs could be destroyed.

Please respect this residential neighborhood, please respect Little Fresh Pond, and please respect the fact that the DEIS is full of doubts and risks – risks that will be detrimental to the fragile ecology of Little Fresh Pond and to the quiet enjoyment and safety of the neighborhood.

We must put our neighborhoods, our safety, and our precious natural resources first.

This change of use is a very serious request. And with all of these doubts and risks before you, I urge you to deny the change of use request. Thank you.

C22

To: the Southampton Planning and Zoning Boards
From: Lindsay Freda, lindsaybee@msn.com, 917-716-4302
8 Justan Avenue, Southampton NY and 186 Riverside Drive, NY.
Date: January 26, 2017

The issue I would like to address is the recent mention at the last Planning Board meeting of the "expanded use" of the "dining hall" at the Southampton Racquet Club.

A few of the attached statements were collected (and presented to the Zoning Board) in 2011 and are dated as such. I have collected additional statements since these earlier statements were clearly not considered sufficient, as there is continued mention of "expanded use" of a dining hall that was actually a share house.

All of the attached statements are from people with whom I shared the 5-bedroom ranch house on the Racquet Club property. The main statements are from the share house managers, Carole Pecore and Kris Bialecki. The additional statements are from people who were members of the share house.

The member statements are confirmation of the statements by Carol Pecore and Kris Bialecki. Note: the reason Kris says she was there for 7 years and Carol says she was there for 10 years, is because Carole ran the house by herself the last 3 years. Also attached, is my own statement regarding my personal use of the ranch house as a summer share group rental. I met my husband, Dan Freda, while a member of the share house. In fact, we were married in the house in 2002. The ceremony was performed in front of the fireplace in the living room (falsely referred to as the "dining room") by Judge Barbara Wilson (photos attached).

C22-1

In addition to share house managers Carole Pecore and Kris Bialecki, I have obtained statements from the following share house members: Dr. Rob Cohen, Jocelyn Griffing, Sally Cressey, MSW, Sandra Pike, Adrienne Berman, Michele Thompson, Gary Cohen, Dan Freda, and myself Lindsay Freda. All attached.

Additional share house members included: Aldo D'Adamo, Kim Fairfield, Bethanne Haft, Catherine D'Hahn, Don Graham, Ava Hansen, Craig Fowlkes, and Dr. Scott Schlesinger. There were many others, whom I only remember by first name, Seth, Carmen, Mary, Jennifer, Tim, Martha, and others whom I've forgotten altogether. We had 8-10 people a weekend.

The only explanation I have for why these facts were not accepted, is that they were somehow contradicted by the Kronemeyers. If that is the case, I assume the reasons the Kronemeyers would not report the truth is that they stood to make $12-16 million on the sale and that they were in violation of the zoning laws by allowing a multi-person share house on their property.

JAN 26 2017

C6/13

Regardless of what was presented by Jay Jacobs as evidence that the 5-bedroom ranch house was being used as a dining hall, those statements are FALSE. I hope you will read the attached statements (call or email the people for varication if you wish!). They attest to the fact that the ranch house was NOT used as a camp dining hall and was NOT used by the camp at all during the 10 year period it was rented as a share house.

In addition, let it be known that the small cottages on the property were NOT dormitories for counselors. They were rented out to couples and individuals as summer vacation rentals. The majority of those people (maybe all) were tennis club members. The cottages are teeny tiny one-two person dwellings.

C22-1 cont'd

Addendum:
Of significance to the environmental impact, is the difference between 10 adults using the Ranch property for long weekends versus 500-800 kids using it as a dining hall five days a week. To use as a dining hall, that would mean food preparation, dish washing over a thousand plates, cups, pots, pan, etc. every day, five days a week. Will they be using eco-friendly cleaning products? I doubt it as they are more expensive and not likely to be sold in the volume packages the camp would need. All that sudsy soap will end up in the ground water and then into the lake.

C22-2

So, my question to you is:
Who do you serve? Do you serve the local community that already has a camp down the road on Major's Path (Stars of Tomorrow). Or do you serve the profits of a wealthy developer? The local community is not in favor of this camp – aside from those families that have received free camp memberships for their kids thanks to Jay Jacobs shrewd strategy to buy off the opposition. The camp isn't marketed to the local community, which could not afford a camp this expensive. That is why kids are going to be bused in. So why should our little sleepy North Sea community house this monster camp to serve kids from other neighborhoods? Why threaten the life of Little Fresh Pond and all the birds, wildlife and humans that enjoy it?

Jay Jacobs will make a lot of money from this camp. And, I'm sure the town will get a nice tax benefit from his business. But PLEASE do not put these financial gains above the preservation of Little Fresh Pond. You cannot put a value on nature. Once it is destroyed, you cannot get it back. The town has spent thousands (millions?) on trying to "repair" Agawam Lake. It couldn't be done. At best, they added oxygenators to the lake to try to keep the fish alive. But entire eco-systems have been wiped out. Nature is a fragile balancing act.

So you have to ask yourself, WHY? Why are you allowing the destruction of the neighborhood and the pond? Will it be worth it once the lake is dead and Jay Jacobs has moved on to other business ventures? You will have killed a lake that has been a part of this community for eons for a few bucks. Is that the legacy you want to leave as a steward of this town?



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Toxic Algae In Fresh Water Lakes, Ponds Rising On Long Island

May 16, 2016 6:50 PM

Filed Under: Carolyn Gusoff, Long Island, toxic algae

LAKE RONKONKOMA, N.Y. (CBSNewYork) — Suffolk County leads New York in toxic algae in fresh water lakes and ponds as the area is seeing an increase in the algae that can cause sickness and even death.

CBS2's Carolyn Gusoff reported that Lake Ronkonkoma is on a swelling list of Long Island lakes and ponds often afflicted with toxic blue-green algae, as new data shows a sharp increase.

"In 2012, Suffolk County had one lake with blue-green algae. Last year, we had 16 lakes contaminated," Adrienne Esposito of the Citizens Campaign for the Environment said.

Lake Ronkonkoma resident Jim Gaffney said he often sees a murky green slime on the lake.

"It just looked like a scum kind of on the water and it stank. The whole lake had an unpleasant odor," Gaffney said.

This year's not off to a good start. There are already two lakes that are tainted with the toxic bloom, caused in part by pollution from nitrogen seeping up from leaky septic systems and running off from fertilized lawns.

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"While this is an ecological travesty, it's also an economic travesty for our region," Bob DeLuca of Group for the East End said.

The algae is a public health threat as the bacteria can cause organ damage. Dogs have died, poisoned from licking algae-covered paws.

"It's simply not something you clearly want to drink and it's something you want to avoid," Carl LoBlue of the Nature Conservancy said.

Politicians are debating how to pay for hooking up 350,000 homes to sewers as some say these new numbers underline the urgency.

"Having more of this kind of algae than any other place in New York state is not a contest you want to win," Dick Amper of the Long Island Pine Barrens Society said. "Suffolk is out in front of it now, we've got to reverse that now."

As the weather warms up, people may come across toxic algae outbreaks that are not even posted yet. Experts said if water looks like a pea soup, it's not safe for you, your pets or your family.

The Suffolk County Executive has proposed a voter referendum to fund new sewers and the needed upgrades to sewage treatment plants.

Comments



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Tom Hardy in the running to be next James Bond

Tom Hardy, Aidan Turner, and James Norton have emerged as the latest front-runners to succeed Daniel Craig as James Bond.

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Dog-Killing Blue Green Algae Bacteria Found in Parts of Long Island

by Beth Buczynski, 08/18/13

filed under: Health,Long Island,Water

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It sounds like the opening scene of a horror movie: a dog in Long Island was playing with its owner and stopped to take a drink from a local pond. A short while later, the poor Jack Russell terrier started convulsing and suddenly died. The cause? A dangerous strain of blue-green algae that has recently been spotted in a number of Southampton waters, including Mill Pond in Water Mill and Agawam Lake in Southampton Village. The deadly algae, better known as cyanobacteria, is the result of fertilizer, pesticides and other chemicals washed into waterways by stormwater runoff. Residents have been advised to steer clear of any body of water that shows contamination, and to keep children and pets away as well.

Deadly Algae Long Island	Deadly Algae Long Island	Deadly Algae Long Island

1. Teany
5 stars, 6 reviews
2. Blossom
5 stars, 4 reviews
3. Curly's Vegetarian Lunch
5 stars, 3 reviews
4. Dirt Candy
5 stars, 4 reviews
5. Candle 79
5 stars, 2 reviews

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According to **Longisland.com**, a dog drank from a contaminated Georgica Pond in East Hampton about a year ago and died. At the time, local officials thought it was an isolated incident, but "the New York State Department of Environmental Conservation (NYSDEC) has confirmed the blue-green algae has made its way to other parts of Southampton lakes and ponds."

Algae blooms most frequently occur in waterways saturated with nitrates from things like fertilizers and septic tanks. These nutrients put the algae into overdrive, especially during hot weather when the water is calm. Although most algae is harmless (if a little gross), blue-green algae, technically known as cyanobacteria, poses a serious health risk to people and animals.

"Symptoms can include nausea, vomiting, diarrhea, skin or throat irritation, allergic reactions or breathing difficulties. Blue-green algae can also produce toxins that affect the liver and nervous systems when water is consumed in sufficient quantities," explains the NYSDEC page on algae blooms.

Water containing blue-green algae may appear discolored in shades of green, blue-green, yellow, brown or red. There may also be scum on the surface. NYSDEC advises that anyone who comes in contact with it should wash all surfaces with soap and water or rinse thoroughly with clean water to remove algae.

Images via Lamiot, Greg Tally, Lamiot



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Inhabitat Green Tour of BKLYN Designs

Project Earth Day Eco Fashion Show

Project Earth Day Fashion Competition

Portable Green Energy

Mary Lou Jepsen on One Laptop Per Child

Enviro-artist Chris Jordan

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"Everything Is at Stake": Toxic Algae Takes Over Long Island Waterways, Killing Wildlife and Threatening People

By Greg Cergol

Some Long Island lakes are overrun with blue-green algae, a toxic bloom that has killed wildlife and kept people out of the water. Greg Cergol reports. (Published Friday, June 12, 2015)

Toxic blue-green algae is blooming out of control in Long Island waters, killing wildlife and keeping people out of lakes this summer.

Bob Celic lives along an algae-filled lake in Mattituck. Signs along the lake read "Blue-Green Algae Bloom Advisory" and warn people not to drink or swim in the water.

- Bear Sighting Disrupts Elementary School Students' Field Day in NY

"You can't swim in it anymore," Celic said. "It's totally polluted."

Resident Loni Lewis watched last month as fish died in record numbers along the Peconic River in Riverhead, about 10 miles west of Mattituck.

- Country Singer Killed by Bounty Hunter in Gunfight

"There were thousands and thousands of fish just floating everywhere," Lewis said.

The fish die-off happened just weeks after turtles were found dead in the same area.

- NJ ROTC Instructor Accused of Sexually Assaulting 2 Students

In the Great South Bay, dozens of miles west of Riverhead, brown tide returned in June, threatening the survival of shellfish there.

"It's been a bad month," Dr. Chris Gobler, a marine biologist at Stony Brook University, said.

- "Seinfeld" Apartment Replica to Pop Up in NYC

Gobler has been investigating the toxic algae and brown tides on Long Island. He says the island's water woes are all caused by the same thing: too much nitrogen in the water. Human waste seeps into bays and rivers, fueling the algae that destroys aquatic life.

"In most places in Suffolk County, it's coming from septic tanks and cesspools," Gobler said.

- Exclusive Cyclist Strikes Woman Unconscious on Street: NYPD, Kin

Seventy-four percent of Suffolk County homes use septic tanks, according to Gobler. That means 360,000 homes have the potential to pump nitrogen into area waterways.

Local governments are trying to tackle the problem, but eliminating it will take years and a lot of money.

- **Exclusive5 Fired in Tot Rough-Up, More Troubling Video**

"The way of life here on Long Island is at stake. We're surrounded by water here," Gobler said, pointing out how important waterways are to the island's economy, especially the tourism industry.

"Everything is at stake," he said.

- **Supervisor in Charge of Boys Accused in Gruesome NYC Rape Arrested**

Published at 7:48 PM EDT on Jun 12, 2015 | Updated at 10:31 PM EDT on Jun 12, 2015

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The Ranch Summer share house at the Southampton Racquet and Tennis club, on Major's Path.

d freda <dfreda11@yahoo.com>

Tue 1/24/2017 3:30 AM

Inbox

To:Lindsay Freda <lindsaybee@msn.com>;

Hi Lindsay,

I was a member of the Ranch summer share house, in Southampton, on Major's path, at the Southampton Racquet & Tennis Club, (SRTC) during the years: 1998, 1999, 2001, and 2002. The house had five bedrooms and 2 bathrooms, a kitchen and a living room/dining room. The share house season was from Memorial Day to Labor Day. The share house members were the only people who occupied the house during the summer season. Aside from the share house people at the ranch house, and the Kronemeyer family in the main house, and the SRTC tennis court area, the rest of the site was pretty much empty and quiet. Occasionally I saw a group of around 10 kids running around, whom I understood were part of a summer program. There was one guy, and his dog, who occupied a summer bungalow on the property, just off the open field behind the Ranch house. We sometimes set up a badminton net on that open field.

Aside from the tennis courts and the adjacent parking lot, the SRTC grounds were very rustic: lots of trees, underbrush and gravel roads/paths. There was no pavement. There was a woodpile near the Ranch, where we sometimes chopped wood for the Ranch house fireplace. I remember that there a small tree was growing on the basketball court! The path from the open field/badminton court to the lake was always thickly covered with leaves, I don't think that it was ever raked.

Dan Freda

1998 - HAMPTONS - THE RANCH





PETOL
ALLEN

JOHN




Chopping Wood
at the Ranch
2001

Little Fresh Pond / Ranch House Statement from Jocelyn Griffing

Jocelyn Griffing <jocelyn@mediadarwin.com>

Fri 1/20/2017 11:11 AM

To:Lindsay and Dan Freda <lindsaybee@msn.com>;

Hi Lindsay,

I am so very sorry to hear about the ongoing and increasingly alarming discussions surrounding the the development of the Southampton Little Fresh Pond ranch house property. I can't imagine how this could be permitted. It will completely compromise and likely destroy the integrity and ecosystem of Little Fresh Pond and all the creatures, human and otherwise, that depend on it.

The Pond is such a special place - both for the residents and guests who swim and enjoy the water as well as the rich and varied wildlife that depends on it for survival. It is crucial to the well being and survival of so much wildlife - deer, otter, a wide array of fish, frogs, turtles etc and of course dozens of permanent and migrating birds. Many of the birds use the pond for nesting as well as food (geese, egrets, heron to name a few I have seen) it's extraordinary, but a delicate and fragile system.

In 2002 I was a member of the share house that rented the 5-bedroom ranch house on the Southampton Racquet Club property. Share house members, like myself, had use of the house for the entire summer (and I took full advantage of that!!) At NO TIME EVER was the house, or any of the associated cabins, used by a camp (or campers, counselors etc) for lodging or dining or anything at any time during the summer.

In fact, I wasn't even aware that there was a camp anywhere near us or on any part of that or any adjacent property. I never heard one whistle or camper or counselor. I never saw a single person associated with any camp or commercial effort.

I do recall a small handful of charming cottages (like a tiny guest house) and I do recall that those were occasionally rented to private individuals. I actually made inquiries myself related to details and availability as I thought it would be nice to have friends come visit even if I couldn't offer them a bed in the main house, I thought a rented cottage could be a solution. They were absolutely NOT occcupied by campers or camp staff or used as a dorm. One was practically in our back yard off the back deck.

Lastly, as you may recall, I assisted Carole Pecore as share house house mother. On several occasions I helped her shop at Costco to stock the house with snacks, b'fast and lunch foods. I assisted with arranging for the cleaning lady to come clean after weekends. I helped strip and make beds after fellow sharemates arrived and departed. I sent you a photo under separate cover of a bunch of us on the back deck in mid-july.

All my best to you, let me know if and how I may further help.

Cheers,

Jocelyn Griffing
917.513.9140

Sent whilst on the move. Please forgive brevity and silly autocorrects. Sent from my BlackBerry 10 smartphone on the Verizon Wireless 4G LTE n etwork.

The Ranch

Jim Meskauskas <jimmy@mediadarwin.com>

Thu 1/19/2017 10:39 AM

To: Lindsay Freda <lindsaybee@msn.com>;

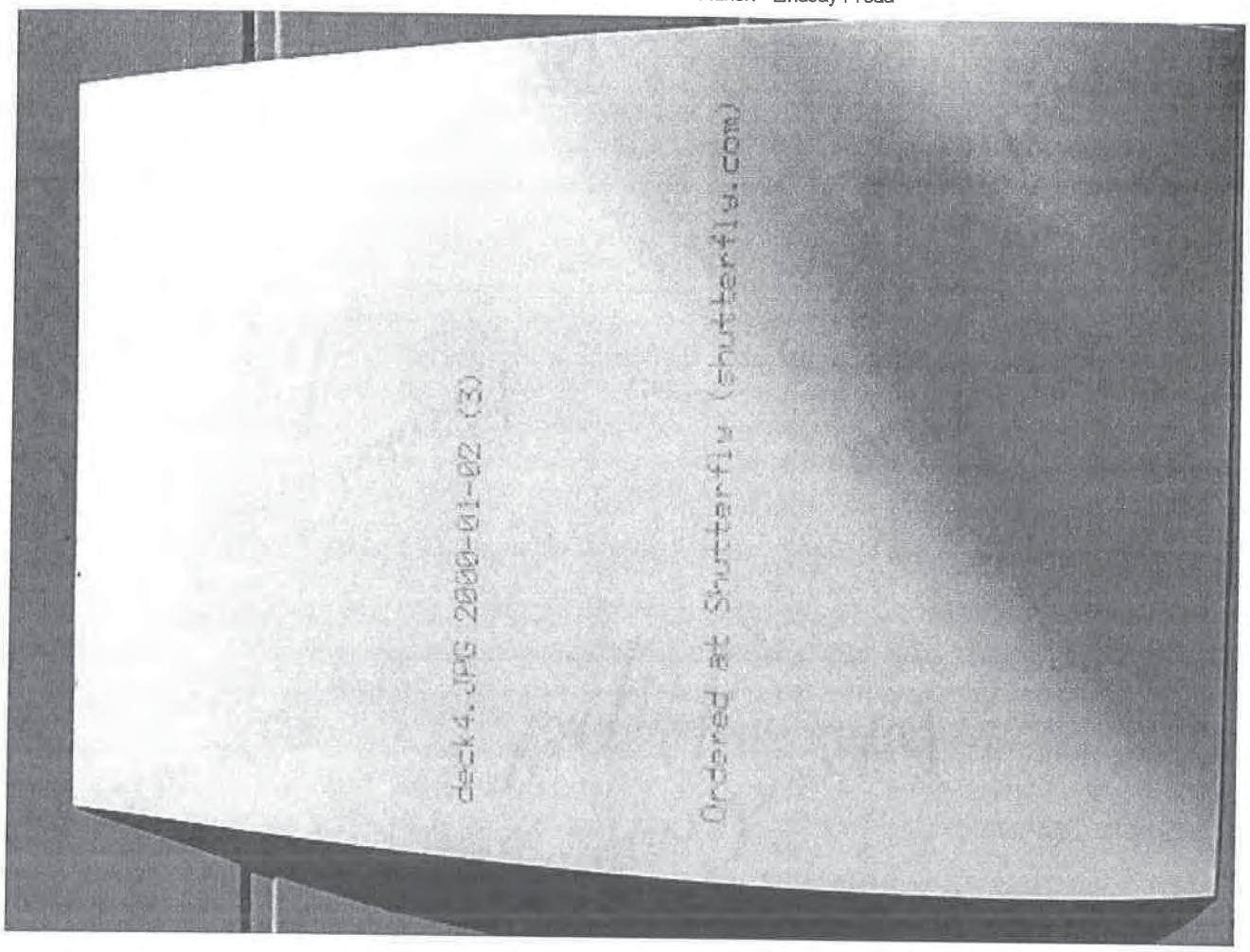
Cc: Jocelyn Griffing - ICE <jocelyn@mediadarwin.com>;

Hi Lindsay,

Hope all is well!

Attached please find copies of a photo from your guys' time at the Ranch. I've attached a copy of the back of the photo as well, which has a date of Jan 2, 2000. Don't know if it's the date the photo was uploaded or processed, but it goes some way towards establishing a timeline.





Jim Meskauskas
Media Darwin, Inc.
917-664-2995
jimmy@mediadarwin.com
@mediadarwin

Sent from iPhone, Small Keys, Big Thumbs

Fw: Little Fresh Pond NEEDS You!

Lindsay Freda <lindsaybee@msn.com>

Tue 1/24/2017 2:20 PM

Inbox

To:Lindsay Freda <lindsaybee@msn.com>;

From: gary cohen <gcwriter@me.com>
Sent: Tuesday, January 24, 2017 9:30 AM
To: Lindsay Freda
Subject: Re: Little Fresh Pond NEEDS You!

To Whom it may concern:

I was a member of the summer share house (the ranch house) for two summers: 2001, 2002. The house was **not** used by a camp for the kids, or for the purposes of a camp dining hall.

Respectfully,

Gary Cohen
339-235-7963


Kitchen w/ Gary Cohen

Little Fresh Pond

R J Co <seachild123@hotmail.com>

Mon 1/16/2017 4:34 PM

To:lindsay <lindsaybee@msn.com>;

Dear Sir

Jan 15,2017

I had the pleasure of spending two wonderful summers in a Southampton share house in the late 1990's on Little Fresh Pond. The two summer were filled with friends and the enjoyment of the beauty of the pond and the beautiful wildlife that inhabit the pond. I am currently a home owner in Southampton and I am strongly against the building of a summer camp on the pond. We need to keep the pond and the environment around it safe from destruction. Other lakes/ponds have been destroyed in Southampton. We need to save Little fresh Pond. I am a home owner in Southampton I paid the Peconic tax to keep the Peconic safe when I bought my home.. Let us do the same for Little Fresh Pond. Stop the Summer camp. Protect the environment .

Robert J Cohen M. D.
Asst Professor of Dermatology
Columbia University School of Medicine

Statement re ranch house

Adrienne Berman <adriennejberman@gmail.com>

Fri 1/20/2017 4:12 PM

Inbox

To: Freda <lindsaybee@msn.com>;

Dear Sir or Madam,

During the summer of 2001 I was a member of a share house at a property known as "The Ranch House" on Little Fresh Pond in Southampton New York.

The house was used at that time as a prototypical "Hamptons share house."

During my tenure in the house it was not used in any way that resembled a camp. It was simply a house that a group of people rented for the purpose of being close to the beach during the summer weekends.

Sincerely,

Adrienne Berman
221 East 78th St #3D
New York, NY 10075
646-928-5017

Fw: Lake stuff

Lindsay Freda <lindsaybee@msn.com>

Tue 1/24/2017 2:21 PM

Inbox

To: Lindsay Freda <lindsaybee@msn.com>;

From: Michele Thompson <mthompson73@gmail.com>
Sent: Tuesday, January 24, 2017 9:37 AM
To: Lindsay Freda
Subject: Re: Lake stuff

Hi Lindsay,

Please note that I was a summer resident at the central house on the Southampton Tennis Cub property in the summer of 2002. The house was rented to a group of adults who used it as a private residence. There was nothing on site to indicate that the house or bedrooms was ever anything other than a private residence. To my knowledge there was not a camp on the property at the time. The cabins were rented to couples and individuals several of whom I met over the course of the summer. None of the cabin residents I met worked for the tennis club.

Thanks,
Michele Thompson

These were submitted to The Zoning Board in 2011

Lindsay Bernal Freda
186 Riverside Drive, 11C
New York, NY 10024
lindsaybee@msn.com
917-716-4302

Date: October 20, 2011
To: Southampton Zoning Board
Re: Southampton Racquet Club Building Use

Enclosed please find email documentation (collected by me) pertaining to the usage of the Southampton Racquet Club.

In addition to the affidavits enclosed, I would like to state my own knowledge of the site. I shared with friends the large 5-bedroom "Ranch" house for the summers of 2001 and 2002. During that time, our group had sole use of the "Ranch" as a private summer rental. The living room was for our use only. It was not used as a dining hall for campers or staff members.

The smaller cottages surrounding the house were rented out to other singles and couples as summer rentals. I do not know if any of them were used by the tennis club staff, although I don't think so as I believe the club staff was all local. They are all very small cottages, 250-550 square feet (they are different sizes). They are meant for one or two people. They were not used as dormitories of any kind.

Additionally, I was married on the property in May 2002 (by Judge Barbara Wilson). For that weekend, my husband and I rented one of the cottages in addition to the 5-bedroom "Ranch" house. So I have personal experience of the size and usage of the small cottages. My husband's mother and father stayed in one. It was a very small cabin.

The Kronemeyer's, who owned the property and ran the tennis club, did offer a morning session for kids at least one of the summers I was there. They maybe had a dozen kids – children of the tennis club members, I believe. But they never used the "Ranch" house. I spent long weekends (Thursday-Sunday) on the property and our house-mother (Carole Pecore whose statement is included) lived there full time the last summer, 2002.

All of us in the house (ten people per weekend) used to walk through the woods to swim in Little Fresh Pond. It is a glorious fresh water pond with osprey, heron, egrets and other wildlife. It is a small pond, one that could easily be destroyed by fertilizer, chlorine or sewage run-off. I now rent a little cottage on the west side of the lake and swim there all summer. There have been years when we have had excessive algae growth and neighbors were called to task for using fertilizer on their lawns. Everyone has become aware of the need to safeguard the lake. No lawn chemicals. No treated wood docks. And, of course, no motor boats – fisherman use small electric boats. The lake association tests the water regularly and sends samples to Albany. It is a fragile ecosystem. And rare. We all care deeply about protecting it for generations of wildlife and humans to come.

If you have any questions, please don't hesitate to contact me.

Sincerely,

Lindsay Freda

DATE: October 13, 2011

TO: Southampton Planning and Zoning Boards

FROM: Carole Pecore

RE: Southampton Racquet Club Property and Usage

I rented the large 5-bedroom ranch house on the tennis club property at 665 Majors Path for ten years, from 1992-2002. I shared it each summer with 8 or 9 friends per weekend. Over the 10 years that I rented the house, we had more than 100 people who stayed with us. If additional statements are needed, I could try to track them down. All of us love the lake and would want to do anything to protect it from damage.

We had exclusive use of the house during that time -- it was not used by the tennis club at all. It was a private rental property. The last summer I rented the house, 2002, I lived there full time. All the years we rented the house, my friends and I regularly used the house mid-week for vacation weeks.

The property owners, the Kronemeyers, ran a small tennis camp for the kids of tennis club members some of the summers. There was never more than 20 kids attending, usually less. The small cottages on the property were rented out to private individuals for the summer. Many people rented the same cottage a number of years in a row. It was a very quiet, rustic, wooded setting. The Kronemeyers left the property fairly natural with no formal landscaping. The people in our summer house used to swim in Little Fresh Pond regularly. The lake is a beautiful pristine natural fresh water lake. We all loved it and would be heart-broken to know that anything had endangered it.

Signed,

Received by email

Carole Pecore
cpecore@msn.com
503 636-4875
~~917-239-2298 NY cell~~ Now lives in Oregon.

October 16, 2011

Southampton Planning and Zoning Boards
Southampton, New York

To Whom It May Concern:

For seven years (1992-1999), I rented the large 5-bedroom ranch house on the tennis club property with Carole Pecore. Each summer we shared it with 20 or so friends (8 to 9 people per weekend). We had exclusive usage of the house during that time. It was never used a dining hall or camp facility. It was not used at all by the tennis club. It was a rental property. The Kronemeyers who owned the club offered tennis lessons to kids and occasionally had other activities for them. They mostly stayed in the tennis court area. I don't remember seeming more than 10-15 kids at any one time.

The Kronenmeyers also rented out the little cottages on the property to other individuals. Each cottage housed one or two people – they are very small buildings. Most of those people came and went quietly. All the activity was focused in the areas where the tennis courts are – south end of property.

Everyone in our house loved to swim in Little Fresh Pond. It is one of my favorite places on earth. It is a beautiful natural fresh water pond. Every pre-caution should be made to protect the pond. It is invaluable – there is no amount of money that is worth destroying it for. And certainly, one man shouldn't profit at the expense of something all of us cherish and enjoy.

Signed,

Received by email

Kris Bialecki
165 West 76th Street
New York, NY 10023

To Whom it May Concern:

From May through mid-September 2001, I stayed in a house on the grounds of the Southampton Racquet Club every other weekend and at least one full week. To clarify, this was not the house in use by the owners of the club or one of the small cottages - it was a house with several bedrooms. The house had been rented to Carole Pecore by the owners of the club and was run as a group share house that summer (and I believe for several summers before and after that year as well). Contrary to any assertion that the home was used as a camp dining hall, during this period of time, the house was furnished and used as a private home. Furthermore, I don't recall ever seeing a child attending the camp or on the grounds the entire time that I was there.

Please contact me if I can provide further information.

Sally Cressey
300 E. 40th Street, 9K
New York, NY 10016

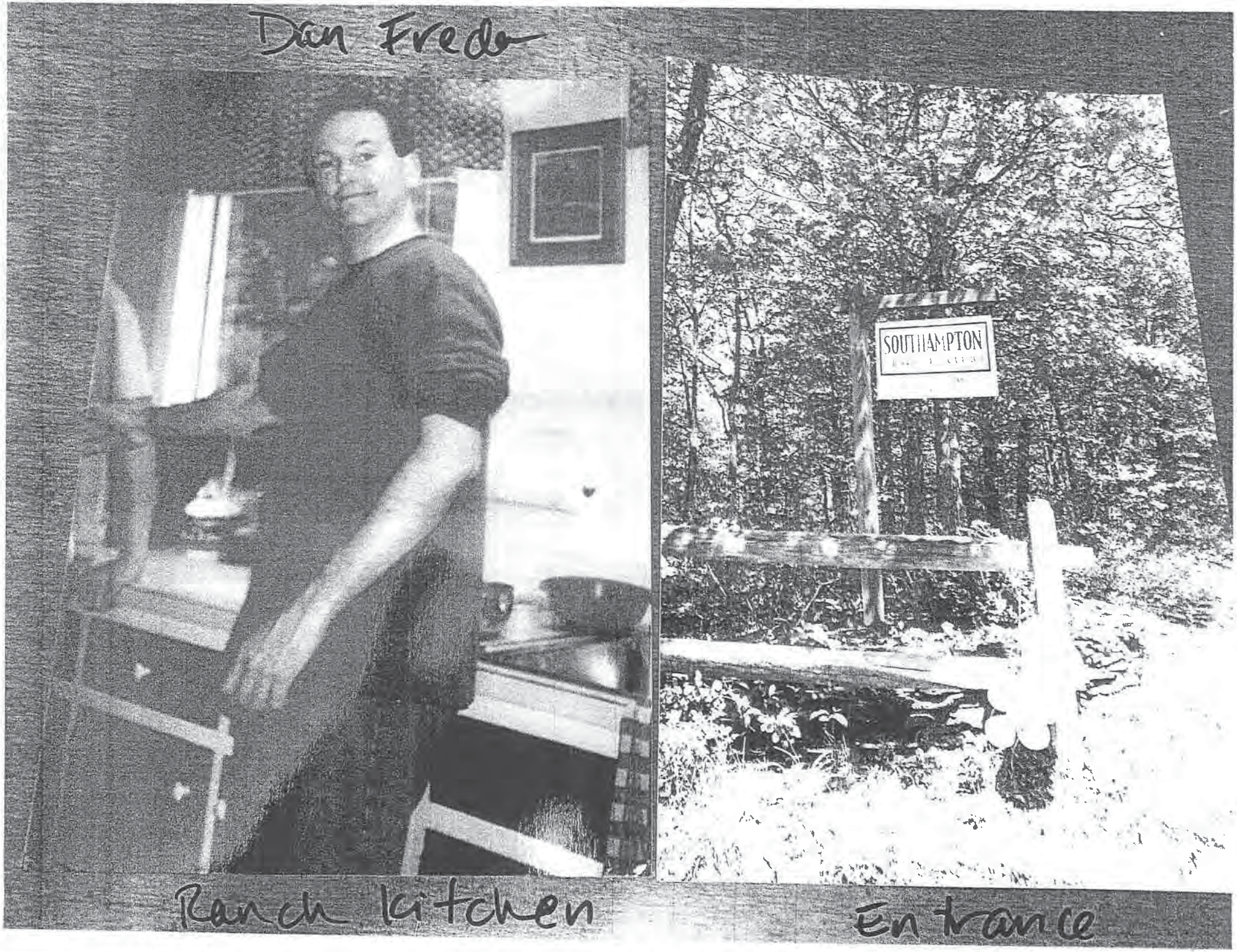
sallycressey@yahoo.com
cell 917-742-1526

To the Zoning Board of Southampton:

I stayed at the main Ranch house during the summers, 2000 and 2001. The Ranch served as a Southampton Summer Share for adults. The living room area was specifically used as a gathering place for the participants in the summer share with the dining room table reserved for the traditional Saturday night dinners. During my time at the Ranch, I was aware that there were rental cottages but I didn't know that it was also used as a camp for children as throughout my stay I never saw any kids of any age doing day camp activities.

Sincerely,
Sandra Pike
Sandrapike.m@gmail.com

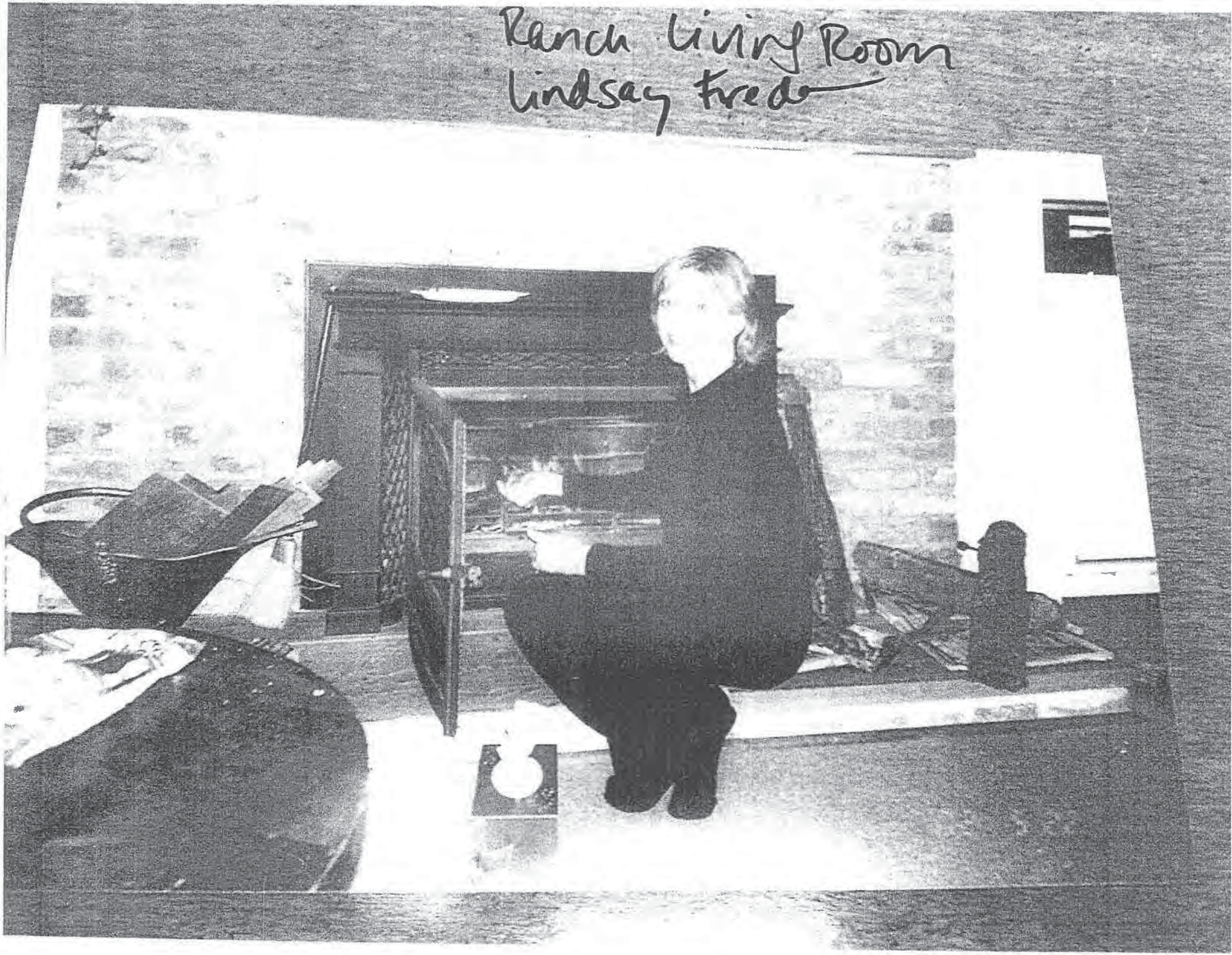
Dan Fredo



Ranch kitchen

Entrance


Ranch Kitchen

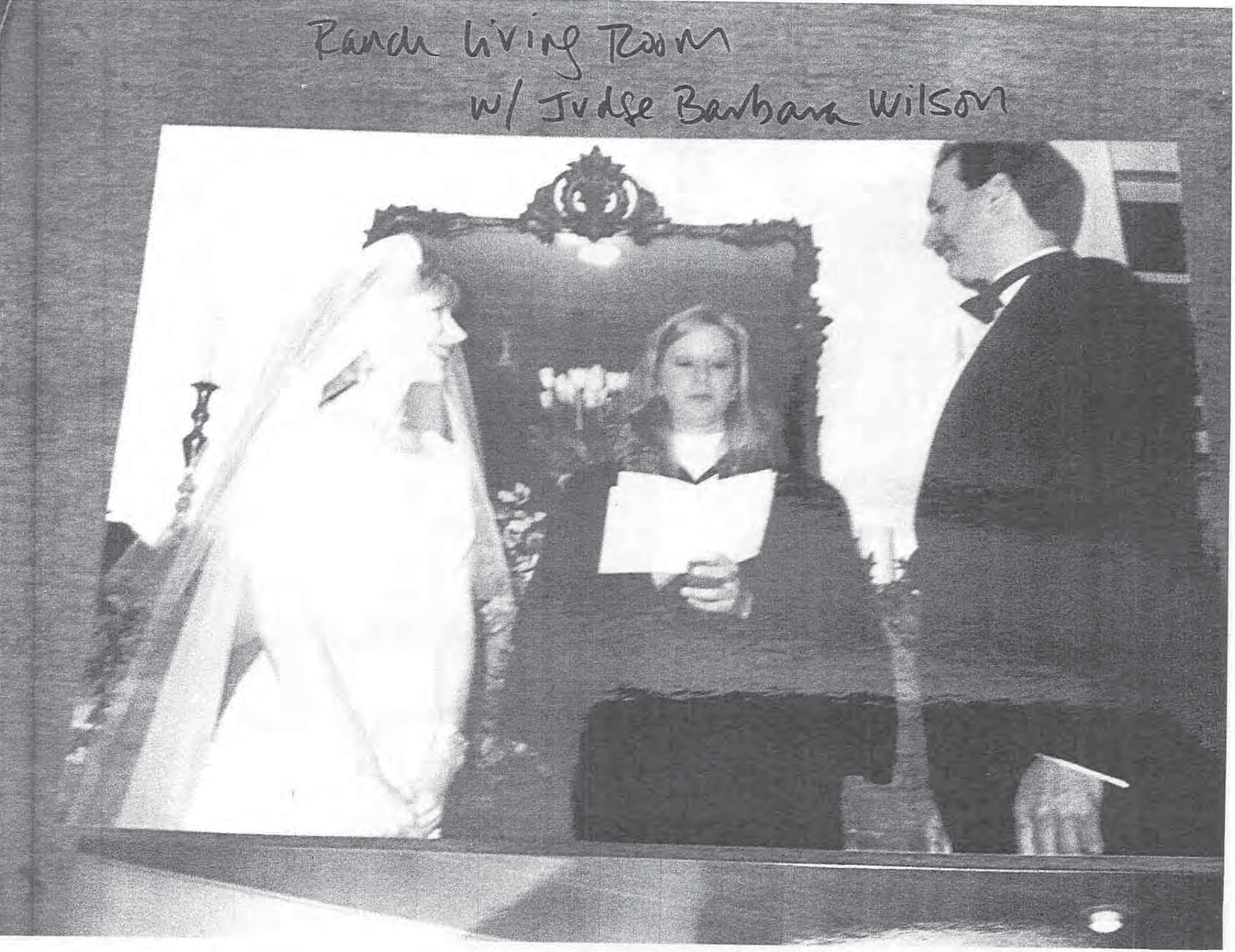

Ranch Living Room
Lindsay Fred

Ranch living room
Lisa




Front door of the Ranch
Carole Pecore

Ranch living Room
w/ Judge Barbara Wilson




Ranch Living Room

Ranch yard





C23

Paul Schaye

From: JIMSILBER@aol.com
Sent: Tuesday, January 24, 2017 9:25 PM
To: fsmaer@aol.com; celeste@littlefreshpond.com; barida@aol.com; barzola.ann@gmail.com; ssummit@phillipsnizer.com; Paul Schaye; daniel.patry@gmail.com; lincolnpalsgrove@gmail.com; grantgreenberg@gmail.com; ivan.bart@img.com; bnadell@nfwcpa.com; sallypage@bareau.com; sophienadell@gmail.com; mbsilver@aol.com
Subject: READ THIS: UPDATE ON TRAFFIC CATASTROPHE

Dear testifiers:

We have some current data today from our traffic engineer that is vitally important. Please review this as he just came to the property at 665 Majors Path to take actual measurements.

The measured departure sight distance for busses leaving the two driveways as located in the proposed changes in the DEIS are as follows:

JAN 26 2017

Northern Exit

right turn looking north on Majors Path
actual **335 feet**
required by AASHTO **505 feet** 66%

left turn looking south on Majors Path
actual **370 feet** 66%
required by AASHTO **560 feet**

Southern Exit

right turn looking north on Majors Path
actual **435 feet**
required by AASHTO **505 feet** 86%

left turn looking south on Majors Path
actual **435 feet** 77%
required by AASHTO **560 feet**

C23-1

AASHTO is the American Association of State & Highway Transportation Officials. It is the organization that sets the standards for all traffic studies in the U.S. From this data there is insufficient departure sight distance for a bus loaded with children to make a **SAFE** turn from any of the 2 driveways turning onto Majors Path in either direction, North or South. Departure sight distance is the distance needed for the bus to exit the camp driveway without causing the oncoming traffic on Majors Path from braking to slow down or to actually stop so that the bus can exit safely. This can not be mitigated because of the winding turns on Majors Path. Please also note that the DEIS traffic report mentions nothing about departure sight distances. The DEIS only measured stopping sight distance which is the distance required for a car actually on Majors Path to be able to stop to avoid an accident with a vehicle exiting the camp. The DEIS is silent on how much distance would be needed for the vehicle already in the driveway to make a safe exit. If anyone has more time in their testimony, it is so important to state this. Our attorney feels that we **MUST** state this on the public record before the Planning Board. The following is a statement that you can read.

"As a concerned resident of North Sea, I have seen recent data that shows the proposed exit driveways from 665 Majors Path do not meet the required departure sight distances for busses as required by AASHTO. As a result, every bus that leaves this property with children on board is at serious threat to be involved in an accident with an approaching vehicle driving on Majors Path. I would like to state my deep concerns about this as I view it as an accident waiting to happen, and I want to put the Town of Southampton on notice that there is potential peril for the children leaving these premises by bus if this plan is approved by the Planning Board."

Please shoot me an email and let me know if you can fit this into your testimony. I want to be sure that this point is covered thoroughly. Guys and gals, this is a real biggy.

CC PB

Patricia Boudreau-Sullivan

From: Carl Benincasa
Sent: Tuesday, January 31, 2017 3:14 PM
To: Patricia Boudreau-Sullivan; Clare Shea; Jacqueline Fenlon; Kerri Meyer
Subject: FW: DEIS SH Country Day Camp (SCDC) - Noise Study with appendices
Attachments: NCE 2017 Proposal for review of Noise Study.pdf

C24

Please include the below in the public hearing record.

From: fsmaer@aol.com [mailto:fsmaer@aol.com]
Sent: Tuesday, January 31, 2017 1:21 PM
To: Carl Benincasa
Cc: Celeste@littlefreshpond.com; jimsilber@aol.com
Subject: DEIS SH Country Day Camp (SCDC) - Noise Study with appendices

Carl,

I write to inquire about the status of SCDC's production of the Noise Study that the Planning Board has now twice directed SCDC to produce, both originally in the March, 2015, DEIS Scoping Document as well as at its recent Jan. 26, 2017 meeting.

As I mentioned when we spoke after that meeting, not only did the DEIS Scoping Document direct SCDC to attach the Noise Study to the DEIS (see p. 10, "XXII. Appendices"), but the DEIS itself repeatedly mentioned and referenced the Noise Study (see "A Noise Study was performed to provide information ...," p. xxvii). The DEIS also described the appendices to it ("The appendices to the Noise Study include photographs of the measurement locations and figures of existing and future with-action sound levels." DEIS, p. 147), crucial data for any review of the Study.

Thus, just to be clear, SCDC should provide the complete Noise Study including its appendices.

To document our need to obtain the complete Noise Study, I have attached a proposal from Noise Control Engineering (NCE), an expert noise consulting firm we intend to retain to review SCDC's Noise Study. As the text in that proposal makes clear, Section 3.9 of the DEIS "Noise" Section is not a "complete acoustic evaluation." NCE makes clear that the Noise Section fails to provide the information they need to conduct a complete review ("Obviously, our peer review service is best performed by review of the separate/complete noise study report.")

C24-1

Lastly, I wish to point out that NCE's proposal states (next to last paragraph) that the work will be performed by a "Board Certified Acoustical Engineer." The DEIS, on the other hand, never states who conducted their Noise Study or whether they have the proper credentials to do so. This failure is compounded by the fact that the Noise Study was not even conducted by an independent reviewer, but by VHB itself, who is both the author of the DEIS as well as (apparently) of the Noise Study. That one of the days that the Noise Study was conducted came after the close of the camp's summer session and failed to acknowledge the existence of, or account for noise coming from, the camp's largest (20-30,000 sq. ft.) sports field, located on the camp's northern border, gives further cause for concern.

NCE's proposal recommends that they would need two weeks to conduct their review after their receipt of the Noise Study. Accordingly, I ask that the Board provide that the record be kept open 20 days after the Applicant submits the Noise Study with its appendices for the public to make comments on it. Chairperson Dennis Finnerty stated on the record that sufficient time would be provided.

I thank you in advance for your assistance on this matter and look forward to an update on the status of the Study's submission.

Sincerely,

Keep as New | Reply | Reply All | Forward | Delete | Spam | More

RE: Monday Morning Call

Mike Bahtiarian to you + 1 more show details

52 min ago

Celeste and Foster,

Our proposal/quote...I stand by to hear back on the complete noise study.

Michael Bahtiarian, INCE Bd. Cert.
Noise Control Engineering, LLC
978-584-3023 (direct line)
www.noise-control.com

From: Celeste2010 [mailto:celestefrank2010@yahoo.com]
Sent: Monday, January 30, 2017 2:56 PM
To: Mike Bahtiarian <mikeb@noise-control.com>
Cc: fsmaer@aol.com
Subject: Re: Monday Morning Call

Hi Mike,

You can address it to me:

Celeste Frank
735 Majors Path

Noise Control Engineering, LLC

799 MIDDLESEX TURNPIKE
BILLERICA MA 01821-3445
PHONE: 978-670-5339
FAX: 978-667-7047
E-mail: nonoise@noise-control.com

January 30, 2017

NCE Proposal: P7544, Southampton Summer Camp Noise Study Peer Review

Ms. Celeste Frank
735 Majors Path
Southampton, NY 11968

JAN 31 2017

Dear Ms. Frank:

Noise Control Engineering (NCE) is pleased to provide this proposal for a peer review of a noise study of the proposed Southampton Summer Day Camp in North Sea, New York. NCE will review Section 3.9, "Noise" of the VHP prepared Draft Environmental Impact Statement (DEIS), dated September 2016 and provide critical technical comments as noted below.

Alternately, if there is a separate noise study report by VHB or others, NCE will review that study as well. Just to note that, NCE has briefly reviewed the DEIS and it is not clear from this report (see section 3.9) if there is, or is not, a separate noise study report. Obviously, our peer review service is best performed by review of the separate/complete noise study report. Section 3.9 of the DEIS is not a complete acoustic evaluation.

After the report review, NCE will provide a letter report summarizing our concerns with the subject noise study. NCE will review and comment on the evaluation methodology, correctness of acoustical computations, comparison to appropriate noise regulations and correctness of conclusion and recommendations (if any).

All work will be performed by a *Board Certified* acoustical engineer (i.e. board certified member of the Institute of Noise Control Engineering, www.inceusa.org). NCE recommends allowing two weeks for completion of the study after receipt of the appropriate report.

The cost for this service is [redacted] on a fixed price basis subject to NCE contractual terms given at the end of this proposal. This effort does not include any site visits or field measurements. If there is a need to have these results presented at a Town board meeting that can be provided at an additional cost.

Sincerely,
NOISE CONTROL ENGINEERING, LLC

Michael Bahtiarian
Vice President

C25

Foster Maer
717 Majors Path
Southampton, NY 11968

March 7, 2017

Via Email – kmeyer@southamptontownny.gov
Dennis Finnerty, Chairman
John Blaney, Vice Chairman
Cathie Gandel, Member
Philip A. Keith, Member
Jacqui Lofaro, Member
Robin Long, Member
John Zuccarelli, Member
Planning Board of the Town of Southampton
116 Hampton Road
Southampton, New York 11968



Re: Southampton Country Day Camp
665 Majors Path

Dear Mr. Chairman and Board Members,

This letter is to request that the Applicant be directed to conduct a Supplemental EIS regarding the noise impact of its proposed action and that if any Final EIS is approved, it contain rigorous noise mitigation measures and strict limitations on the camp's size, activities, and the location of its activities. The survival of the quiet, pristine beauty of Little Fresh Pond and the livability of the surrounding woodlands and the community of modest homes on half acre lots within it is at stake as the Camp's noise already threatens to make one residence unlivable and can already be heard on the far (northern) side of the Pond.

Below I both present five questions that I ask the Board to direct the Applicant to answer. I also describe the significance of each of those questions and their answers.

Background

The proposed transformation of this long standing members-only tennis club into a day camp would dramatically increase the level of noise generated on the property, the inevitable consequence of converting what had been a family run tennis club with ten courts, 40 players and 30 overnight residents into a massive day camp with 450 campers and staff along with up to 100 overnight residents. In short, a 1000% increase in people using the property if this proposed action is approved as is. C25-1

Yet VHB,[1] both the author of the DEIS and of the Noise Study,[2] tells the camp's neighbors that they are neither now, nor ever will be, subjected to any disturbing noise from the camp's operations. Tell that to Celeste and Scott Frank who testified at this Board's hearing about measuring noise levels inside their home at 83 dCB's, noise coming from that camp's children's play area just 50 feet from their home. The camp's neighbors know what they hear and it belies VHB's claim that its operations do not, much

[1] VHB Engineering, Surveying and Landscape Architecture, PC,
[2] The DEIS uses the terms "noise" and "sound" interchangeably; this memo will refer to the study that was utilized in this DEIS as the "Noise Study."

less will not, generate unpleasant noise levels. In fact, as testified to at the hearing, noise from the camp not only penetrate into its neighbors' homes but can be heard as far as away the far (northern) side of the Pond half a mile away.[3]

C25-1 cont'd

Below is a series of questions (and likely answers) that I request the Board to ask the Applicant to answer and their significance. I rely on attached the Noise Report on from NCE, an acoustical firm hired by LFPA to provide a written evaluation of the Noise Study.

Question 1: Why did Applicant fail to provide the "supporting data and information," information normally provided an agency reviewing a DEIS as documented in the NCE Report (p. 1)?

Significance: Despite being asked, the Applicant refused to provide that data and information, including a 2011 Noise Study, without any explanation for its failure to do so, depriving the Board and public of a critical means to assess its validity.

Though the Applicant was directed by the Scoping Document to perform a Noise Study and attach it to its DEIS, the Applicant simply refused to do so at first, not even providing the data the Noise Guidance directed it to provide. This refusal left the Planning Board and the public in the dark as to the data, information and methods relied upon by VHB at the very moment the Board and public were reviewing the DEIS. I then asked the Board at the second hearing to obtain a copy of the Study, which it did, finally succeeding three weeks later, late last month, when the Applicant provided what it described as a copy of the "original" Noise Study.

With one small but telling exception discussed below, this original Noise Study contained no new data or information about the Study that was not in the DEIS. In fact, the text of the Study appeared to be a word for word copy of the text in the DEIS Chapter on Noise. Thus, the production of the Noise Study did not give the Board or the public the information they needed to assess the Study's validity.

> "The [Noise] report is missing what NCE would classify as usual supporting data and information for this type of study and what is usually found in similar studies of this nature."[4]

C25-2 cont'd

Tellingly, the Noise Study even failed to provide such basic required information as the time of day the measurements were taken and/or the noise levels were heard, much less the duration, intervals, and maximum/minimum intensities of the noise being measured.

The author of the Study, VHB, admitted as much in its February 6, 2017 letter to this Board in which it acknowledged it had failed to include technical information "normally … summarized in the text of a DEIS and included in its entirety in an appendix." Other than acknowledging these shortfalls, neither the Applicant nor VHB explained why they refused to comply with the clear, unequivocal rules governing this process.

Perhaps most disturbing was the Study's failure to include a Noise Study that the Applicant had commissioned two years earlier (2011) that came to a very different finding with respect to perhaps the most critical measurement in this entire process: the ambient sound level. That original 2011 Noise Study found the ambient sound levels along the property's northern border to range from 46 – 49 dBa, findings 11 decibels lower than the Applicant's second study found (58), findings that would have mandated significant mitigation measures, if not alterations, to the proposed project if it had been relied upon.

Accordingly, the Applicant must be directed to conduct a Supplemental EIS to provide the missing data and a *full* noise analysis based upon it.

Question 2: Why did VHB not conduct sound level measurements on a typical "camp day," one on which a typical number of campers, not just a tiny handful, were present?

C25-3

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[3] Testimony of Barbara Marsh, January 5, 2017.

[4] Noise Control Engineering Report authored by Michael Bahtiarian attached as Attachment A.

Significance: Unless VHB can document otherwise, this failure to measure sound data on a "typical" day could result in underreporting of both current and future sound levels.

In response to the March 25, 2015, Scoping Document and its directive that the Applicant conduct a noise study, VHB conducted this noise study based upon data it collected on just two days, two unusually *quiet* days with far fewer campers present compared to the rest of the summer.

First, VHB chose a day to make its noise measurements that it had apparently already collected data on two years earlier, August 14, 2013, two days before the camp's August 16, 2013 closing, a day with reduced attendance as many families were already leaving their "summer" homes (precisely why the camp's summer session was ending). The reliance on data already collected for such a study would seem to be problematic, a form of cherry picking data in that the Applicant already would have likely known that the data it had collected on that day in 2013 supported the Applicant's preferred outcome; the Applicant could also be choosing to avoid using data collected on certain *other* days where the outcome did not support its position.[5]

Equally odd, VHB then chose to rely on data collected on August 18, 2015, four days after the camp's 2015 Summer Session had ended, for its second and only other day of testing. A very quiet day indeed. Given the Applicant's 2015 eight week summer session's end date, August 14, the choice of August 18 certainly stands as an extremely unrepresentative day to establish the baseline noise levels for the camp's operations, current or future. Whatever the reason, the choice of this day, without documentation that it had no impact on the results, is both inexplicable and unacceptable.

VHB also failed to disclose the measurements it relied on in establishing the ambient sound level. Given that the property consists of 18 acres, spread out between a quiet wooded nature preserve to the north and west and a well-traveled road to the east, Majors Path, the ambient sound level will vary greatly depending on precisely where these "measurements" are being "taken," ie the locations where the ambient sound was either actually measured or virtually estimated for. Knowing those precise location for which these measurements were "conducted" is key, be they actual or virtual measurements calculated by VHB. VHB never provided any of that essential data needed to assess its accuracy or application. The singular ambient level given by VHB for the entire 18 acre property, with no indication of the specific locations where the measurements were taken is close to meaningless and must be redone.

C25-3 cont'd

Question 3: Why did VHB fail to measure or otherwise account for noise coming from the property's largest sports field, its largest outdoor deck, and many of the Property's other noisiest sources?

Significance: As a result of these failures, the study underreported both current and future sound levels.

The Noise Study failed to identify and analyze the noise generated by three of the four loudest noise sources at the proposed day camp: 1)) the sports field between the dining hall and the property's northern border, the camp's largest playing field at 20-40,000 sq. ft., 2) the 7,200 sq. ft. northern tennis court that serves as the play area for younger children, and 3) the property's largest (665 sq. ft.) outdoor deck, proposed to be added to the dining hall for both dining and other camp activities.

C25-4

Of any single source of noise, the children's play area on northern tennis court is currently the most disruptive to its neighbors, both because it serves as the play area for the dozens of younger campers with their ear-piecing shrieks, but also because the court itself directly abuts and extends over the property's northern boundary such that each of those shrieks blasts its way into a home just fifty feet away. Its owners, Celeste and Scott Frank, have measured noise levels inside their home of 82-84 dCb

[5] If the dates given in the Noise Study were in any way erroneous, i.e. that both days upon which the data was collected were in 2015, then the Study should be amended accordingly and the public given an opportunity to comment upon that and any other changes.

from the noise coming from the camp, invading every room in their home, at times making it uninhabitable (see letter submitted to this Board by Celeste Scott). Under the proposed plans, that noise would substantially increase with two to four times as many children playing basketball and other games in that same space, the children's play area.

The unevenly shaped "sports field" that stretches between the dining hall and the property's northern boundary, is the property's largest outdoor playing field at approximately 20-40,000 sq. ft.,[6] able to host more than half of the 360 kids projected to attend the day camp.[7] With their endless series of chants, cheers, and boos during games or other play activities, the kids playing on that field are already loud enough at times to be heard by those living on the far side (north) of the Pond. Testimony of Barbara Marsh, *id.* Instead of measuring the noise generated by a sports activity on that field, VHB chose to measure (from the property line) the noise generated on a much smaller field in the middle of much the property, a decision that will end up measuring a much lower noise levels than the noise from the larger field immediately adjacent to the property's northern property line.

The proposed outdoor deck space (665 sq. ft.), to be built immediately adjacent to the dining hall, would constitute the camp's largest outdoor deck and host another 50 or more campers. Sittings atop the hillside overlooking the nearby homes and Pond below, and with the playing field serving as an unimpeded sound corridor, any noise from the deck would carry down the hillside into those homes and across the Pond.

C25-4 cont'd

Though these three locations could easily host two thirds (250) of the total 360 campers there and generate far more noise than all the other noise sources combined, the DEIS neither measured the noise level at any of them nor projected what their impact would be on noise levels in the future under the proposed plan. Packed together along the property's northern border, these three, very loud noise sources would overwhelm their neighbors with noise.[8]

It should be noted that though the Applicant stated he had no current intention of conducting outdoor nighttime activities at the camp, he would not necessarily be bound by that limitation if he subsequently sought to undertake any night-time activities there.

Question 4: If the ambient sound consisted of "insects, wind … foliage, and vehicles traveling on Majors Path" as described in the Noise Report (p. ?), wouldn't the ambient sound level of the homes further away from Majors Path be rural-like (38), not urban-like (58),?

Significance: According to expert testimony and a more detailed and geographically focused noise study conducted for the Applicant in 2011, the increase in ambient sound levels would be approximately 20 dCb, which represents a very large increase in noise that will very definitively disturb its neighbors.

The typical range of background sound levels (residual noise level) during the day for the following types of communities is:

- Quiet suburban residential: 36-40 dB(A)

C25-5

[6] The text of the DEIS ignore the existence of this sports field. In fact, the picture background two maps presenting the noise data are based upon an overhead picture of the site taken 5-10 years ago. (Perhaps the Noise Study had a more current overhead map, but we have yet to see it.) However, the DEIS, Appendix F, has a picture of the field looking out along its northern boundary.

[8] The Applicant had just recently cleared and deforested close to an acre of land, including a substantial portion of the large playing field, since he had first sought permission from the Town to convert the property to a day camp but without disclosing its actions in the DEIS. In fact the applicant engaged in a series of acts, as described below, to hide the destruction and demolition of the current premises, including the clearing and deforestation of an acre of native woodlands. I ask that the Applicant be asked to specify which wooded areas it has cleared and the total amount cleared so far.

- Urban/suburban residential: 42-56 dB(A)
- Cities: 62-69 dB(A)

http://www.sauerburger.org/dona/crosscredit16.html

Without specifying where within the 18 acre property it was "measuring" the ambient sound level, the DEIS simply held that the ambient sound level for the property as a whole was 58. A very urban, if not city-like ambient level as the above reference guide indicates. As described above, the Study failed to give the normal background information that accompanies an ambient noise measurement.

Yet the facts surrounding this property come to a very different conclusion. The property lies amid a "quiet suburban residential" if not rural, neighborhood, sitting amid a heavily wooded residential neighborhood, adjacent to 6 acres of nature preserve and a large pond, across the street from just a few homes on the edge of a vast expanse of 15 or more acres of open pasture and farm land, without any traffic lights or commercial uses (other than farm land) within a mile of its entrance. So the descriptor "quiet suburban residential" certainly applies.

Based upon his professional experience, Mike Bahtiarian, a Board Certified Noise Control Engineer (Institute of Noise Control Engineering), estimated the ambient sound level in this manner:

> "The ambient SPL of 58 dB(A) [as found in the Noise Report] is high for such a suburban (nearly rural) area that is found in Southampton, NY. Measurements by our firm for daytime suburban/rural areas give SPL values as low as 40 dB(A) during the day. Further, NCE believes that if a lower ambient SPL were used, the computations would be markedly different. (emphasis added)

ECB Report, p. 1. (attached)

C25-5 cont'd

VHB also failed to disclose where or how it took the measurements it relied on in calculating the ambient sound level. Given that the property consists of 18 acres spread out between a quiet wooded nature preserve to the north and west and a well-traveled road to the east, Majors Path, the ambient sound level will vary greatly depending on where these "measurements" are being "taken," ie the locations where the ambient sound was either being actually or virtually measured.

The most compelling evidence of all regarding the noise impact is the August 2011 Noise Study conducted by EEA Inc, at the behest of the Applicant. This carefully documented study, breaking out the varying noise level by hour of day for three contiguous measurement sites focused on just one section of property, the northern section , measured the ambient noise levels at 46-48 along the property's northern border. *See* "Final Report - Special Environmental Noise Study,'" p. 13, August 2011, appended as "Appendix B" to its EEAF (Expanded Environmental Assessment Form) submitted to this Board in August 2011 and attached herein as Attachment ??. In that it was authored by the Applicant's expert at the time, its findings of ambient sound levels at 46-48 dBa should be given substantial weight, especially when compared to the results in the new noise study, 58-59, which would seem to defy common sense.

Question 5: Why did VHB create a misleading "multiplier," 67%, for estimating the increase in campers when in fact it is much higher, 200-400%, which has the effect of lowering the anticipated impact on noise, in part by relying on a misleading comparison between the 215 "existing" campers versus the 360 "anticipated" campers?

Significance: By providing a much lower multiplier than the data supports, VHB misleads the Board by relying on the false equivalency between these two categories of campers, existing versus anticipated campers, that results in the substantial underestimation of the scope and severity of the impact this proposed conversion will have.

C25-6

Relying on the misleading comparison, or equivalence, between the 215 "existing" campers versus the 360 "anticipated" campers, VHB asserted that noise levels would *increase* by 67% (the multiplier) if the property's conversion into a day camp were approved. In fact, the

projected increase in attendance would be in the range of 200-400%, as would be the increase in noise if it's a proportionate increase as presumed in the DEIS.[9]

The anticipated maximum of 360 campers represents the maximum number of campers that would be attending the camp on a daily basis. Over the eight week (40 days) summer session, 360 campers a day would add up to a total of 14,400 camper days for the summer (360 campers x 40 days).

A close read of the phrase "215 existing campers" suggests that it represents a different metric: the total number of campers that attended the camp at any point during the entire length of the summer session, be it for a week or all eight weeks. If true, the multiplier will have to be revised dramatically upward. For example, if each of those 215 campers attended the camp for half of the eight week summer session (four weeks-20 days), the total camper days for the summer season would be 4300 (215 campers x 20 days).

The Applicant would have to discloses the camp's daily attendance and the average length of stay of those 215 existing campers if the Board and public can meaningfully predict what the impact of the conversion of this property to a day camp will be. We, the public, as well as the Board, are entitled to know what these numbers represent so that the correct multiplier can be determined so as to be able to project the future increase in campers and noise.

C25-6 cont'd

\\

Conclusion

Because its noise study distorted the record and did not provide the data required by this Board, the Applicant should conduct and submit a Supplemental EIS based upon a new noise study that will provide the missing data

The noise data collected by VHB was based upon just two days of testing, one of which came after the camp's summer session had ended. VHB failed to measure or account for the noise coming from the property's largest (20,000-30,000 sq. ft.) sports field, just 15 feet from the property's northern border, or from the 7,200 sq. ft. play area for the camp's younger children, immediately adjacent to sports field along that same northern border and 50 feet from a neighbor's home. Common sense dictates that such noisy activities as these, conducted on adjacent sites along the same property line, will be very audible to its neighbors.

Perhaps unsurprisingly, the Noise Study nonetheless concluded that no one would hear or be troubled by the noise from the camp, that a proposed new basketball court on that children's play area just 45 feet from a neighbor's windows will not disturb them.

As a result, the Planning Board should exercise its authority to insure that it has reliable and complete information. Thus, all of the DEIS deficiencies and omissions summarized in this letter should be corrected, and the Applicant's FEIS should incorporate all required revisions. Given that the Planning Board can mandate further information as necessary to render a decision even after the submission of an FEIS, it should mandate that the applicant provide the information sought above by means of a supplemental EIS.

In fact, this proposed action will unquestionably have a very significant impact noise-wise both to its immediate neighbors as well as, to a lesser degree, to those who live on enjoy Little Fresh Pond. In that

[9] The March 7, 2017, letter brief submitted by Jeffrey Bragman, Esq., on behalf of Little Fresh Pond Association has a fuller explanation of this multiplier effect and its implications.

the noise measurements need to be redone for the reasons described above, the Noise Study should be redone as part of a Supplemental EIS to capture and then analyze the data that the Applicant should have, but did not, provide.

Yours truly,

-s-

Foster Maer
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From: Foster Maer

Noise Impact Assessment

Noise Study for Southampton Tennis Club and Camp

PREPARED FOR

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February 8, 2016

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1.0 Introduction

VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) has conducted a noise study associated with changes at the Southampton Day Camp located at 665 Majors Path in Southampton, New York. The proposed action include a change from an existing non-conforming use, tennis club and tennis camp, to another non-conforming use, a tennis club and camp. This noise study has been prepared in support of the Southampton Day Camp Realty, LLC Draft Environmental Impact Statement (DEIS) application to the Town of Southampton Planning Board.

As with the existing use, the proposed camp will operate seasonally during weekdays over a 10-week period between mid-June and late August for children of ages 2.5 to 16 years. The tennis club activities will operate daily over an 18-week period between late May and early October. The camp and tennis club will include overnight accommodations for a limited number of employees and camp counselors, but not for campers. The proposed action will include renovations and replacement of cottages, changing sheds, the Welcome Center and an extension to the dining hall building deck. The proposed action also includes two new swimming pools, for a total of three, playground areas, and a basketball court. There would be changes to the vehicular circulation and parking to provide a total of 70 parking spaces between the existing and proposed parking areas.

This study provides information on existing and future with-action sound levels at the proposed site as specified in the adopted DEIS scope dated March 26, 2015, pursuant to New York Codes, Rules and Regulations (NYCRR) State Environmental Quality Review (SEQR) Chapter VI Part 617.8, including construction-period and operational conditions. The report includes background on applicable noise regulations and criteria, results of sound level monitoring to characterize the existing environment of the tennis club and tennis camp, predictions of future sound levels associated with the proposed use and construction-period activity and an assessment of potential noise impact and mitigation recommendations. Appendix A to the report includes photographs of the measurement locations and Appendix B includes figures of existing and future with-action sound levels.

1.1 Background on Sound Levels

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, or recreation. How people perceive sound depends on several measurable physical characteristics. These factors include:

- Level – Sound level is often equate to loudness.
- Frequency – Sounds are comprised of acoustic energy distributed over a variety of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz. Pure tones have all their energy concentrated in a narrow frequency range.

Sound levels are most often measured on a logarithmic scale of decibels (dB). As shown in Table 1, the decibel scale compresses the audible acoustic pressure levels which can vary from the threshold of hearing (0 dB) to the threshold of pain (120 dB).

Because sound levels are measured in dB, the addition of two sound levels is not linear. Adding two equal sound levels creates a 3 dB increase in the overall level. Research indicates the following general relationships between sound level and human perception:

- A 3-dB increase is a doubling of acoustic energy and is the threshold of perceptibility to the average person.
- A 10-dB increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person.

The human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter known as A-weighted (dB(A)) is used to evaluate environmental sound levels. A variety of sound level indicators can be used for analyzing environmental sound. Leq is commonly used in assessing environmental noise as it has been shown to correlate well to human annoyance. Leq is the continuous equivalent A-weighted sound level that represents the same acoustic that exists over a period of time in a single value as the fluctuating levels. The Leq takes into account how loud events are during the period, how long they last, and how many times they occur. Leq is commonly used to describe environmental noise as it relates well to human annoyance.

Table 1. Indoor and Outdoor Sound Levels

Outdoor Sound Levels	Sound Pressure (μPa)	Sound Level dB(A)	Indoor Sound Levels
	6,324,555	110	Rock Band at 5 m
Jet Over-Flight at 300 m		105	
	2,000,000	100	Inside New York Subway Train
Gas Lawn Mower at 1 m		95	
	632,456	90	Food Blender at 1 m
Diesel Truck at 15 m		85	
Noisy Urban Area—Daytime	200,000	80	Garbage Disposal at 1 m
		75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	70	Vacuum Cleaner at 3 m
Suburban Commercial Area		65	Normal Speech at 1 m
	20,000	60	
Quiet Urban Area—Daytime		55	Quiet Conversation at 1 m
	6,325	50	Dishwasher Next Room
Quiet Urban Area—Nighttime		45	
	2,000	40	Empty Theater or Library
Quiet Suburb—Nighttime		35	
	632	30	Quiet Bedroom at Night
Quiet Rural Area—Nighttime		25	Empty Concert Hall
Rustling Leaves	200	20	
		15	Broadcast and Recording Studios
	63	10	
		5	
Reference Pressure Level	20	0	Threshold of Hearing

μPA MicroPascals describe pressure. The pressure level is what sound level monitors measure.
dBA A-weighted decibels describe pressure logarithmically with respect to 20 μPa (the reference pressure level).
Source: Highway Noise Fundamentals, Federal Highway Administration, September 1980.

2.0
Regulatory Context

This section describes the regulatory context in which potential noise impact is assessed. This study has been completed in fulfilment of the adopted DEIS scope dated March 26, 2015, pursuant to NYCRR SEQR Chapter VI Part 617.8. The New York State Department of Environmental Conservation (NYSDEC) has issued program policy on "Assessing and Mitigation Noise Impacts" which provides guidance on the methods for identifying when sound levels may cause a significant environmental impact and how to assess, avoid and reduce noise accordingly. The study also addresses sound level limits outlined in the Town of Southampton Noise Ordinance (Part I, Chapter 235 – Noise) which are associated with specific activities and have the potential to be a nuisance. This section provides background information on the NYSDEC program policy for assessing noise and the Southampton Noise Ordinance.

2.1 NYSDEC Noise Program Policy

The NYSDEC policy recommends that existing and future with-action sound levels be evaluated when residential, commercial, institutional or recreational uses are adjacent to a facility which generates sound. The NYSDEC policy indicates that receptor locations may be either at the property line of the parcel on which the facility is located or at the location of common use or inhabitance on adjacent property. With respect to this guidance, sound levels for existing and future with-action conditions have been reported at receptors located near the property line and also near the buildings.

The goal for any permitted operation is to minimize increases in sound levels. Table 2 presents the thresholds for significant increase in sound level and the NYSDEC program policy on determining the need for mitigation. According to the policy, limiting maximum sound levels may be appropriate in some circumstances. For example, in non-industrial settings, a proposed action should generally not raise ambient sound levels above 65 dBA. Whether the proposed action would cause a pure tone condition should also be considered since they are readily discerned by the human ear and can cause annoyance. A pure tone is commonly considered to the condition where the sound level in any 1/3-octave band exceeds the two adjacent bands by 3 dB or more.

Table 2. NYSDEC Guidelines for Assessing Noise Impact and Mitigation

Sound Level Increase (dB)	Impact Determination	Need for Mitigation
0 to 3	No impact	None
3 to 6	Potential adverse impact for the most sensitive receptors	Mitigation may be needed for the most sensitive receptors.
6 to 10	Potential adverse impact depending on existing sound level and character of land use	Mitigation is generally needed for most residential receptors.
10 or more	Adverse impact	Mitigation is warranted where reasonable.

When a noise study indicates that the proposed action may result in significant impact, the NYSDEC requires the applicant to implement reasonable and necessary measures to mitigate or eliminate the adverse effects. If a significant adverse impact is identified, in addition to physical mitigation measures such as noise barriers, an applicant should also consider best management practices (BMP) to reduce noise by means of modifying noise-generating equipment or activities, limiting the period of time or duration of noisy operations or relocating noise sources farther away from receptors.

2.2 Southampton Noise Ordinance

The Town of Southampton Noise Ordinance prohibits persons from creating sound, when measured on the property line of a residential district, exceeding an overall level of 65 dBA between the hours of 7:00 A.M. and 7:00 P.M. The noise ordinance has an overall sound level limit of 50 dBA at residential receptors for the night time period between 7:00 P.M. and 7:00 A.M. It should be noted that no outdoor activities at the camp are anticipated during the night-time period.

Construction activities that occur between 7:00 A.M. and 7:00 P.M. are exempt from the sound level limits provided that the construction complies with other applicable provisions. Noise generated from vehicles on public ways are also exempt from sound level limits as long as the vehicles meet other applicable Federal or state regulations.

The noise ordinance also prohibits yelling, shouting, hooting, whistling or singing at any time which is plainly audible at a distance of 50 feet from where the noise is generated and which annoys or disturbs the quiet, comfort or repose of persons in the vicinity.

3.0 Noise Impact Assessment

This section presents the existing and future with-action conditions at the tennis club and camp facility including a description of sound-generating activities, existing sound level measurement results, predictions of future with-action sound levels and a noise impact assessment according to applicable criteria limits.

3.1 Camp Activities

The tennis club and camp had 215 campers in attendance during the 2015 season. Without the proposed action, enrollment at the camp is anticipated to increase to 280 campers during the 2016 season. The tennis club and camp is planning to accommodate up to 360 campers with the proposed action. Because this sound study compares the 2015 "existing" enrollment to the proposed with-action enrollment of 360, the assessment is conservative in showing greater potential increases in noise than if the anticipated 2016 enrollment was compared to the proposed action. The primary existing outdoor activities that have the potential to generate sound include tennis, swimming at the outdoor pools, basketball and general playground games such as soccer. Indoor activities include arts and crafts, music, cooking and science. These indoor activities do not generate significant sound that would propagate into the neighboring community. Additionally, there is no machinery or equipment (i.e. woodworking tools) that creates significant sound that could propagate into the surrounding neighborhood. These same general indoor and outdoor activities are anticipated for the proposed action.

Tennis is currently played at the seven courts located at the southern end of the facility, the single court located next to the pool and the single court located at the northern end of the facility. There is an existing basketball court that is approximately 34 feet by 57 feet located at the northern end of the facility. There is currently one pool 23 feet by 63 feet in area located just north of the tennis courts.

With the proposed action, there would still be tennis played at the seven courts located at the southern end of the facility but the other two courts would be replaced

by other uses. Specifically, two new outdoor swimming pools would be constructed adjacent to the existing pool. These two new pools would be 30 feet by 53 feet and 25 feet by 63 feet in size and would replace the existing tennis court that is adjacent to the existing pool. The existing pool mechanical equipment located on the north end of the pool area would remain in its current location. Additional mechanical equipment for the two new pools would be located adjacent to the existing equipment.

With the proposed action, a new basketball court approximately 55 feet by 90 feet would be replacing the existing tennis court located on the northern end of the facility. The overall footprint of the existing tennis court would be reduced with the installation of the proposed basketball court. New vegetation would replace existing tennis court pavement between the basketball court and the northern property line.

Currently campers travel to the facility primarily by 16 small passenger buses with a capacity of 24 persons each. On average, there are 13 campers in each bus. There are also three shuttle vans for staff members that travel to the facility in the morning around 8:15 A.M. and depart in the afternoon around 4:15 P.M. With the proposed action, there would up to 22 passenger buses to accommodate up to 360 campers.

3.2 Noise Sensitive Land Use

Land use within ½-mile of the subject property includes single-family residences, open space conservation land, commercial properties and industrial facilities. Noise sensitive land use adjacent to the facility includes single-family residences on S Road to the north, Majors Path Road to the east, Horton Terrace to the south, North Sea Mecox Road to the south and west, Robinson Road to the west, and a nursery to the south on North Sea Mecox Road.

3.3 Existing Conditions

VHB conducted sound level measurements at the tennis club and camp on August 14, 2013 and August 18, 2015 to characterize the existing conditions. On August 14, 2013 the temperature was 74 degrees Fahrenheit with sunny skies, winds up to 15 mph and no precipitation. On August 18, 2015 the temperature was approximately 73 degrees Fahrenheit, with partly cloudy skies, winds less than five mph and no precipitation. In addition to specific outdoor camp activities, ambient conditions include sound from insects, wind blowing through the trees and foliage, and vehicles traveling on Majors Path Road.

Sound level measurements were conducted adjacent to the swimming pool, basketball courts, and tennis courts to obtain reference level information, as shown in the figures in Appendix B. During the measurement period, the distance of the measurement to the specified activity, the sources of sound and the number of participants were documented. Table 3 presents the results of these reference sound level measurements.

Table 3. Existing Sound Level Measurement Results

Activity	Measurement Distance Source (feet)	A-weighted Equivalent Sound Level (LAeq, dBA)
Soccer with 12 campers	30	59.6
Tennis with 25 campers	80	51.3
Basketball with 7 campers	20	62.3
Swimming Pool with 84 campers	75	60.0
Parachute with 14 campers	30	59.5
Ambient conditions	n/a	57.6

3.4 Future With-Action Conditions

Based on the existing sound level measurements, the number of existing and future participants and the proposed location and size of the facilities, future with-action sound levels generated by camp have been predicted throughout the neighborhood. Noise exposure contours have been computed using the Cadna-A™ prediction software. This program calculates sound level emissions of standard or user-defined sources and takes into consideration influences due to the surrounding environment, including propagation effects, ground cover, intervening buildings and terrain. Reference sound levels for the primary outdoor activities including tennis, swimming, and basketball were input to the model based on the existing measurements.

To account for proposed changes to the camp facilities, the sound levels have been scaled according to the number of potential future campers. Because these outdoor activities are dependent on the number of participants, as the number of participants increase, the future sound levels will increase. When summing multiple sound sources in this manner, the following equation is used:

$Future\ Sound\ Level = Existing\ SoundLevel + 10 * Log(A/B)$ where;

A is the number of future participants in a given activity and B is the number of participants during the measured activity. This modeling approach is relatively

conservative since with greater enrollment there is greater potential for some of the additional campers to be observing activities rather than actively participating.

With this relationship, if the number of participants doubles, there is a three decibel increase in sound. For the potential increase in the number of campers from 215 to 360 campers, a given activity would have approximately 67% more participants and sound generated from the activity would increase 2.3 dB.

Future with-action outdoor activities are assumed to be the same as the existing activities with 67% more participants. The remaining campers are assumed to be participating in indoor activities.

- Swimming at three pools with 140 campers (total)
- Tennis at the seven courts with 42 campers
- Basketball at the existing court with 12 campers
- Basketball at the proposed court with 320campers
- Soccer with 20 campers

Table 4 presents the existing and future sound levels at receptors located near the property line and near the residence. This table presents the increase in future sound levels at each receptor and whether there would be noise impact in regard to the Southampton Noise Ordinance daytime limit of 65 dBA. Existing and future sound level contours, which show the sound exposure throughout the study area are presented in Appendix B.

Many receptors near the property line are adjacent to roadways or driveways and frequent human use would not be expected. Therefore, noise impact would generally not occur at these property line locations. While information has been provided for receptors both near the property line and near the buildings, potential noise impact should be assessed primarily at locations near the buildings.

Table 4. Noise Impact Assessment Results

Receptor Location	Receptor Near Building			Receptor Near Property Line			
	Existing Sound Level (dBA)	Future Sound Level (dBA)	Sound Level Increase (dBA)	Existing Sound Level (dBA)	Future Sound Level (dBA)	Sound Level Increase (dBA)	Noise Impact?
717 Majors Path Rd	58	58	0	58	58	0	No
719 Majors Path Rd*	58	58	0	58	58	0	No
721 Majors Path Rd*	58	60	2	60	63	3	No
735 Majors Path Rd*	58	60	2	60	65	5	No
727 Majors Path Rd*	58	59	1	58	60	2	No
690 Majors Path Rd	58	59	1	58	59	1	No
676 Majors Path Rd	58	59	1	58	59	1	No
660 Majors Path Rd	58	59	1	58	59	1	No
640 Majors Path Rd	58	58	0	58	62	4	No
632 Majors Path Rd	58	58	0	59	61	2	No
620 Majors Path Rd	58	58	0	59	60	1	No
606 Majors Path Rd	58	59	1	58	60	2	No
605 Majors Path Rd	58	60	2	59	61	2	No
22 Horton Terr	59	61	2	59	62	3	No
15 Horton Terr	59	60	1	59	61	2	No
139 N. Sea Mecox Rd	58	60	2	58	60	2	No
105 N. Sea Mecox Rd	58	58	0	58	60	2	No
103 N. Sea Mecox Rd	58	58	0	58	59	1	No
99 N. Sea Mecox Rd	58	58	0	58	58	0	No
95 N. Sea Mecox Rd	58	58	0	58	58	0	No

* Receptor near property line is located on 717 Majors Path Rd property line adjacent to given address.

Table 3 shows that existing sound levels are up to 60 dBA at receptors near the building and near the property line. With-action sound levels near the building are predicted to be 61 dBA or lower and 65 dBA or lower near the property line. Sound levels are predicted to increase up to two decibels at most receptors. For receptors at to the north end of the property, sound levels are predicted to increase up to five decibels due to the introduction of the new basketball court.

The impact assessment results show that future with-action sound levels do not exceed the Southampton Noise Ordinance daytime limit of 65 dBA for residential land use and, therefore, there would be no impact. Additionally, the increase sound is less than six decibels at all receptors and noise mitigation is not needed for residential receptors according to the NYSDEC program policy.

3.5 Construction-Period Activities

Construction associated with the proposed action would generally include small equipment such as a backhoe for moving earth, a generator, a paver and hand tools for constructing buildings. Although the Southampton noise ordinance does not limit sound generated from construction activities between the hours of 7:00 A.M. and 7:00 P.M., projections of temporary construction sound are presented for informational purposes.

The following are reference sound levels of typical equipment that may be used during construction. The reference data was obtained from the Federal Highway Administration Roadway Construction Noise Model. All sound levels are maximum values referenced to a distance of 50 feet.

- Backhoe, 80 dBA
- Generator, 82 dBA
- Paver, 85 dBA

The closest receptors near adjacent buildings, such as at the northern end of the facility, are approximately 100 feet or farther from where construction would occur. Assuming that a single piece of construction equipment such as a backhoe would operate at a time, temporary construction sound levels would be approximately 79 dBA or less. Construction activities would be limited in accordance with the Town of Southampton requirements, and would be of relatively short duration (i.e., construction noise would cease upon project completion).

4.0
Noise Mitigation

The results of the assessment show that there would be no noise impact associated with the proposed action according to NYSDEC program policy or the Southampton Noise Ordinance, such that no noise mitigation is required. Even though no impacts have been identified, best management practices (BMP) may be considered to minimize noise generating activities at the camp or during construction.

BMP for reducing noise from camp activities could include minimizing the yelling, hooting or screaming of campers near the property line, not reproducing amplified music, or using public announcement equipment on the camp. Yelling, hooting or screaming could be limited through general counseling of the campers and/or signage near the property lines.

BMP for construction activities could include performing noisy operations only during periods of the day with less potential for annoyance to abutters, increasing the setback distance of construction equipment (such as portable generators) to receptors as feasible, using smaller and/or quieter equipment, altering construction methods (i.e. using a small bull dozer rather than a large bull dozer), and making sure equipment such as backhoes have functioning mufflers.

Appendix A

This appendix includes photographs of the noise measurement locations.

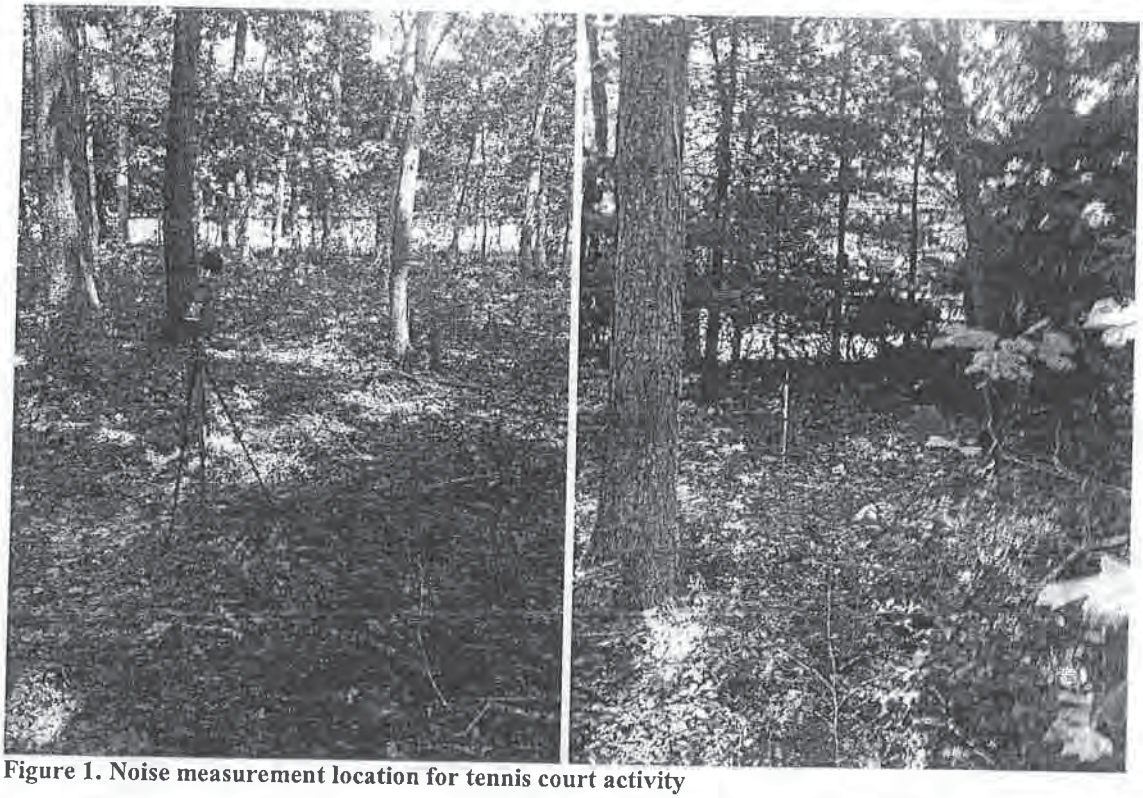


Figure 1. Noise measurement location for tennis court activity

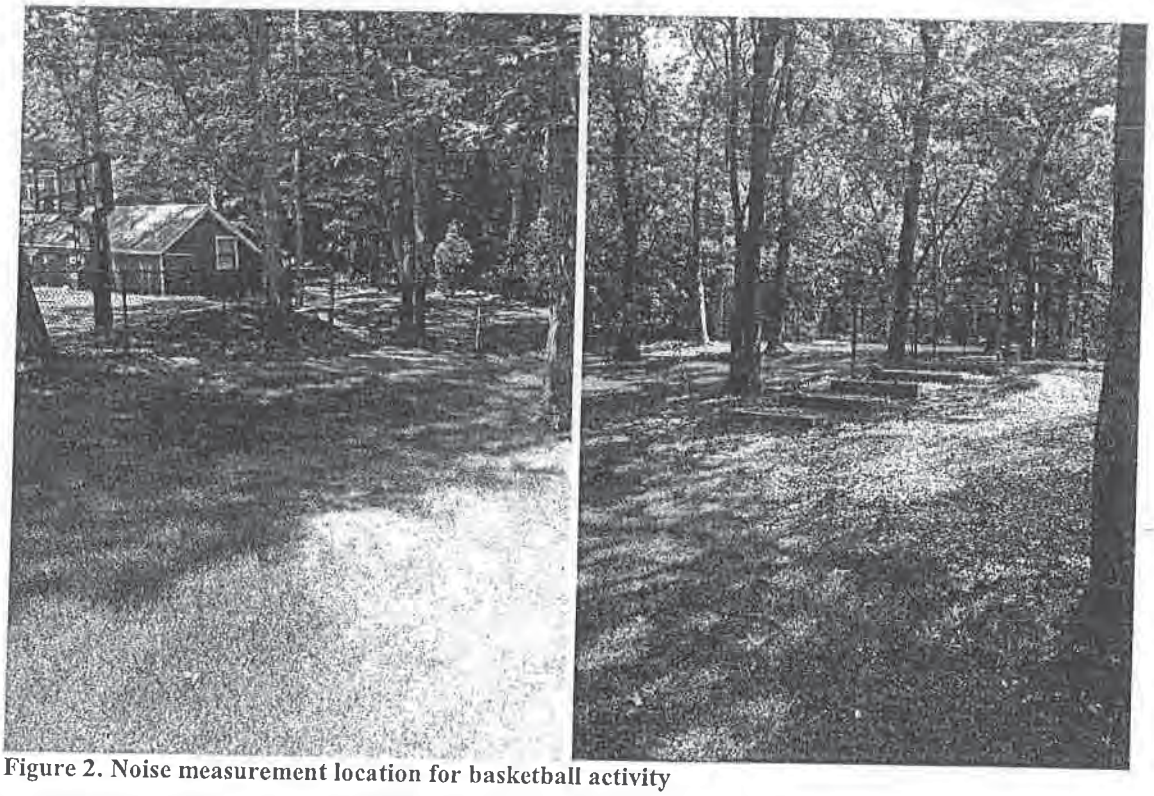


Figure 2. Noise measurement location for basketball activity



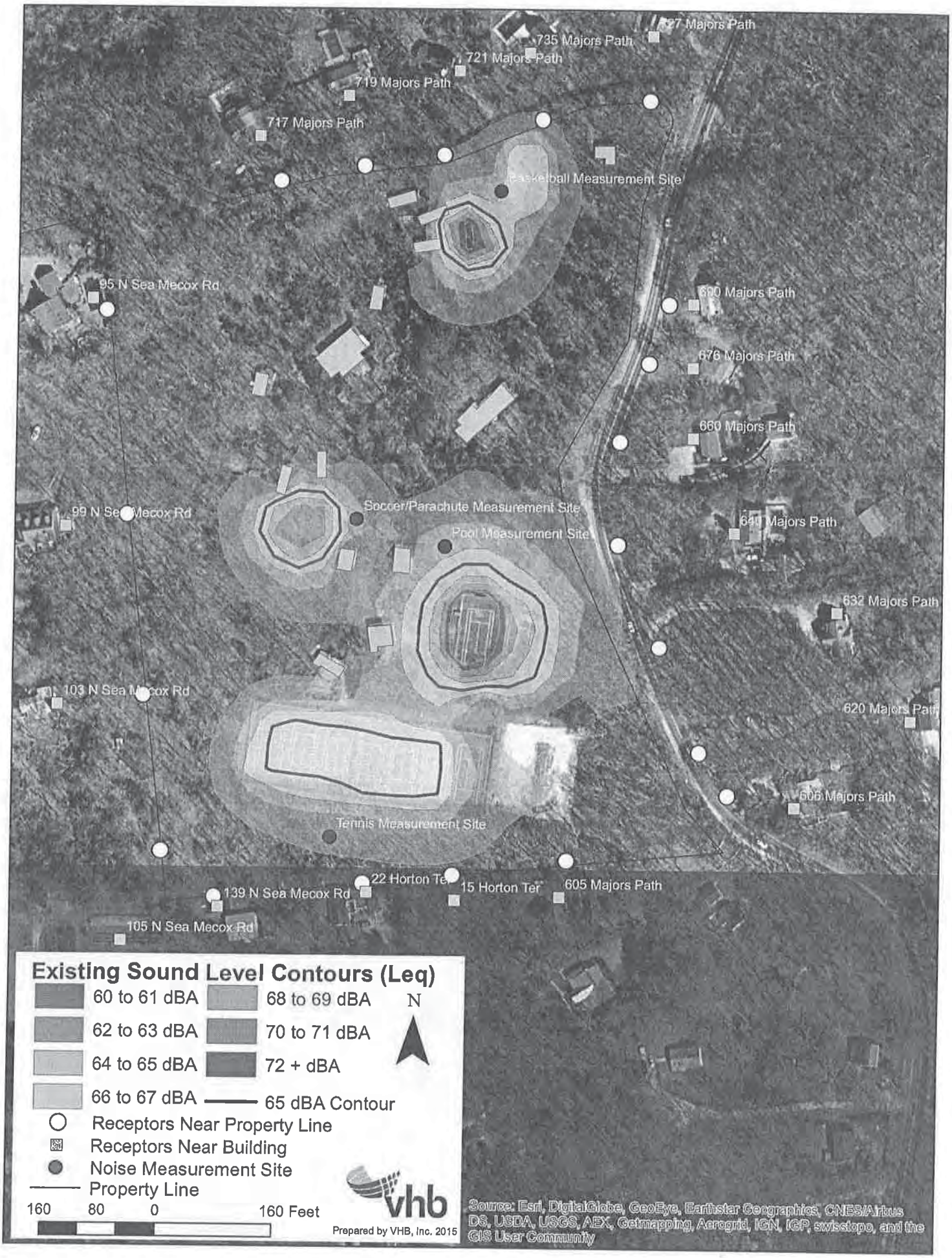
Figure 3. Noise measurement location for pool activity

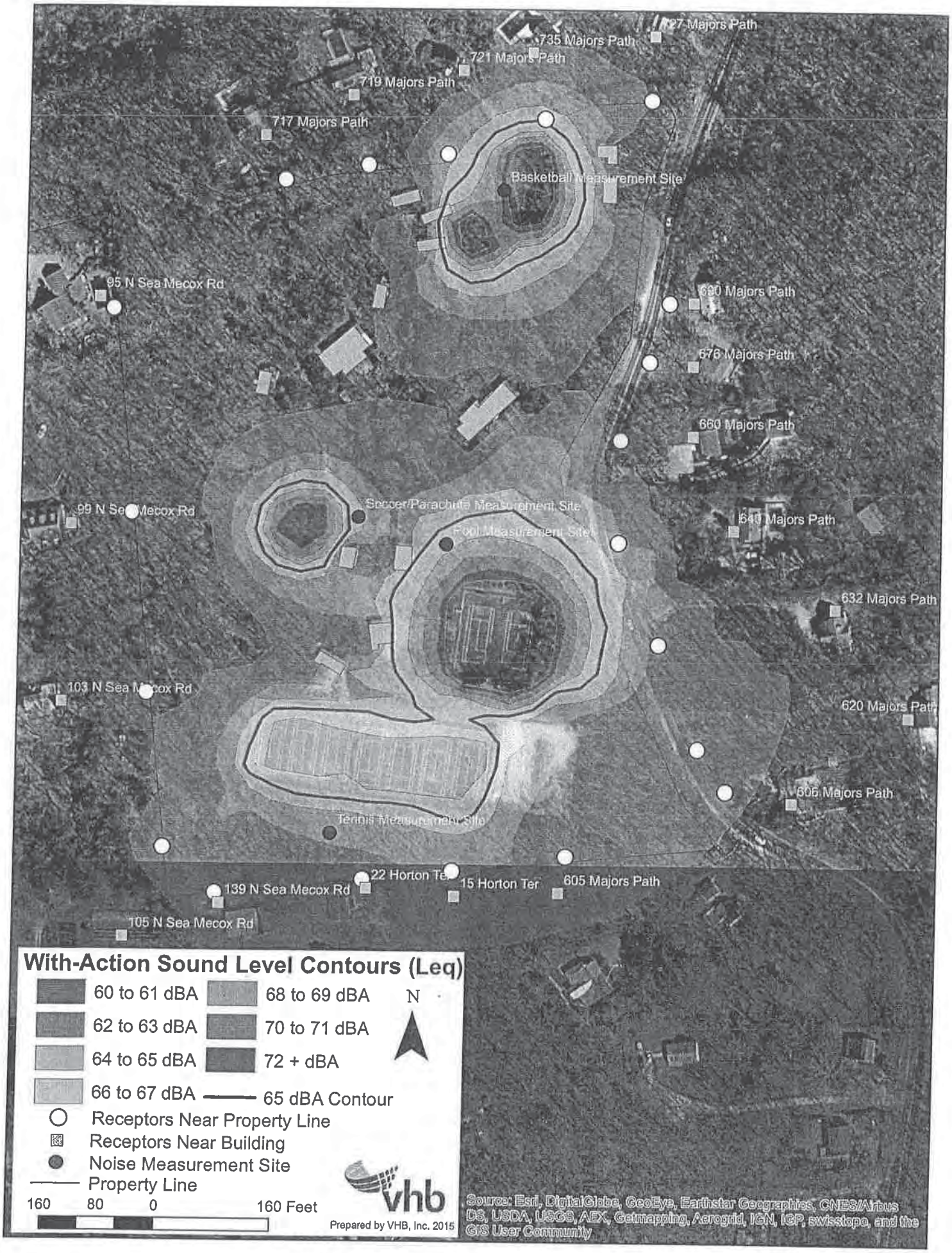


Figure 4. Noise measurement location for soccer and parachute activities

Appendix B

This appendix includes sound level contours for the existing and future with-action conditions at the camp.


727 Majors Path
735 Majors Path
721 Majors Path
719 Majors Path
717 Majors Path
Basketball Measurement Site
95 N Sea Mecox Rd
680 Majors Path
676 Majors Path
660 Majors Path
99 N Sea Mecox Rd
Soccer/Parachute Measurement Site
Pool Measurement Site
640 Majors Path
632 Majors Path
103 N Sea Mecox Rd
620 Majors Path
606 Majors Path
Tennis Measurement Site
22 Horton Ter
15 Horton Ter
605 Majors Path
139 N Sea Mecox Rd
105 N Sea Mecox Rd
Existing Sound Level Contours (Leq)
60 to 61 dBA
62 to 63 dBA
64 to 65 dBA
66 to 67 dBA
68 to 69 dBA
70 to 71 dBA
72 + dBA
65 dBA Contour
Receptors Near Property Line
Receptors Near Building
Noise Measurement Site
Property Line
N
160 80 0 160 Feet
vhb
Prepared by VHB, Inc. 2015
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community


735 Majors Path
721 Majors Path
719 Majors Path
717 Majors Path
Basketball Measurement Site
95 N Sea Mecox Rd
680 Majors Path
676 Majors Path
660 Majors Path
99 N Sea Mecox Rd
Soccer/Parachute Measurement Site
Pool Measurement Site
640 Majors Path
632 Majors Path
103 N Sea Mecox Rd
620 Majors Path
606 Majors Path
Tennis Measurement Site
22 Horton Ter
15 Horton Ter
605 Majors Path
139 N Sea Mecox Rd
105 N Sea Mecox Rd
With-Action Sound Level Contours (Leq)
60 to 61 dBA
62 to 63 dBA
64 to 65 dBA
66 to 67 dBA
68 to 69 dBA
70 to 71 dBA
72 + dBA
65 dBA Contour
Receptors Near Property Line
Receptors Near Building
Noise Measurement Site
Property Line
N
160 80 0 160 Feet
vhb
Prepared by VHB, Inc. 2015
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

APPENDIX B

Special Environmental Noise Study

Final Report

Special Environmental Noise Study

PROPOSED SOUTHAMPTON COUNTRY DAY CAMP
665 MAJORS PATH
SOUTHAMPTON, NEW YORK

Prepared for

SOUTHAMPTON DAY CAMP REALTY, LLC
85 Crescent Beach Road
Glen Cove, New York 11542

Prepared by

EEA, *Inc.*
55 Hilton Avenue
Garden City, New York 11530

August 2011

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EXECUTIVE SUMMARY

This report describes the potential operational noise impacts of the loudest proposed activity at the proposed Southampton Country Day Camp. It presents the results that depict the noise environment surrounding the facility under existing operations, estimates of the noise environment with the proposed operational and site changes, and reports the findings regarding the compliance with the provisions of the Town of Southampton Noise Code. This study was commissioned to address specific concerns of the Town of Southampton Planning Board.

This study evaluated the impacts of the activity in the camp with the greatest noise potential upon ambient noise conditions. Of all the planned activities, the proposed pool activity at the northwest section of the site has the greatest potential for a noise impact. A noise monitoring program documented ambient noise levels at the proposed site in Southampton. A noise monitoring program of children's activities at a similar pool facility as the proposed facility (located in East Hampton) was conducted to serve as a reference noise level. The long term environmental noise impacts of the proposed project resulting from the pool operation were assessed for conformance with the Town of Southampton Noise Code.

The study finds that the existing or ambient noise environment at the proposed Southampton Country Day Camp is well below the noise limits set in the Town of Southampton Noise Code. Noise from the proposed pool facility is not expected to cause an exceedence of the Town of Southampton Noise Code. Increases in noise levels at residences are not expected to exceed guidelines established by the New York State Department of Environmental Conservation (NYSDEC) with respect to noise impacts.

It is therefore concluded that the proposed pool facility in Southampton will be in full compliance with applicable Town noise regulations and NYSDEC noise guidelines.

1.0 INTRODUCTION

This report examines the potential impacts of the Southampton Country Day Camp in the Town of Southampton, New York on community noise levels resulting from its long-term operation by evaluating the planned activity that is easily the loudest -- the proposed pool in the northwest section of facility.

Noise pollution comes from numerous sources. Some sources are activities essential to the health, safety, and welfare of the town's inhabitants: noise from emergency vehicle sirens, from garbage collection operations, and from construction and maintenance equipment. Other sources, such as rail and traffic, stem from the movement of people and goods, activities that are essential to the viability of the area as a place in which to live and do business.

The noise impact assessment was performed by EEA consulting acoustical engineer Mr. Yeuk Moy under the direction of EEA's Principal Consulting Acoustical Engineer, Van M. Lee, Ph.D.

1.1 REPORT ORGANIZATION

The Noise Study report has been organized into seven sections. Section 2.0 provides a brief description of common noise terminology and presents the noise regulations and guidelines applicable to the project. Section 3.0 presents the results of noise monitoring which depicts the existing noise environment within the project area. Section 4.0 presents the estimated noise contribution from the proposed pool facility. The impacts of the proposed pool facility are summarized in Section 5.0. A discussion on additional mitigation measures are discussed in Section 6.0. And Section 7.0 is a list of bibliography referenced in the study. The resumes of the authors of this report have been appended.

2.0 NOISE FUNDAMENTALS

2.1 WAYS TO DEFINE AND MEASURE NOISE

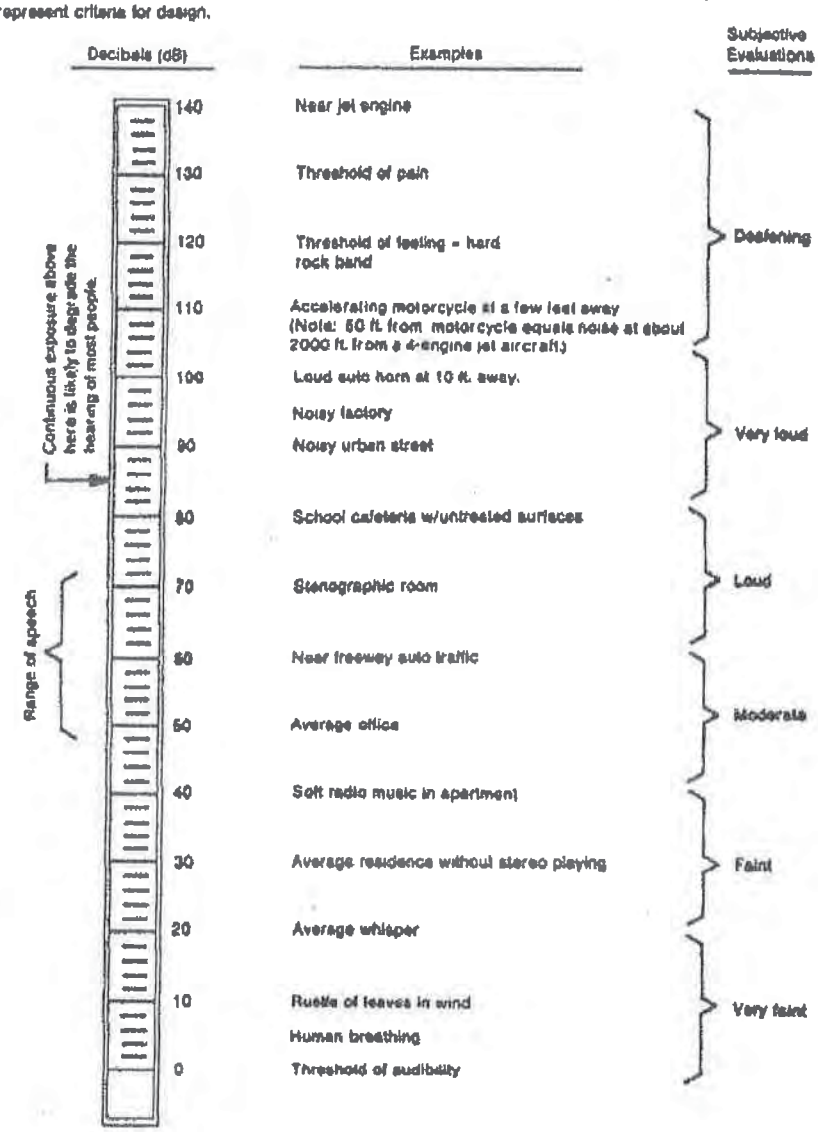
Noise is unwanted sound. Environmental noise is defined as the sound in a community emanating from man-made sources such as surface and air traffic, fixed industrial, commercial, transportation and manufacturing facilities or from natural sources such as animals, insects and wind. A common method of measurement that simulates the response of the human ear is the "A-weighted sound level" or "dBA". Since environmental noise is composed of sounds from moving as well as from stationary sources, it varies from moment to moment as well as from place to place. The procedure recommended by the EPA of evaluating sound pressure level at a given site is by averaging the instantaneous acoustic energy (corresponding to the A-weighted SPL) over the measurement period. The resulting measure is called the equivalent energy level (L_{eq}), which also has units of dBA, is the constant sound level that, in a given situation and time period (e.g., 1 hour, $L_{eq\,(1)}$, or 24 hours, $L_{eq\,(24)}$), conveys the same sound energy as the actual time-varying sound.

A few general relationships may be helpful in understanding the decibel scale. Doubling of the noise energy produces a 3-dBA increase in sound pressure level, (SPL). For example, doubling of the traffic volume on a roadway, keeping all other traffic characteristics fixed (i.e., speed, vehicle mix, geometry) will produce a doubling of energy, and hence a 3-dBA increase. A 3-dBA increase in SPL is, however, a barely perceptible change to the average human ear. A 5-dBA increase in SPL represents a perceptible change at which impact is typically said to occur. And a 10 dBA increase corresponds to a 10-fold increase in sound energy, but to only a doubling of perceived loudness.

Typical noise levels, which a person may encounter in his or her daily activities, are presented in Figure 2.1-1 [1].

Figure 2.1-1 Typical Noise Levels

Some common, easily recognized sounds are listed below in order of increasing sound intensity levels in decibels. The sound levels shown for occupied rooms are typical general activity levels only and do not represent criteria for design.



Human response to changes in noise levels depends on a number of factors, including the quality of the sound, the magnitude of the changes, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely

with the individual, as does the response to the perceived changes. However, the average ability of an individual to perceive changes in noise levels is well documented (see Table 2.2-1). Generally, changes in noise levels of less than 3-dBA will be barely perceptible to most listeners, whereas a 5-dBA change is typically perceived as a noticeable change in noise levels at which sporadic complaints may occur [2]. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Various government and research institutions have proposed criteria that attempt to relate changes in noise levels to community response. One commonly applied criterion for estimating response is incorporated into the community response scale proposed by the International Standards Organization (ISO) of the United Nations [3] (see Table 2.2 -2). This scale relates changes in noise level to the degree of community response and permits direct estimation of the probable response of a community to predicted change in noise level.

Table 2.2 -1 Average Ability to Perceive Changes in Noise Levels

Human Perception of Sound	Change (dBA)
Barely perceptible	2-3
Readily noticeable	5
A doubling of the loudness of sound	10
A dramatic change	20
Difference between a faintly audible and a loud sound	40

Table 2.2 -2 Community Response to Increases in Noise Levels

Change (dBA)	Category	Description
0	None	No observed reaction
5	Little	Sporadic complaint
10	Medium	Widespread complaints
15	Strong	Threat of community action
20	Very Strong	Vigorous community action

2.2 Noise Standards and Criteria

There is no federal noise regulation directly applicable to the proposed project.

2.2.1 New York State

There is no State noise regulation directly applicable to the proposed project. However, New York State Department of Environmental Conservation (NYSDEC) guidelines exist. A draft Program Policy Memorandum "Assessing and Mitigating Noise Impacts" (DEC-00-3), October 2008, states:

> "Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have the potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dB may require a closer analysis of impact potential ...".

This NYSDEC policy is consistent with the NYS Department of Transportation's relative noise impact criteria of a 6 dB increase.

2.2.2 Local Regulations

The Town of Southampton contains provisions in its Town Code Part II, §235-3 Noise Standards promulgating noise limits at or beyond the lot line of the property on which the noise is generated. From the hours of 7 AM to 7 PM, airborne sound is not to exceed 65 dBA.

2.3 Noise Impact Assessment Methodology

The methodology used to assess the noise impacts of the proposed facility changes on adjacent noise-sensitive receptors included the following steps:

- Identifying sensitive and representative receptor locations that have the greatest potential for being impacted by noise from the project operation;
- Determining existing noise levels through field measurements; ambient or background noise levels at Southampton site and noise levels associated with

greatest noise generator at the Hampton Country Day Camp in East Hampton, the children's pool activities.

- Characterize the noise associated with children's activity in a pool;
- Estimate the future property line noise levels with the proposed addition of the pool facility;
- Determining project impacts by comparing predicted Build noise levels with No Build noise levels, and project impact criteria; and
- Where necessary, examining and evaluating noise abatement measures for reducing or eliminating significant adverse noise impacts.

3.0 EXISTING CONDITIONS

3.1 INTRODUCTION

Figure 3.1-1 shows the location of the project site at 665 Majors Path, Southampton, NY. The dominant land uses immediately adjacent to the development site are residential uses to the north, west, south, and east.

The ambient background noise environment adjacent to the project site is dominated by noise from wind, rustling leaves with distant traffic noise.

Figure 3.1-1 Project Location



3.2 EXISTING FACILITY

The proposed site is on approximately 17.28 acres at 665 Majors Path. The site is used as a tennis club that is not currently operating.

3.3 NOISE MONITORING PROGRAM

Both the ambient noise monitoring program and the pool activities monitoring program took place on June 30th, 2011, from 8:00 AM to 3:30 PM. The following instrumentation, consistent with an ANSI S1.4-1971 Type II noise level meter, was used for this monitoring:

- Metrosonics db-308 Metrologger with 1/4 inch Microphone and Wind Screen
- Rion NC-73 Sound Level Calibrator
- Metrosonics db-3100 Metrologger with 1/8 inch Microphone and Wind Screen
- Metrosonics CL304 Sound Level Calibrator.

The sound level meters were programmed to store 1-minute measurements. Hourly L_{eq} values were computed from two hundred and forty (240) 1-minute L_{eq}s using the following formula:

$$L_{eq} = 10 \times \log_{10} \left[\frac{1}{240} \sum_{i=1}^{240} 10^{L_{eq}(1\,min)/10} \right]$$

The instruments were calibrated before and after the measurement period and operated according to manufacturer's instructions.

Weather information during the monitoring period was acquired from the local weather service. The weather during the monitoring period began at approximately 8 AM Thursday, June 30th, 2011 with generally clear skies. Temperatures ranged from the low-70's to the high-70's degree Fahrenheit during the monitoring period. Temperatures at the East Hampton noise measuring location reached into the 80's degree Fahrenheit. Aloft winds were light and variable, but increase to approximately 15 mph from the southwest by midday. Ground level winds were lighter and variable. Humidity ranged between 50% and 60%. Barometric pressure was fairly steady, from 29.92 inches to

29.94 inches. These conditions satisfy the meteorological requirement for the measurement of ambient noise per ANSI S1.2 (ANSI, 1962).

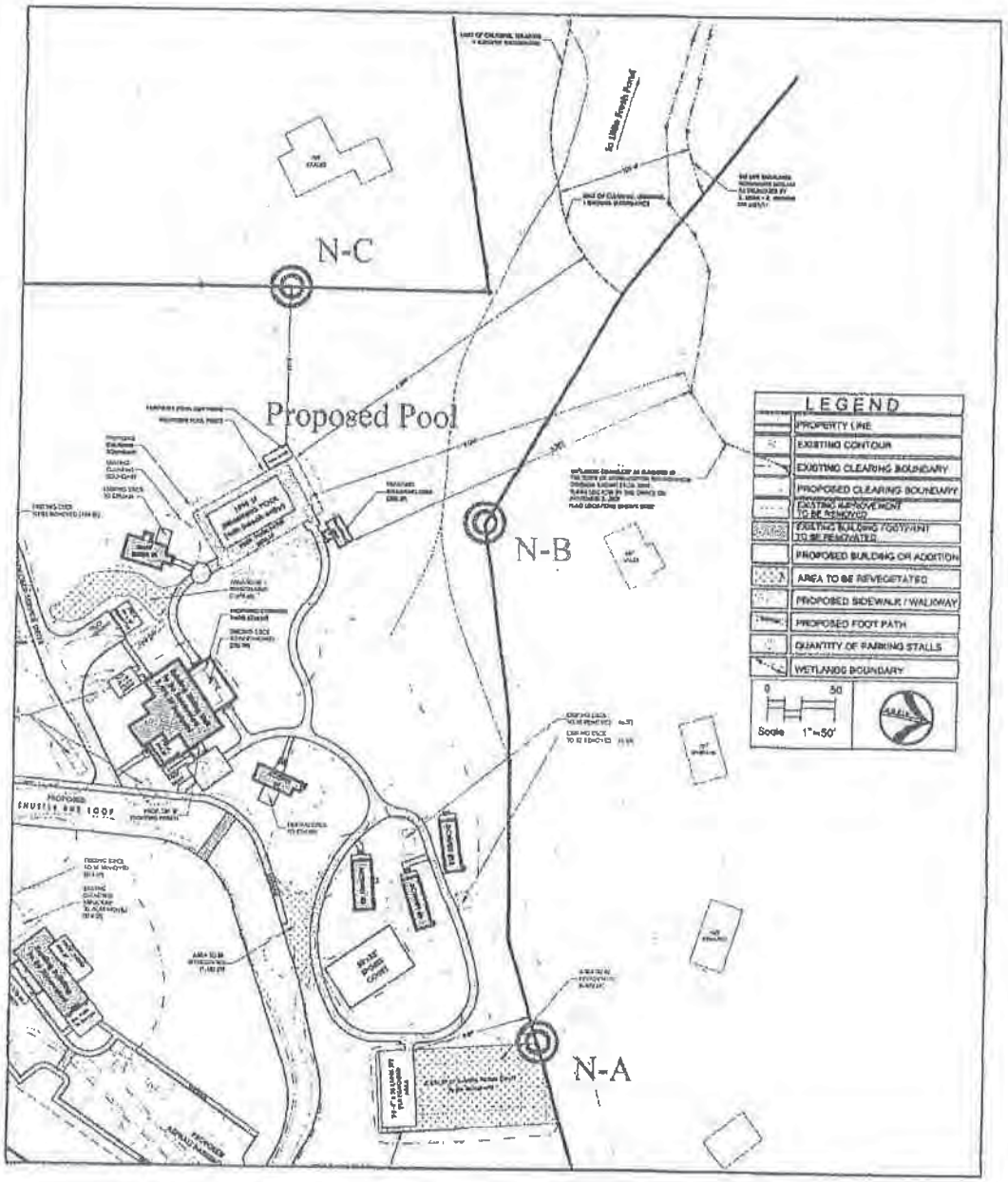
3.3.1 Ambient Noise Monitoring at Proposed Southampton Facility

An ambient noise measurement program was conducted Thursday, June 30th from approximately 8:00 AM to 3:30 PM, encompassing the proposed hours of operation (9 AM to 3 PM, Monday through Friday). Three continuous noise monitoring locations near the boundaries of the proposed site captured the ambient noise levels during the facility's proposed hours of operation. The purpose of the monitoring program was to determine and document the existing noise levels at those locations where the proposed project has the greatest potential for impact. Noise monitoring locations were chosen on the basis of proximity to residential land uses. The monitoring locations are listed in Table 3.3-1 and are shown in Figure 3.3-1.

Table 3.3.1-1 Locations and Land Use at Noise Monitoring Sites

Monitor Site	Site Location	Adjacent Land Use
N-A	North Property Boundary	Residential
N-B	North Property Boundary	Residential
N-C	West Property Boundary	Residential

Figure 3.3.1-1 Noise Monitoring Locations at Project Site



Monitoring Location N-A was located near the northern property line, approximately 200 feet west of Majors Path. Residences are immediately to the north. The proposed pool is approximately 415 feet to the west. The ambient noise environment is dominated by wind

and rustling leaf noise with some traffic noise from Majors Path. Distant traffic noise is audible in the background.

Location N-B was situated near the property line, directly between the location of the proposed pool and the nearest residence to the north. The proposed pool is approximately 100 feet to the south, approximately 175 feet from center of pool. This site is next to the common driveway between the site and the residences to the north and sits in a small valley. The ambient noise environment is dominated by wind and rustling leaves noise. Distant traffic noise is audible in the background.

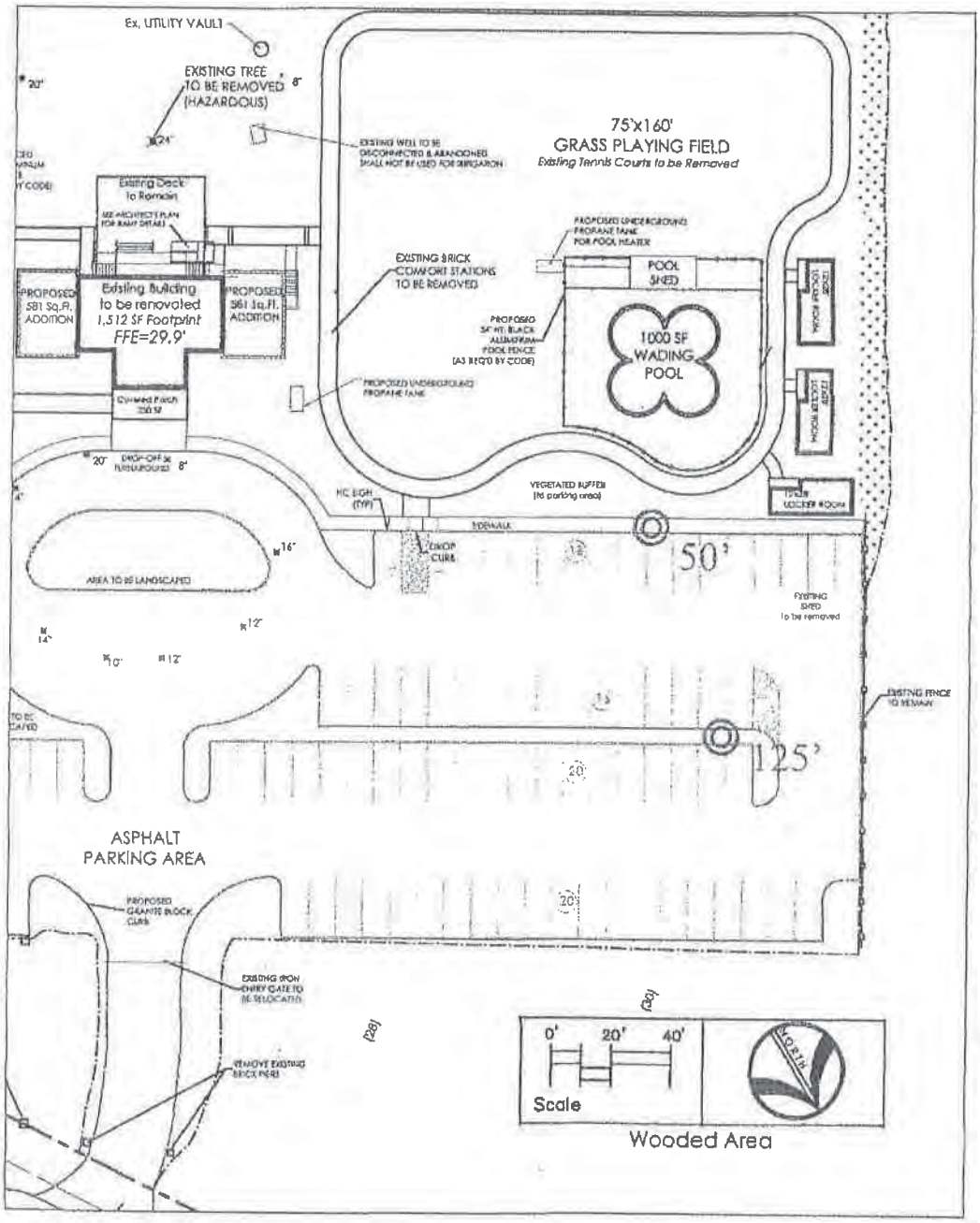
Monitoring Location N-C was located near the western property line, approximately 115 feet west, approximately 165 feet from center of pool, of the proposed pool and in direct line with the nearest residence to the west of the pool. The immediate area to the south is vacant and wooded. Like Location N-A, the ambient noise environment is dominated by wind and rustling leaves noise. Distant traffic noise is audible in the background.

3.3.2 East Hampton Pool Facility Noise Sampling

As requested by the Town of Southampton Planning Board, a noise measurement program of a similar pool operation was conducted to characterize the noise of children at play at a pool facility. Such a facility exists at the Hampton Country Day Camp on Buckskill Road, in East Hampton, NY. Monitoring was conducted from 9:00 AM to 1:30 PM.

Children pool activity noise levels were captured when the children were fully engaged in the pool. The children ranged from three years to four years of age. The number of children within the pool area was noted for each period. The monitors were located at a range of approximately 50 feet and 125 feet from the center of the pool across an open parking lot as shown in Figure 3.3.2-1.

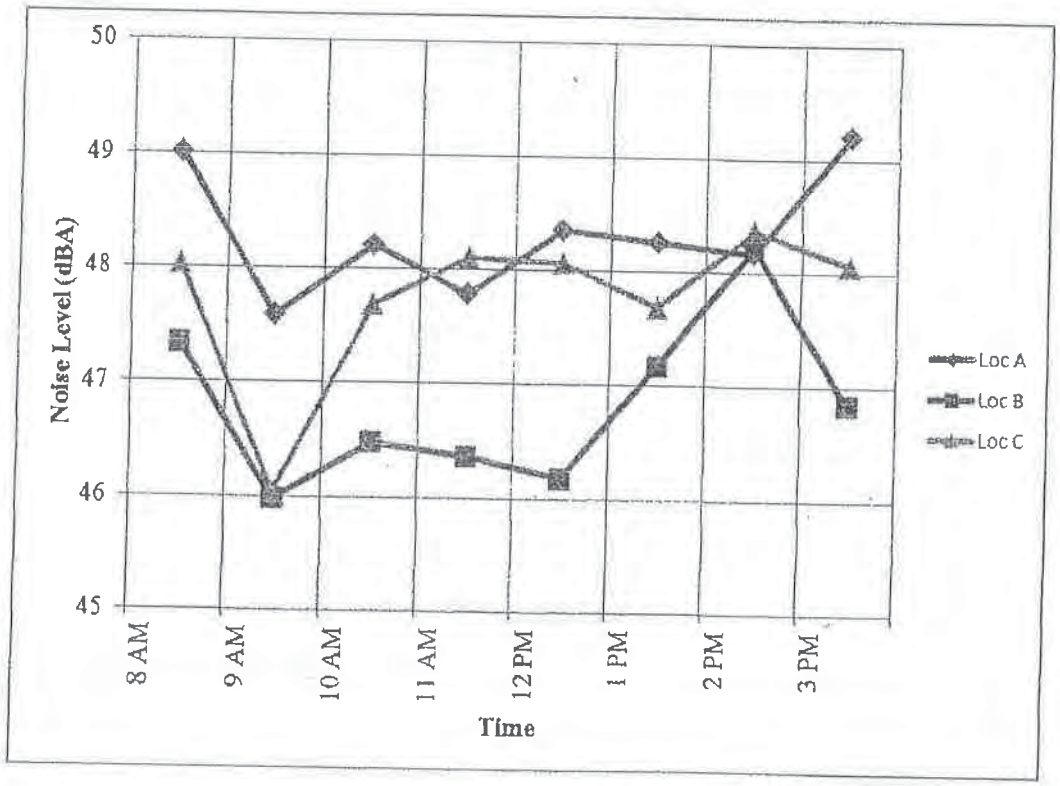
Figure 3.3.2-1 East Hampton Day Camp Noise Monitoring Location



3.4 Measured Southampton Project Site Property Line Noise Levels

The ambient noise levels at the proposed project site at 665 Majors Path, in Southampton, are very low, characteristic of a rural area. Noise levels at Location N-A ranged in a very narrow band between 48 dBA to 49 dBA, while noise levels at Locations N-B and N-C where in a narrow range from 46 dBA to 48 dBA as shown from Figure 3.4-1. The dominant noise sources at all locations were the wind, leaves rustling and distant traffic. Other man-made noises (e.g., distant leaf blower, hitching or unhitching of a trailer, starting of a car engine, etc) were noted, but were not a significant contributor to the ambient noise environment.

Figure 3.4-1 Hourly Noise Level in L_{eq} at Property Boundary Monitoring Locations



3.5 Measured Noise Levels at Hampton Country Day Camp Pool Facility

Children pool activity noise levels varied greatly with the number of children and their particular activity within the pool area. These factors were noted with each group. Table 3.5-1 provides the number of children in the pool area, the noise level captured for the

various periods at a distance of 50 feet and 125 feet, the calculated Reference Noise Level, and the noise decay rate per doubling of source-receptor distance. The reference noise level is the normalized noise equivalent of one child at a distance of 50 feet and will be used as a reference for predicting future noise levels. The noise decay rate is how much the noise level decreases with each doubling of distance. It should be noted that the noise levels captured included camp counselors engaging with the children in the pool area. There was at least of one counselor/lifeguard for every two children in the pool area. Furthermore, other day camp activities were audible during the noise measurements and may have contributed to the noise levels captured. However, the pool activity was the dominant noise source. For the purpose of this study, all of the noise levels captured have been conservatively attributed to the children in the pool area regardless of actual source.

Table 3.5-1 Measured Pool Noise Levels (L_{eq}) at Hampton Country Day Camp (dBA)

Children	Noise Level (50-ft / 125-ft)	Reference Noise Level	dB / Doubling of Distance
26	66 / 57	52.3	6.9
15	59 / 51	47.0	6.3
27	65 / 56	50.8	6.9

It can be seen that the children's noise level varied greatly from group to group due the number and energy level of the children. Activities observed included organized group singing to very active play as observed with the first group of 26 children.

4.0 FUTURE CONDITIONS

4.1 INTRODUCTION

This study focuses on the noise contribution of the proposed pool to be used and 3-4 year old children since it is the greatest potential noise source of all the planned activities. It is on this noise-generating source that this study is focused.

4.2 PROPOSED POOL OPERATIONS IN SOUTHAMPTON

The proposed pool is to be located in the northwest corner of the 665 Majors Path, Southampton site with hours of operation from 9 AM to 3 PM. As a general practice, less than 30 children utilize the pool at any one time. As presented in Table 3.5-1, the loudest activity occurred with the first group with a reference noise level of 52.3 dBA. Time in the pool is approximately 30 minutes out of the 1 hour period with the rest of the time changing into and out of their swimsuits and going to the next activity. Table 4.2-1 below presents the estimated noise levels at the monitored noise locations. Predicted noise levels at the monitoring locations have been be conservatively based on 45 children actively using the pool for 30 minutes, a reference noise level of 52.3 dBA during the active period, and a noise decay rate of 6.9 dBA per doubling of distance. The distance decay rate of 6.9 dBA per doubling of distance was over an open parking lot with negligible intervening vegetation or terrain. The Southampton site is a wooded area of uneven terrain and light undergrowth. However, no consideration was given for intervening terrain, intervening vegetation or intervening structures in the following noise estimates.

Table 4.2-1 Pool Noise Contributions (L_{eq}) at Property Boundary in dBA

Location	Pool Noise Contribution
N-A	45
N-B	53
N-C	54

Table 4.2-2 presents the pool noise contributions (L_{eq}) at the two nearest residences. It is assumed that the ambient noise at the two nearest residences is equivalent to that of their nearest monitoring location.

Table 4.2-2 Pool Noise Contributions (L_{eq}) at Residences in dBA

Residence	Distance To Pool (ft)	Nearest Monitor	Ambient Noise Level (dBA)	Pool Noise Level (dBA)	Difference (dBA)
Maer	260	N-B	48	49	1
Krauss	230	N-C	48	51	3

5.0 NOISE IMPACT ASSESSMENT

5.1 COMPARISON WITH TOWN OF SOUTHAMPTON NOISE ORDINANCE

The proposed pool operation is not expected to exceed the the Town Noise Code at the property boundaries, as summarized in Table 5.1-1. Noise levels can be expected in the low- to mid-50's dBA at the nearest property boundaries. These levels are over 10 dBA below the Town of Southampton Noise Code of 65 dBA.

Table 5.1-1 Comparison of Pool Noise Contribution and Town Noise Limit (dBA)

Location	Pool Noise Contribution	Town Limit	Exceedence
N-A	45	65	No
N-B	53	65	No
N-C	54	65	No

5.2 RELATIVE CHANGE IN NOISE LEVELS AT RESIDENCES

Exterior noise levels at the two nearest residences are conservatively expected to be in the neighborhood of 50 dBA as shown in Table 5.2-1. A change of 1 dBA to 3 dBA in noise level is considered barely perceptible by the typical person and does not approach the NYSDEC relative criteria of 6 dBA for a noise impact.

Table 5.2-1 Comparison of Existing Noise Levels and Pool Noise Contributions (L_{eq}) in dBA

Residence	Ambient Level	Pool Noise Level	Difference	NYSDEC Criteria	Exceedence
Maer	48	49	1	6	No
Krauss	48	51	3	6	No

5.3 POOL NOISE AT LITTLE FRESH POND

Residences on the far side of the Little Fresh Pond have expressed concern about noise from the proposed pool operation. The near shore of Little Fresh Pond is approximately 650 feet from the proposed pool. Expected noise level from the pool at the near pond edge is expected to be 35 dBA, approximately 10 dBA below existing ambient noise

levels. Residences have noted that that sound travels with very little decay over water, which is considered as an acoustically "hard" surface with a smaller decay rate of 3 dB with doubling of distance. Nonetheless, the additional distance crossing the pond would reduce the pool noise contribution further below 35 dBA.

5.4 Summary of Impacts

The expected noise associated with the proposed pool facility is not expected to approach, much less exceed, the Town of Southampton Noise Code. Increases in noise level associated with the proposed pool facility are not expected to impact the nearest residences according to NYDEC's relative impact criteria. No further noise mitigation is required or recommended.

6.0 ADDITIONAL NOISE MITIGATING MEASURES

While noise from the proposed pool has been determined not to exceed any regulations or standards or cause an impact, and no mitigation measures are required, additional mitigations measures may be considered.

A possible mitigation measure is an intervening noise barrier erected along the sides of the pool between the pool itself and the nearest residences. Such a barrier - whether a solid wall (in lieu of a the typical chain-linked fence), a berm, or a wall on top of a short berm - 3 feet in height, can be expected to provide a minimum of 5 dBA insertion loss and reduce the children's pool noise contribution to a level near the existing ambient noise levels. Such a barrier must be solid since gaps of as little as 15% of total surface area can render the entire barrier useless.

7.0 BIBLIOGRAPHY

[1]. Egan, M.D. 1972. *Concepts in Architectural Acoustics*. McGraw-Hill.

[2]. Bolt Beranek and Newman. 1973. *Fundamentals and Abatement of Highway Traffic Noise*. NTIS PB-222-703.

[3]. ISO 150/TC43. 1969. *Noise Assessment with respect to Community Response.*

[4]. Code of Federal Regulations, Title 23, Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.

VAN M. LEE
PRINCIPAL CONSULTING ACOUSTICAL ENGINEER

Education:

Ph.D., New York University - Noise and Acoustics

M.S., Kansas State University - Applied Mechanics

B.S., National Taiwan Chung-Housing University - Applied Mathematics

Professional Affiliations:

Institute of Noise Control Engineers (Board Certified)

Acoustical Society of America

RESPONSIBILITIES:

- Directing Noise Monitoring and Noise Impact Assessments
- Directing Air Quality Impact Assessments

SUMMARY OF EXPERIENCE:

Dr. Lee has been EEA's Principal Consulting Air Quality and Noise Engineer for over 20 years. He has over 35 years of experience in the environmental sciences. Dr. Lee has managed numerous projects in diverse related disciplines, with particular emphasis on noise and vibration', air quality, and environmental permitting for energy facilities, transportation-related facilities and fixed facilities. He has been engaged by DHS/FEMA as REP-10 Subject Matter Expert in outdoor sound propagation since the 1980s and as expert witness in U.S. Atomic Safety and Licensing Board and Canadian environmental review board hearings for private industries and government agencies.

Noise Control Studies of HVAC Condensers and Emergency Diesel Power Generators. Verizon Wireless. As acoustical consultant to the Village of Garden City, NY. 2010.

F/DEIS Lighthouse Project, Uniondale, NY. Reviewed and conducted noise impact assessment of major development with Mitchell Field Mixed-Use Zone development considering onsite HVAC systems, special events (concerts and games), and offsite induced traffic noise impacts. 2010.

F/DEIS Noise Impact Assessment of Major Expansion of the Hempstead Resource Recovery Facility. Covanta Energy Company. Conducted impact assessment including induced truck traffic and on-site trucking noise and operation of expanded facility operation per NYSDEC Guideline, Part 360, and local ordinance. 2007-2010.

DGEIS Heartland Town Square Project, Islip, NY. Conducted noise measurements and evaluation of development HVAC systems and induced traffic noise impacts using TNM computer model. 2006-10.

Noise and Air Quality Impact Assessment of, Long Island Jewish Hospital, Hillside, NYC. Conducted air quality and noise impact assessment of proposed facility modernization program in Hillside, Queens per NYCEQR, NYSEQR and DASNY requirements. 2001-09.

VAN M. LEE

HPD-HUD Development Noise Assessments in Bronx, Brooklyn, Manhattan, Queens, and Staten Island, NY. Conducted ANSI noise measurements and studies to determine suitability of site for residential development under HUD guidelines. 2002-2009.

Noise Impact Assessment of Gowanus Facility Upgrade. NY City Department of Environmental Protection. Conducted field noise monitoring and impact assessment at three work sites with FTA/FHWA construction noise model including induced truck traffic per NYCEQR and new NYC Local 113 provisions on construction. 2006-08.

EIS Noise Impact Assessment for a Rail C&D/MSW Transfer Station in NYC. Conducted impact assessment including induced truck traffic and on-site operations of a C&D and MSW rail transfer station in Maspeth, Queens per NYSDEC Guideline, Part 360, and the new NYC Local Law 113. 2007.

Noise and Vibration Impact Assessment – Far West Midtown Manhattan Rezoning – No. 7 Subway Extension. MTA/NYCPD. Contract No. CM-1189R/C26501. Conducted Noise and Vibration assessments in support of GEIS for a proposed extension of the No. 7 train to the Westside of Manhattan, a multi-use stadium, expansion of the Convention Center, and rezoning of the Hudson Yards Area with regard to FTA, SEQRA, and CEQRA guidelines. 2002-04.

Environmental Noise Assessment of Proposed Former Revere Sugar Site Rezoning, Erie Basin, NY. Erie Basin Marine Associates. Conducted technical review of proposed rezoning of the former Revere Sugar site from Heavy Manufacturing (M-3) to Residential. Assessed the potential noise impacts to proposed residential development from existing Erie Marine Basin marine transport and pier operations. Examined waterfront operations and equipment and marine traffic noise from barges, tugboats, and water taxis with particular focus on the use of fog horns. 2006.

Warehouse Loading Bay Noise Impact Assessment, Far Rockaway, NY, Federated Jeans/ E & Y Development. Conducted assessment of potential noise impacts as a result of loading and unloading activities from proposed warehouse per NYCEQR and NYC Manufacturing District Performance Standards. 2003.

Noise and Air Quality Impact Assessment of Bus Facilities in NYC. NYC Transit Authority. Conducted air quality (CO and PM) and noise impact assessment of proposed bus maintenance and storage facilities in Manhattan, Queens, Brooklyn, and Staten Island per NYCEQR and NYSEQR requirements. 2000-02.

LIE/Cross Island Parkway Interchange Improvement Project, NYSDOT PIN 0228.67. Performed detailed and final noise barrier design using TNM, and modified STAMINA/OPTIMA 2.0. 1997 - 2003.

Long Island Expressway Service Roads, SOBE Interchange Improvement Project, NYSDOT PIN 0228.28. Construction support services. Investigate community concerns and respond to Department requests 1993-96

YEUK C. MOY
CONSULTING ACOUSTICAL ENGINEER

Education:

M.S., State University of New York (SUNY) at Stony Brook – Certificate of Graduate Studies Environmental and Waste Management

B.S., Carnegie-Mellon University - Metallurgical Engineering, and Material Science and Engineering and Public Policy

SUMMARY OF EXPERIENCE:

Yeuk C. Moy has been a consulting acoustical engineer at EEA, Inc. for over 10 years. He has participated in numerous environmental projects related to transportation and transit systems and facilities and proposed new residential and commercial development projects.

DETAILED RELEVANT EXPERIENCE

HPD-HUD Development Noise Assessment New York City, NY. Conducted numerous noise studies determine suitability of a site in all five boroughs of NYC for residential development under HPD and/or HUD noise guidelines. 2002-2008.

Noise Impact Assessment of, Long Island Jewish Hospital, Hillside, NYC. Conducted air quality and noise impact assessment of proposed facility modernization program in Hillside, Queens per NYCEQR, NYSEQR and DASNY requirements. 2001-08.

Noise Screening for East 11th Street Project, LES Peoples Mutual Housing Assoc. Inc. / NYCHPD, Manhattan, NY. Conducted Noise Screening as per NYC's C.E.Q.R. Technical Manual. Screened for potential Noise impacts for a low-income housing project with facilities for homeless recovering from mental illness. 2010.

Noise and Vibration Impact Assessment - Senior Housing Projects - Town of Oyster Bay, Nassau County, NY. Conducted Noise and Vibration assessments in support of proposed senior housing developments adjacent to LIRR with emphasis on ground vibrations from train passbys and noise control designs and vibration isolation measures for mitigation. 2004-05.

Noise and Vibration Impact Assessment – Cantiague Commons Senior Housing Projects – Town of Oyster Bay, Hicksville, NY. Conducted Noise and Vibration assessments in support of proposed senior housing developments adjacent to the LIRR with emphasis on ground vibrations from train passbys and noise control designs and vibration isolation measures for mitigation. Documented peak train-passby vibration spectra and site decay characteristics and peak indoor-outdoor train-passby noise levels. 2004-06.

YEUK C. MOY

Noise and Vibration Impact Assessment - Tappan Zee Bridge/I-287 Corridor MIS/DEIS, Rockland and Westchester Counties, NY. NYS Thruway Authority and MTA/Metro-North Railroad,Contract No. D213123. Performed Fatal Flaw and Levels 1 & 2 Screening Analysis of noise and vibration impact per FHWA and FTA guidelines and NY State regulations. Conducted generic noise and vibration assessment using Noise Impact Index and Vibration Impact Index and Ranking throughout the 30-mile project corridor for 15 project alternatives with combinations of highway, bus, commuter and LRT elements. 2003-Present.

Bridge Widening and Intersection Improvement Project at Hospital Road and NYS Route 27, Suffolk County, NY. Town of Brookhaven Job ID OT2384. Performed Air Quality, Noise and Ground Water Screenings in accordance with 40CFR51 and 40 CFR93 and NYSDOT/NYSDEC requirements. 2009 - 2011.

No. 7 Subway Extension – Far West Midtown Manhattan Rezoning Draft GEIS, New York and Queens Counties, NY. NYCT/NYCEDC CM-1189R/C26501. Conducted Noise and Vibration assessments in support of GEIS for a proposed extension of the No. 7 train to the Westside of Manhattan, a multi-use stadium, expansion of the Jacob Javitts Convention Center, and rezoning of the Hudson Yards Area. Conducted ambient noise monitoring and vibration sampling within the study area. Assessed construction and operational impacts with regard to FTA, SEQR, and CEQR. 2002-04.

Noise Barrier Design for CIP/LIE Interchange Improvement Project, Queens County, NY. NYSDOT PIN 0227.86. Performed detailed and final noise barrier design using a modified STAMINA/OPTIMA 2.0 as well as the Tilted Parallel Barrier Program. 1996-2002.

Rt. 114 Traffic Calming Study, Suffolk County, NY. NYSDOT PIN S118.04. Performed environmental assessment per NYSDOT PEG and attended public meeting in support of the project. 2000.

DPW Animal Shelter Noise Control, Town of North Hempstead, NY. Assisted DPW Commissioner in conducting a noise control design study. Investigated noise complaint of dogs in the North Hempstead Animal Shelter. Conducted an indoor and outdoor noise study to assess the irregular and sporadic noise source to include octave band spectra sampling and RT60 reverberation analysis of building interior. Evaluated and recommended various noise mitigation measures to include noise barriers, enclosure, and surface treatment. 1997.

Noise Control Engineering, LLC

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BILLERICA MA 01821-3445
PHONE: 978-670-5339
FAX: 978-667-7047
E-mail: nonoise@noise-control.com

JOB MEMO

TO:	**Celeste Frank, President**
COMPANY	Little Fresh Pond Association, LLC
FROM:	Michael Bahtiarian, INCE Bd. Cert. {mikeb@noise-control.com}
DATE:	February 23, 2017
SUBJECT:	**Peer Review: Southampton Tennis Club & Camp Noise Study**
CC:	Foster Maer

INTRODUCTION

Noise Control Engineering, LLC (NCE) has been retained by the Little Fresh Pond Association, LLC, Southampton, New York to perform a peer review of a noise study prepared by VHB Engineering, Surveying, and Landscape Architecture, P.C. (VHB) of the proposed changes at the Southampton Day Camp located at 665 Majors Path in Southampton, New York. As part of this peer review, NCE has reviewed the Town of Southampton's noise ordinance (Reference 1), the New York State Department of Environmental Conservation (NYSDEC) noise policy (Reference 2) and most importantly the VHB noise study (Reference 3).

CRITICAL COMMENTS

NCE has critically reviewed the Reference 3 noise study and provides the following seven comments below. The comments are provided in no particular order.

1. NCE has reviewed the stand-alone noise study[1] (Reference 3) which includes two appendices. The report is missing what NCE would classify as usual supporting data and information for this type of study and what is usually found in similar studies of this nature. These items are as follows:
    - Specific conditions during existing noise measurements:
        - Specific time of day and duration of the measurements
        - Description of the activity during the measurements
        - Photographs of the activity (see also comment 2)
        - Graphs and or a summary of all sound pressure level data (see comment 3)
    - Specific inputs to the acoustic (Cadna/A) noise model:
        - Source sound levels in octave bands
        - Source sound level modeling details, including source types (area or point)

[1] NCE understands this was extracted by VHB from there DEIS Report, dated April 2016 and revised September 2016.

- Acoustic spreading assumptions
- Acoustic ground absorption assumptions
- Wind and meteorological assumptions

2. Section 3.3 of the VHB noise study notes that sound level measurements were performed on August 14, 2013 (4 years ago) and August 18, 2015. NCE accessed the Southampton Camp and Club website (reference 4) and understands from this public information that the last day of camp is on/around August 18 of each year. NCE questions whether data from the last day of camp (as done in 2015) or 4 days before the last day of camp (as done in 2013) provides representative peak activity noise levels.

3. Table 3 of the VHB noise study provides existing (source) sound pressure level measurement results. For each of six events (five camp activities and ambient) one value of sound pressure level (SPL) using the L_{EQ} metric in A-weighted decibels (dB(A)) was provided. These values are meant to represent the (energy) average SPL during the measurement period. However, the actual minute-by-minute sound pressure levels are likely to be significantly higher and lower than the L_{EQ} values presented in the report. The NYSDEC guideline specially states that, "*These maximum and minimum SPLs should be given in the noise analysis. The time interval over which the Leq is measured should always be given.*"[1] None of this information is supplied. Most importantly, if the maximum SPL for the noted activity (particularly at the basketball court) is even 1 dB higher than the L_{EQ}, the noise study would show an excess to the Town of Southampton noise regulations.

4. Table 3 of the noise study also provides a documentation of measured existing ambient SPL. The table states that the ambient L_{EQ} is 58 dB(A). Comment #3 above applies to the ambient conditions as well as the operational SPL data, but to be conservative, the lowest value is of interest for ambient conditions. The ambient SPL of 58 dB(A) is high for such a suburban (nearly rural) area that is found in Southampton, NY. Measurements by our firm for daytime suburban/rural areas give SPL values as low as 40 dB(A) during the day. Further, NCE believes that if a lower ambient SPL were used, the computations would be markedly different. While the use of the ambient SPL within this study is not specifically described in the report, NCE believes it is used as a background SPL within the acoustical model. This would mathematically limit any sound projection to nothing lower than the ambient SPL and therefore, this would greatly reduce the sound level increases given in Table 4.

5. NCE has concerns regarding the accuracy and reporting of the "With-Action" sound pressure levels given in Table 4 and Appendix B. With the information available in Reference 3 and other materials from Little Fresh Pond Associates, it appears that the new basketball court is potentially less than 30 feet from the property lines from a few of the northern abutters, particularly 717 Majors Path. Using the distance of 30 feet from the proposed basketball activity, the projected sound level is just over the 65 dB(A) limit. Our

[1] Reference 2, Section V (page 7). Further, this requirement is also made by VHB in the subject noise study in Section 2.1 (page 5).

own computations show that there is a significant increase in sound level as well due to the fact that there is the introduction of a "new source" of sound (i.e. the new basketball court).

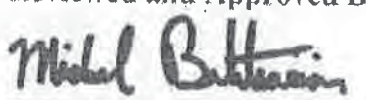
6. The VHB evaluation has failed to include other potential noise producing modifications to the Southampton Camp property. Section 1 of the VHB noise study states there will be renovations and replacement of cottages, changing sheds, a welcome center and an extension to the dining hall. To be complete, any new mechanical systems should be included in the noise study. There is also a statement regarding change in vehicular circulation and increase in passenger buses from a quantity of 16 to 22 vehicles. While the sound of these vehicles on the local roads are not part of the noise impact, sound from idling buses during the morning drop-off and afternoon pick-up periods should have also been included in the study.

7. Appendix A provides photographs of the noise measurement locations. Figures 1 and 2 show no campers taking part in any activities. The activity level at the pool is not distinguishable from the Figure 3. In fact, the pool looks relatively empty. Figure 4 shows about six campers taking part in the parachute activity. Table 3 provides specific numbers of campers as follows: 12 campers playing soccer, 25 campers playing tennis, 7 campers playing basketball and 14 campers playing the parachute game. This level of activity is <u>not</u> substantiated through these photographs.

SUMMARY

It is NCE's professional opinion that the VHB noise study does <u>not</u> completely and properly assess the Southampton Day Camp noise impact. The report is brief on supporting details with respect to the measured data and noise modeling inputs. For the measured SPL, the report failed to document the time of day, duration and specific activity levels. Also, the measured data appears to be within the last four days of the Camp's season. Further, this report only offers average (L_{EQ}) data, but as noted by NYSDEC noise impact guidelines it should have included minimum and maximum noise levels. NCE believes the ambient sound pressure level is too high given the context. The with-action sound levels may be under reported for the northern abutters due to accurate location of the sources relative to the property line and the excessive ambient may overestimate the existing noise predictions. Lastly, other modifications at the camp have not been included.

Reviewed and Approved By:



Michael Bahtiarian, INCE Bd. Cert.
Board Certified Acoustical Engineer by the Institute of Noise Control Engineering (www.inceusa.org)

REFERENCES

1. Town of Southampton, NY Noise Ordinance, dated March 11, 2008.
2. New York State Department of Environmental Conservation (NYSDEC), Program Policy, "Assessing and Mitigating Noise Impacts", Issued, October 6, 2000, revised February 2, 2001.
3. VHB Engineering, Surveying and Landscape Architecture, P.C. Noise Impact Assessment, "Noise Study for Southampton, Tennis Club and Camp, dated February 8, 2017.
4. http://www.southamptoncc.com/future-families/dates-fees/, accessed by NCE on February 22, 2017.

C26

March 7, 2017, 2017

Planning Board of Southampton
116 Hampton Road
Southampton, NY 11968

RECEIVED
MAR - 7 2017
TOWN PLANNING DIVISION

re: Southampton County Day Camp Expansion

Members of the Planning Board:

It seems to me that the owner of the Southampton County Day Camp (SCDC) has by definition said that his SCDC is not appropriate for its present location at 665 Majors Path.

C26-1

In the DEIS, he states that were he to abide the the 100 foot buffer proscribed in the Southampton Town Code, his camp would not be "feasible" and that is exactly what we have been saying.

The area in which his camp is located cannot support a camp of this size. We are caught up in one part of the Cinderella story - the part where the mean step-sister (Mr. Jacobs) can't fit her big foot into the fragile glass slipper (Little Fresh Pond). We need Prince Charming (The Planning Board) to see our real value and come to our aid.

We are a small neighborhood group, and Little Fresh Pond is small, but we hope you will understand that preserving our resources and the quality of life for citizens is a crucial issue for now and for the future.

With best regards,
Ann Barzola
111 Little Fresh Pond Road
Southampton, NY 11968

Patricia Boudreau-Sullivan

From: ann welker [aew63@yahoo.com]
Sent: Tuesday, March 07, 2017 8:50 PM
To: Patricia Boudreau-Sullivan
Subject: Southampton Country Day Camp

C27

Dear Mr. Finnerty and Members of the Planning Board,

Having spoken on behalf of Trudy and Steve Ainge of 142 Little Fresh Pond Rd. at the January Planning Board Meeting, and then again on behalf of the Eastern Long Island Chapter of Surfrider Foundation at the February meeting , I hesitated to write during the public commentary period. However, I have decided to go ahead and do so at the risk of repeating myself because I feel so strongly that the if the Southampton Country Day Camp is allowed to continue to operate that not only its impact on Little Fresh Pond , but also its impact on the surrounding neighborhood MUST be mitigated as much as possible.

Therefore, I will repeat my request to implore you to please limit not only the number of campers, but ALSO the number of counselors living on site to a number that is sustainable .. And even more importantly to mandate that IF the camp is to be allowed to continue to operate that the septic system MUST be upgraded to the most advanced, state of the art , commercial, de-nitrifying system available, exponentially superior to the system presently in place. Lastly, the vast majority of the acreage of the camp has been left in its natural state; lot clearing for playing fields, or more tennis courts in the future must be limited as much as possible. C27-1

Thank you so very much for your time and attention to the protection of this little jewel of an ecosystem that we have been entrusted to act as guardians of in the face of the pressure of development.

Sincerely,
Ann Welker

RECEIVED
MAR - 8 2017
TOWN OF SOUTHAMPTON

Charles F. Guilloz
103 North Sea Mecox Rd.
Southampton, NY 11968
631-283-6680

C28

March 7, 2017

RECEIVED
2017 MAR -7 PM 1:01

Southampton Town Planning Board
116 Hampton Road
Southampton, NY 11968

Re: Southampton Camp & Club on Major's Path

To Whom It May Concern:

This letter is in regard to my opposition to the plans for the expansion of the existing Camp & Club on Major's Path. Currently, there are wooded areas on the property that serves as a shield for the noise and cover for the surrounding houses for the people living in the area. The removal of trees and vegetation would change that drastically for the worse, if more building and development is permitted on this site.

C28-1

The expansion of the number of counselors, staff and children will also be of concern to the residents of the area. The 'neighborhood noise' is hard to control and loud speakers, like those now used, does not help.

I understand that the pond is to be used this year for canoes, kayaks, etc. I am also opposed to this as sound travels long distances around the pond. In addition, the pond's health recently has not been good with virus bacteria reported last year.

C28-2

Our concerns are that should this expansion be granted, the increase in numbers of staff and children, will become a burden to us and our lovely wooded area and pond will lose the quality of life we enjoy .

Sincerely,

Charles F. Guilloz

Charles F. Guilloz & Family

CC PB

C29

Jacqueline Fenlon

From: Celeste2010 [celestefrank2010@yahoo.com]
Sent: Tuesday, March 07, 2017 3:37 PM
To: Patricia Boudreau-Sullivan; Clare Shea; Jacqueline Fenlon
Subject: Public Comment - DEIS Southampton Day Camp
Attachments: Planning Board_1.26.17.pdf; ATT00001.htm



Dear Planning Board,

Please accept the attached documentation that outlines our opposition to the proposed Southampton Day Camp to be located at 665 Majors Path, Southampton NY. My husband and I live at 735 Majors Path. Since Southampton Day Camp bought the property, we have been subject to continuous noise. To be clear, it is not just a few children here and there. It is continuous noise from outdoor sporting events and playgrounds, massive 15' round sand boxes, Thomas the Train whistling and counselors yelling " WHOO HOO, GREAT SHOT, GOOD GAME, DO IT AGAIN, NO PUSHING, ANYONE NEED TO USE THE RESTROOM, GREAT KICK, GOAL, GET IT, GET IT, BRING IT DOWN, NO TOUCHING, RUN, RUN RUN." And, on and on all day long.

C29-1

I've made recordings of this noise from inside my home. I bought a decibel meter. And, the readings are over 80 decibels inside our house!! It is unbearable.

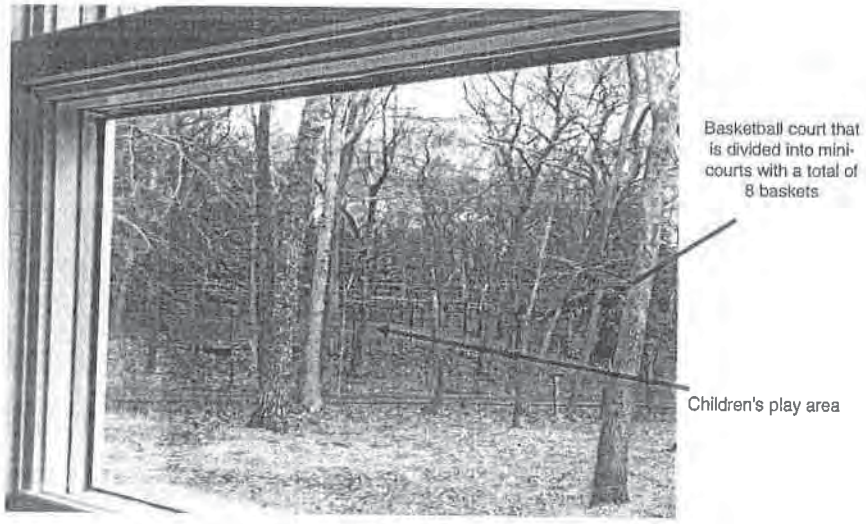
You have the power to stop this. Please consider the impact on the folks who live and love this town. We are your neighbors.

Thank you for all your hard work and everything you do for Southampton.

Sincerely,

Celeste & Jonathan Scott Frank
735 Majors Path
Southampton, NY 11968

The formerly abandoned North Tennis Court, which is now the Children's Play area, is just outside our window. On one side of it are 2 massive sandboxes for the youngest kids, and on the other is a basketball court with 8+ nets. We hear continuous noise (yelling, shouting, hooting, whistling) **INSIDE** our home all day long. It wakes us in the morning and does not stop. We have measured the noise with a decibel meter and throughout the day it fluctuates between 83 and 85 dcbs **INSIDE** the house. This is well above the noise ordinance, even for for *outdoor* noise.





Here is how it looks during the summer

In addition to the general noise from all the kids and activities, the counselors chant *"louder, louder"* all day long.

We also hear Thomas the Train's horn and bell as the children are shuttled back and forth to the different activities all day long.

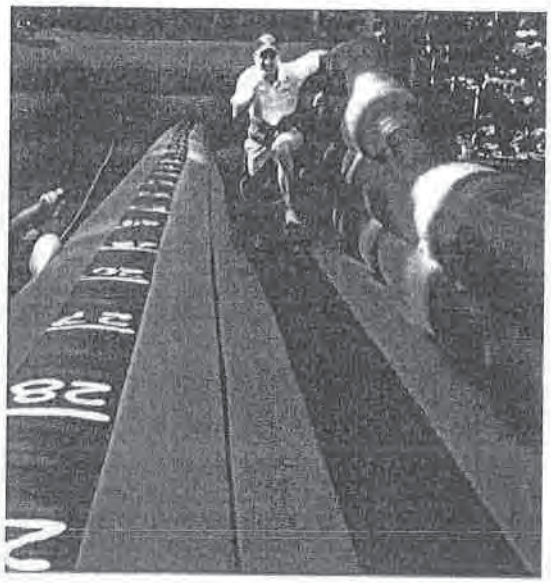


Throughout the day, Thomas the Train toots his horn as children are shuttled continuously to & from activities



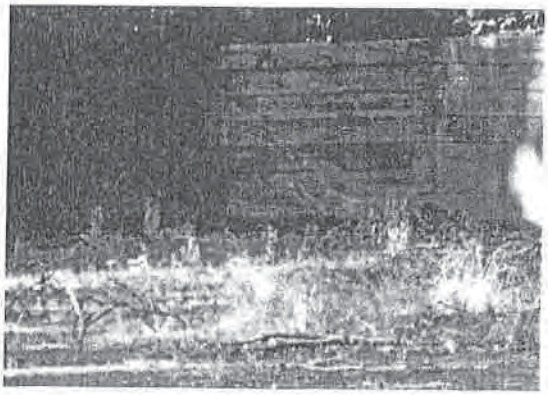
We also can clearly hear the random amplified music, and the generators that keep the bouncy houses full with air.

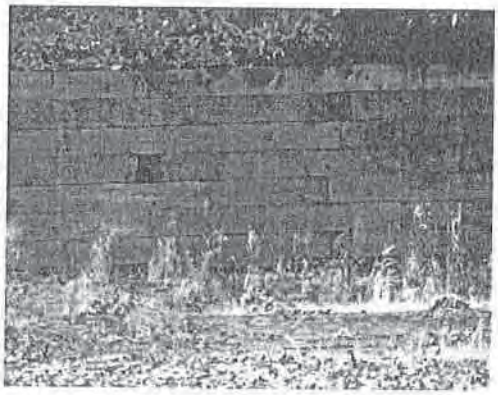




BACKGROUND: FORMER NORTH TENNIS COURT

We purchased our home in 2007. The North Court on the former Tennis Club's property had been abandoned. Below are photos of its condition at that time. Small pine trees and weeds can be seen growing through the massive cracks in the cement.





C30

MARCELLA SILVERMAN

717 Majors Path
North Sea, N.Y. 11968

917-533-7398
mbsilver@aol.com

March 7, 2017

Southampton Town Planning Board
Southampton, NY 11968
By email to kmeyer@southamptontownny.gov

RECEIVED
MAR - 7 2017
TOS PLANNING DIVISION

RE: Southampton Day Camp Realty LLC
665 Majors Path, Southampton, NY
("subject property")

Dear Planning Board Members:

Thank you for your extensive time and attention to this important proceeding, and for the opportunity for me and so many of my neighbors to testify about the environmental impact that the proposal will have on Little Fresh Pond and the surrounding residential neighborhood. I share many of the objections to the DEIS raised to you, and will focus here as I did in my hearing testimony on those related to the impact of *noise* on residents whose properties abut the subject property.

I have owned my home at 717 Majors Path since 2003. My property abuts the subject property on its northern border, and my house is less than 50' from the subject property's largest (and ever enlarging as tress have been cleared!) athletic field. I was a member of the predecessor tennis club on the subject property when it was owned by the Kronemeyers, where my now-adult sons attended their small tennis camp and worked cleaning the courts.

As so many neighbors testified at the hearings, noise is no small matter in connection with this application. The so-called "accessory to a tennis club" camp that the Applicant has been running for the past several years, like the enlarged day camp it proposes, are in no way specialty camps focused on arts, drama, tennis or other relatively quiet activities. Rather, the Applicant has been running and proposes to enlarge a high-volume multi-activity camp, which continues to awaken and otherwise intrude those of us living nearby, with its loud and continuous chanting, shouting and screaming ("LOUDER! LOUDER! I CAN'T HEAR YOU") of 2-11 year olds, "train" whistles and bells, amplified voices and music, an all-day compressor used to inflate enormous blow-up structures on a "special event" day, cheer-led soccer games (including the staff after hours) right next to our property line, pre-season "spirit training" for counselors. C30-1

All wonderful sounds of the fun and excitement that children should enjoy at camp, and that so many of us residents enjoyed when we were children and our own children were young -- just *not* in the midst of a residential neighborhood, and *not* while the Applicant thwarts noise-related provisions of our local laws.

Applicant Intends to Continue Violating Three Noise-Related Town Code Provisions

The Southampton Town Code ("Town Code") includes three noise-related requirements for properties used as "summer camps" or "day camps." (collectively, "day camps" below). See Town C30-2

Code § 330-160.12 (B), (C) and (E). [1] Yet, the DEIS makes clear that the Applicant's *intended plan* is to violate all three noise-related Town Code requirements in running the very camp they propose. In evaluating the environmental impact of the Applicant's non-compliant proposal, the Planning Board should take the Applicant's brazen refusal to comply with the Town Code into consideration.

Minimum 100' Set-back and Landscaped Buffer

Two of these three Town Code requirements provisions govern what must exist at the property lines shared between the subject property as a day camp and each of 20 adjoining residential properties owners[2], like me. Specifically, the Town Code require that a day camp have:

- a minimum 100' set-back of all buildings from any property line
- a minimum 100' landscaped buffer adjacent to any property line.

See Town Code § 330-160.12 (B) and (C).[3] Taken together, the law prohibits the Applicant from having any buildings within 100' of other property lines, and requires that the 100' buffer zone be landscaped.

Simply put, these rules reflect the compromise that our local legislature and agencies have struck between a day camp's need to accommodate the inevitable noise and activities of young children, on the one hand, and the needs of its neighbors for quiet enjoyment of their homes on the other. The law mandates auditory and visual separation between residential neighbors and the inevitable noise of most day camps. These rules recognize that day camps, with all the noise that we know kids make – as delightful as it may be in the abstract -- may not be right "in the eyes and ears" of neighbors, and may not encroach on the right of neighbors to quiet enjoyment of their own properties.

C30-2 cont'd

Yet, the DEIS makes crystal clear that Applicant has no intention of complying with these, as follow:

> Due to the extensive site disturbance (and cost) that would be involved in establishing **a 100-foot landscaped buffer around the perimeter of the subject property...it is not feasible** for the project sponsor to implement this alternative. [4]

---

[1] Town Code §330-162.12. Campgrounds, **summer camps, day camps** or health camps....

B. All buildings will be set back at least 100 feet from any property line, and in no case shall the setback be less than that required in the applicable district.

C. A minimum one-hundred-foot landscape buffer shall be provided adjacent to any property line...

E. No overnight residential building or structure shall be permitted, except for one permanent dwelling for the use of a caretaker or other custodial person.

[2] By the Applicant's own DEIS maps, there are 20 adjoining properties.

[3] See footnote 1 above.

[4] Clearly, when the Applicant's landscaper testified on Dec. 8 that she was impressed with how little had to be done to turn the property into a day camp, she did not have the 100' landscaped buffer in mind.

The Applicant's own list of *what already exists* in the mandated buffer that they'd have to relocate or remove, on the one hand, and *what they plan to add* in the mandated buffer, on the other, place in stark relief *what they propose in lieu of complying with the mandated landscaped buffer.*

Already in the mandated 100' buffer [5]	**What Applicant seeks to ADD in the 100' buffer:** [6]
three cottages (used and proposed as overnight dorms for staff)	appx 20 gravel parking spaces (23 incl existing, in front of residence)
four tennis courts	a 2nd basketball court
16 parking spaces	a 14th cottage
largest athletic field	part of a new pool

These Town Code provisions, and the Applicant's concession in the DEIS of its plans for non-compliance, are set forth in ATTACHMENT A (previously presented at the January 26 hearing).

The Planning Board should not approve an application whose DEIS that violates laws that exist to shield neighbors from the environmental impact of noise from a high volume day camp. The Applicant must obey the 100' landscaped buffer rules.

Overnight Residential Structures Prohibited

The Town Code also prohibits day camps from having any overnight residential structure, except for a permanent dwelling for a caretaker. See Town Code § 330-160.12 (E). [7] Sensibly, our lawmakers do *not* want day camps to devolve into entirely unregulated residential housing. The rules for day camps contemplate that everyone goes home at the end of the camp day - children and staff alike.

C30-2 cont'd

By its DEIS [8], the Applicant makes clear that it ***plans to house 65 adults (over 70% of his staff), in 14 dormitories, 4-5 people/structure*** – without no assurance that number will not increase – as follows

	Tennis members	Campers	Staff	
			Total	Overnight
2015	90	215	65	22
2016	90	280	66	53
Proposed	90	360	90	65

The Applicant's need to house its staff overnight seems to be unique and of its own creation; it has not identified any other day camp that houses its staff. As I understand it, this need arises solely from the Applicant's own chosen "business model" (and that of its own affiliated camp in Easthampton)

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[5] See, e.g., DEIS Executive Summary, p. XXXVIII.

[6] See footnote 5 above.

[7] See footnote 1 above.

[8] See ATTACHMENT B and DEIS, pp. iii and 6. See also DEIS, Exec. Summary (pp. ii, iii, xx, xxiii, xl), Description of Proposed Action (pp. 5, 6, 8, 13, 15), Existing Conditions, etc. (pp. 49, 60, 105, 114, 140), Alternatives and their Impacts (pp. 160,165, 178, 179), Growth-inducing Aspects (p. 184)

of hiring primarily special visa-holders from other countries – who need not be paid even minimum wage if they are housed, fed and paid a small allowance, despite the $1,575 per week which campers pay – rather than hiring local residents. The Planning Board should reject the Applicant's proposal to house the vast majority of its growing staff onsite, and prevent the inevitable noise and other environmental impact from 24-7 overnight occupancy by 65 (or more) largely teenage/20-something staff in small dorm-like structures-- many of them within the mandated 100' buffer! The DEIS leaves unexplained why the Applicant does not hire local residents as would allow it to comply with prohibition of overnight housing at day camps.

C30-2 cont'd

In addition, what accounts for the actual and predicted dramatic increase in staff housed overnight? In 2015, 22 out of 65 staff members – 34% -- lived onsite. Yet, ***in 2016, with only one additional staff member, 53 out of 66 staff members – a full 80% – lived on-site!*** Further, the applicant proposes in the future to increase its overnight staff from 53 in 2016 to 65 in the future. What accounts for the 31 additional overnighters in 2016? Might they include staff forced in 2015 to leave the Easthampton house where this Applicant was illegally housing its Easthampton Camp staff? Does it reflect an ever-increasing reliance on hiring staff from other countries rather than from our own community and, if so, why? The Planning Board should ask these questions of the Applicant, lest it allow here what Easthampton will not.

Thank you for your hard work. Please do the right thing. Save Little Fresh Pond, save our neighborhood, and save those of us who live next to the subject property from these and the other environmental impacts presented to you.

Very truly yours,

Marcella Silverman

Attachments (A and B)

SOUTHAMPTON TOWN CODE

NEW YORK

Chapter 330. Zoning
Article XVII. Special Exception Uses

§330-162.12 Campgrounds, **summer camps, day camps** or health camps.

B. All buildings will be set back at least 100 feet from any property line, and in no case shall the setback be less than that required in the applicable district.

C. A minimum one-hundred-foot landscape buffer shall be provided adjacent to any property line.

DEIS Executive Summary xxxviii

"...to reflect these two selected requirements, a substantial amount of site disturbance would be necessary, as several of the existing and proposed site improvements fall within the 100-foot setback and would require relocation or removal, including:

- Cottages 9, 10, 11 and the proposed Cottage 14
- The existing tennis court (proposed basketball court) on the north side of the subject property
- Three of the seven existing tennis courts on the south side of the subject property
- 16 parking spaces in the existing southern gravel parking lot
- 23 proposed gravel parking spaces (including existing parking) in front of the residence
- A portion of one of the two pools proposed to replace existing tennis court north of the tennis club gravel parking lot.

"Due to the extensive site disturbance (and cost) that would be involved in establishing **a 100-foot landscaped buffer around the perimeter of the subject property...it is not feasible for the project sponsor to implement this alternative.**"

SOUTHAMPTON TOWN CODE

NEW YORK

Chapter 330. Zoning
Article XVII. Special Exception Uses

§330-162.12 Campgrounds, **summer camps, day camps** or health camps.

E. No overnight residential building or structure shall be permitted, except for one permanent dwelling for the use of a caretaker or other custodial person.

DEIS pp iii and 6.

	Tennis Members	Campers	Staff	
			Total	Overnight
2015	90	215	65	22
2016	90	280	66	53
Proposed	90	360	90	65

See also DEIS, Exec. Summary (pp. ii, iii, xx, xxiii, xl), Description of Proposed Action (pp. 5, 6, 8, 13, 15), Existing Conditions, etc. (pp. 49, 60, 105, 114, 140), Alternatives and their Impacts (pp. 160,165, 178, 179), Growth-inducing Aspects (p. 184)

Kerri Meyer

From: Sundy Schermeyer
Sent: Wednesday, January 25, 2017 3:30 PM
To: Patricia Boudreau-Sullivan; Kerri Meyer
Subject: Fwd: Local resident in support of SCC camp on Majors Path

C31

Sent from my iPad

Begin forwarded message:

From: Suzanne Henning <suzanne@morleyagency.com>
Date: January 25, 2017 at 2:43:28 PM EST
To: <jblaney@southamptontownny.gov>, <cgandel@southamptontownny.gov>, <sschermeyer@southamptontownny.gov>, <jlofaro@southamptontownny.gov>, <rlong@southamptontownny.gov>, <jzuccarelli@southamptontownny.gov>, <dfinnerty@southamptontownny.gov>
Cc: Thomas Coffey <tom@camptlc.com>
Subject: Local resident in support of SCC camp on Majors Path

JAN 25 2017

Dear Esteemed Planning Board Members,

I am a year-round resident of Southampton and my 11-year-old daughter, Jacqueline Thulin, has greatly benefitted from the camp scholarship she has enjoyed for the past 4 years from the Southampton Camp & Club on Majors Path. It has been our experience that the camp is extremely well-run and responsive to the needs of parents and children. During the last four summers, Jackie has been exposed to a wide variety of activities, including tennis & swimming lessons & her great joy is the dance & theater program. Her counselors have been of top quality—some local and others international. While we literally live five minutes from the camp on Kings Lane, the camp provided bussing for Jackie the first 3 years. Last year, when I drove to & from camp, I experienced an extremely organized pick up & drop off system with very little waiting and safe driveway access. As I travel Majors Path all year long to and from the SYS recreation center, I have not witnessed any increase in traffic during the summer months, despite the more populous Future Stars camp located on the SYS property up the hill.

C31-1

Regarding any negative impact on the community, my daughter has said they have been told from time to time to keep their voices down so as not to disturb neighbors and she has never even seen Little Fresh Pond from the camp property, which is not surprising considering the numerous acres of land that comprise the camp property. Jackie has certainly benefitted from the good values promoted at SCC, and has made lasting friendships with the group of children she has been with. Her best camp friend has a summer home in Southampton Village, but lives in San Francisco and had it not been for the camp scholarship opportunity, they would have never met. Unfortunately, Jackie has aged out of the camp this summer, but hopes to return in two years as a counselor in training. I am so grateful for SCC giving my daughter this experience which would have been otherwise unaffordable for our family. It would be a shame to think that this camp, which has only improved over the last 4 years, would be curtailed in its mission to provide a wonderful summer experience for all involved. The joy of children playing in a bucolic treed environment is a welcome respite from the over-sized summer homes which continue to crop up all around our community.

C31-2

CC PB

C32

January 20th 2017

Southampton Town Planning Board

116 Hampton Road

Southampton, NY 11968

JAN 23 2017

Dear Chairman and board members,

My name is Garry Sweeney and I am writing to you regarding Southampton Country Day Camp, and the reasons I believe why the camp should continue to operate as it is for the foreseeable future. I am 24 years old from Glasgow in Scotland, and I live on site at camp during the summer. This year I will be returning for my third year as a counselor at Southampton Country Day Camp. The previous two summers I have worked at the camp I undertook roles firstly, as the Soccer Specialist, then last year, Senior Counselor of the 'Bluejays', which was 5 year old boys which is also the position I shall be fulfilling again this year.

The basis of this letter I am writing to you is to help clear up the false and quite frankly laughable claims made against the camp. The first of which being the 'issue' regarding Little Fresh Pond. I have been made aware of the opposing party's claim that campers use the lake, and pollute it by urinating, as well as sun screen and bug spray washing off meaning the wildlife that inhabits the pond is destroyed along with killing the cleanliness of the pond. This would be a good point, however as we have never used the pond this claim is quite simply ridiculous. Both campers and counselors have no need to be anywhere near the pond during camp hours as the lake is not included in any daily activities. Therefore meaning this claim is completely fabricated.

C32-1

Another claim I have been made aware that has been made is that the campers arrive, shouting and screaming from 7.30am. Firstly, I think I speak for all housed staff in saying that we would all still be in our beds at that time! Secondly, the camp operates between 9am-4pm, and children are not permitted to be dropped off before this time. Any families that do arrive before 9am are asked to wait in front of the welcome centre in an orderly fashion so we, the staff, are able to safely escort the campers to their designated morning meeting areas before beginning activities at 9.30am.

C32-2

An issue that is mainly related to the staff living on site at the camp is locals claim that there is excessive noise when returning from the nearby bar and drop litter on

CC PB

Little Fresh Pond Road. I can confidently say I have not witnessed such behaviour. Both summers I have worked at the camp I have been a regular attendee of the local bar and, along with numerous others, have ensured to conduct ourselves in an appropriate and considerate manner to the local area. The camp also run a strict curfew policy for housed staff, where we are required to be back in our cabins for midnight or risk disciplinary action, which is always adhered to.

C32-2 cont'd

The final point I shall raise is the ridiculous claim that the camp is 'buying' support by awarding local families and people that contribute massively to the local community scholarships in order to attend camp. Personally, I believe this is a tremendous opportunity for families to be able to send their kids to an environment that is designed to make kids thrive in active and social surroundings. All activities that are scheduled for the campers every day are stimulating and encourage them to develop vital life skills that will be of much use to them as the get older. It also presents an opportunity for families who may not necessarily be in a strong enough financial position to be able to send their children to camp, therefore meaning their children suffer by missing out on the opportunity to develop their basic core skills and interact with other campers. Childhood obesity is also a significant problem in today's society, and camp is the perfect environment for a child to be active and become accustomed to a healthy lifestyle.

C32-3

Lastly I would like to share my own experience both within and out with the camp. The fact I am returning for a third year speaks volumes. Working at Southampton Country Day Camp has been, by a mile, the best thing I have ever done in my life. Having the opportunity to be able to make a difference in the children's lives is an experience I'll never forget. It is hugely fulfilling when a child can come up to you and be absolutely ecstatic with their self because they tied their shoe lace for the first time by using the way that you showed them. We don't solely act as counselors to the campers. We are their friends, big brother's/sister's, mentors, and role models. Everyone who works with the kids are playing a huge part in the campers lives. Working at camp has also gave me the chance to visit and travel America. Just last year my friend Calum (who I met working at camp and actually lives 30 mins away from me back home in Scotland) and I set off on a road trip of a lifetime across the country, travelling through twelve states between New York and Los Angeles in one month. Such a thing would not have been possible without the camp. Not only do I gain lifelong memories of being there, I also gain lifelong friends. I am in regular contact with numerous people who I met at camp, which has also allowed me to make trips during the year away from camp to visit them. For this I am extremely grateful.

To briefly sum up my letter, Southampton Country Day Camp plays an important role in the community of Southampton. If the camp was for whatever reason to be removed, a huge part of a huge number of kid's childhoods would be destroyed. It would also leave a vast plot of land desolate. I would be astounded if someone could think of an alternate that could possibly replace Southampton Country Day Camp and still have the same enormous beneficiaries to the amount of people that it has

affected and continues to do so. I fully believe that the camp should continue to operate and I hope you see all the positives that the camp brings with it. If you have any questions regarding my letter I would be more than happy to help.

Campfully

Garry Sweeney - Senior Counselor of the Bluejays

56 Hillview Drive
Clarkston
Glasgow
Scotland
G767JD

Mobile Number - +(44)7950170405
Email – garry_s92@msn.com

C33

January 23rd, 2017
From the beautiful Emerald Isle of Ireland

Southampton Town Planning Board
116 Hampton Road
Southampton, NY 11968

JAN 24 2017

Dear Chairman and board members,

My name is Timothy John Carroll and I am writing to you regarding Southampton Country Day Camp, and the reasons why I believe the camp should continue to operate as it is for the foreseeable future. I am 22 years old from County Kildare in Ireland, and during the summers I work at the camp I live on site. This year I will be returning for my third summer as a counselor at Southampton Country Day Camp. During the summer of 2015, I undertook the role of general counselor and when I returned the following summer I was hired as a senior counselor. In the upcoming summer I will return once again to the camp as a senior counselor. In the last two years I have followed a group of boys between the ages of 6-8 through two different groups at camp, the parrots and pelicans.

My reason for writing this letter is to help clear up the false and the very laughable claims made against the camp. The first of which regards Little Fresh Pond, the pond bordering the edge of the camp. I have been made aware of the opposing party's claim that campers use the lake, and pollute it with urine and washed off sunscreen or bug spray, harming the wildlife that inhabits the pond. This would be a good point, however as we have never used the pond this claim is quite simply ridiculous. Both campers and counselors have no need to be anywhere near the pond during camp hours as the lake is not included in any daily activities. Therefore, this claim is completely fabricated. All staff are clearly told during orientation and throughout the time camp is in session that under NO circumstances- and let me repeat that again for the opposing party UNDER NO CIRCUMSTANCES are children allowed near the lake in

C33-1

CC
P/B

addition to the staff who live there during the summer.

C33-1 cont'd

Another claim I have been made aware that has been made is that the campers arrive, shouting and screaming from 7.30am. Firstly, I think I speak for all housed staff that we would only be turning over in our bed for the last nap at that stage. Secondly, the camp operates between 9am-4pm, and children are not permitted to be dropped off before this time. Any families that do arrive before 9am are asked to wait in front of the welcome center in an orderly fashion so we, the staff, are able to safely escort the campers to their designated morning meeting areas before beginning activities at 9.30am.

Another issue that is mainly related to us staff living on site at the camp is locals claim that there is excessive noise when returning from the nearby bar and that we litter on Little Fresh Pond Road. I can confidently say I have not witnessed such behavior. Both summers I have worked at the camp I have been a regular attendee of the local bar and, along with numerous others, have ensured to conduct ourselves in an appropriate and considerate manner to the local area. The camp also runs a strict curfew policy for housed staff. Staff are required to be back in our cabins for midnight or risk disciplinary action, which is always adhered to. Just to clear it up no one wants to see Thomas or Cindy out of their beds at 1in the morning disciplining you as you know you're in trouble then.

C33-2

The final point I will raise is the ridiculous claim that the camp is 'buying' support by awarding local families and people that contribute massively to the local community scholarships in order to attend camp which can change a child's life positively. Personally, I believe the scholarship program is a tremendous opportunity for families to be able to send their kids to an environment that is designed to make kids thrive in active and social surroundings. All activities that are scheduled for the campers every day are stimulating and encourage them to develop vital life skills that will be of much use to them as they get older. It also presents an opportunity for families who may not necessarily be in a

C33-3

strong enough financial position to be able to send their children to camp. Without camp in the summer, their children may suffer by missing out on the opportunity to develop their basic core skills and interact with other campers. Childhood obesity is also a significant problem in today's society, and camp is the perfect environment for a child to be active and become accustomed to a healthy lifestyle. The camp ~~also~~ helps kids to develop through a system which we call "starfish", which teaches kids a moral conduct to use in their everyday ~~of~~ life. Each week we celebrate this by hosting a ceremony which teaches kids the virtue of the week some of which include friendship, sportsmanship or tolerance. These life lessons help grow these great kids, who then contribute positively back into your community.

C33-3 cont'd

Finally, I would love to share with you guys my personal experience of camp. The fact I am returning for a third year from another country must tell you something about this wonderful place. Working at Southampton Country Day Camp has been, by far the best thing I have ever done in my life. Having the opportunity to be able to make a difference in these children's lives is something I will never forget even seeing them grow in the 10 weeks that you see them in camp makes me personally feel special. It is hugely fulfilling when a child can come up to you and be absolutely thrilled with themselves that they have just scored a goal on your co counsellor or that they have swam in the deep end for the first time (5 meters deep it's a big moment in their lives). We don't solely act as counselors to the campers. We are their new friends, big brothers/sisters, mentors, and role models…or in my case just that big leprechaun from Ireland. Everyone who works with the kids are playing a huge part in the campers lives and the locals opposing that just don't understand. Working at camp has also given me the chance to meet some of my best friends who I now get to travel to and see the world. In addition, I am able to travel after camp to exotic places such as the Dominican Republic where me and two of my friends from camp travelled to last year. Who would've thought that a big country boy like me would ever get to drink from a coconut in the Dominican? I was raised far away from coconut milk! But I have to say what an experience

that was and I could never had done that without this camp. I have also grown a great love for the national sport of American football where I won't say who I support so that you can't have a giggle to yourselves while reading this letter.

Now to sum up my letter/story about Southampton Country Day Camp plays an important role in the community of Southampton. If the camp was for whatever reason to be removed, a huge part of a serious number of kid's childhoods would be destroyed. It would also leave a vast plot of land desolate and would leave many fond and wonderful memories behind and personally, I would be astounded if someone could think of an alternate that could possibly replace Southampton Country Day Camp and still have the same enormous beneficiaries to the amount of people that it has affected and continues to do so. The removal of the camp would also have an adverse effect of local employment as well as allowing people such as myself to discover how wonderful wacky and amazing your country is. I fully believe that the camp should continue to operate and I hope you see all the positives that the camp brings with it. If you have any questions regarding my letter I would be more than happy to help.

PS. You are all more than welcome to come and discover Ireland anytime you want. First drink on me.

Campfully,

Timothy John Carroll Senior Counselor of the Pelicans.

19 Oak Road Connell Drive
Newbridge
Co Kildare
Ireland

Mobile Number - +(353) 851059511
Email – timothyjohncarroll@hotmail.com

C34

January 9, 2017

Dennis Finnerty, Chairman, and

Southampton Town Planning Board Members

116 Hampton Road

Southampton, NY 11968



RE: Southampton Country Day Camp

Dear Chairman and Board Members:

The purpose of this letter is to express my reasoning as to why the Southampton Planning Board should permit Southampton Country Day Camp to continue their operations. I was a general counselor for Southampton Country Day Camp this past summer. My exceptional experience with the camp, specifically in relation to their commitment to both campers and their surrounding community, serve as the impetus of this letter.

There are many claims against the camp of which lack factual backing. As such, I'd like to start by clarifying any possible misinformation by sharing my personal experiences as an employee of the camp. As a resident of Sayville, we experience a surge in traffic volume during the summer, as our town serves as a ferry departure hub for both Cherry Grove and The Pines on Fire Island. While not to the extent of Southampton, our normally subdued main street becomes much more active over the summer months. I share this simply to express my sympathies with Southampton community members over concerns about possible increased

traffic caused by the camp, especially in the residential area where Southampton Country Day Camp is located. However, as a local staff member, I am required to park in the designated satellite lot located at the Tuckahoe School on Sebonac Road. All local staff are then shuttled on two mini-buses to Southampton Country Day Camp. Furthermore, most campers themselves take advantage of the included bus transportation to and from camp. As such, in my experience, camp impact on traffic volume surrounding the immediate area is minimal. C34-1

Furthermore, there is concern over the effect Southampton Country Day Camp may have on Little Fresh Pond. I can confirm no activities in relation to camp take place on or near Little Fresh Pond. At no point does any camper or counselor need to go near the lake. Furthermore, it is clearly stated during orientation, to both counselors and campers, that Little Fresh Pond is strictly off limits. That message is enforced by folklore tales, such as "there are leaches in the pond," which only aid in deterring campers from that area. C34-2

Lastly, I'd like to express my personal experience with my employer and the young campers themselves. There is an undeniable environment of professionalism cultivated at this camp. Every morning begins with a briefing given by division leaders, who communicate onto the counselors what is expected of them. Unlike other camps that serve as "holding ground," Southampton Country Day Camp provides experiences that engage kids in meaningful activities of which promote teamwork and sportsmanship, among others traits. The result? These young children are thriving during the summer months. I had the pleasure of being assigned 7-8 year old boys, otherwise known as the "Pelicans." These are very formidable years for kids and I had the fortune of seeing my boys grow and develop, far more than would be achieved by being at C34-3

home. Also, about 5 of the boys in my group were under the scholarship program extended by the camp to families who are members of the surrounding fire and police departments. C34-3 cont'd

In short, Southampton Country Day Camp provides a healthy, safe and community conscious resource for the children of the Southampton community. If camp is closed, the space will become abandoned, forcing members of the community to find alternative camps and create more traffic on Montauk Highway. Southampton Country Day Camp is home to many of these children, and the families of Southampton will be missing an important piece of their community if camp is closed. Therefore, please consider keeping this camp in operation. Please, do not hesitate to contact me with any questions.

Campfully,



Matthew Spina

53 Muriel Place

West Sayville, NY 11796

Cell: 631-512-0145

Email: matthew.spina@cortland.edu

Kerri Meyer

From: Sundy Schermeyer
Sent: Wednesday, January 25, 2017 2:28 PM
To: 'stacydimon@gmail.com'
Cc: Patricia Boudreau-Sullivan; Kerri Meyer
Subject: RE: Southampton Camp & Club - public comment

Hi Stacy,

Thank you for your correspondence in regards to the planning board application, I serve as the Town Clerk and work directly with the Town Board and their legislative files but I will be happy to forward your comments to the planning board secretary to distribute to the Planning Board and be added to the planning file that you reference. If I may be of further assistance please don't hesitate to contact me.

Sundy A. Schermeyer
Southampton Town Clerk, RMC
townclerk@southamptontownny.gov
Phone (631) 287-5740
Fax (631) 283-5606

C35

JAN 25 2017

From: stacydimon@gmail.com [mailto:stacydimon@gmail.com]
Sent: Tuesday, January 24, 2017 10:01 PM
To: Sundy Schermeyer
Cc: Tom Coffey
Subject: Southampton Camp & Club - public comment

Dear Sundy,

Let me start by saying that I appreciate your service to our community, and that of the planning board members for the time that you all dedicate to hearing matters such as this. I would secondly like to tell you a little about myself and my family as I feel that it is relevant. My husband and I were both born and raised here, in Southampton, and have been fortunate enough to be able to remain here to raise our own family. Unfortunately, due to the extremely high cost of living, many of our peers have not been able to do this. We have seen friends stay in their college towns, or move away to more affordable locations with greater employment and housing choices after not finding those here. Staying here has not been an easy task, but it is one that is important to us. Affording to live here has been possible due to each of working full-time, becoming entrepreneurs & opening 3 businesses that operate within the Town during the last 10 years. We are teaching our children the value of hard-work, and thus have needed to utilize child care when our work schedules require it. As I'm sure you know the available child care options are limited on the East End, especially during the summer. If you have had the experience of sending a child to day care or camp, you can certainly appreciate that it is not inexpensive.

Both of our children have had the privilege of attending the Southampton Camp and Club on Majors Path since it's opening. The camp graciously reached out to volunteer organizations and extended scholarships for children of members. My husband proudly serves our community as a volunteer firefighter, and has for the past 10 years. I'm extremely grateful to the camp for the opportunities afforded to my children; they would otherwise have never been able to have this type of summer camp experience. The things that they have

C35-1

CC
RB

learned and the friendships that they have forged over the last several years are invaluable. The fact that my husband and I were able to work during this time, knowing our children were being well cared for also gave us such incredible peace of mind – another thing that is truly invaluable. C35-1 cont'd

I can personally attest that the camp is well run, you would be hard pressed to find a more caring, knowledgeable and enthusiastic group of people so committed to the well-being and positive experience of campers, and their parents. The camp offers transportation, and if parents opt not to use the bus system their drop-off and pick-up is extremely well coordinated and above all, SAFE. My children have used both options without incident. This past summer when I was driving my children I can honestly say that I NEVER noticed any additional traffic in the area due to the camp. The way transportation is organized prevents congestion from happening, the bus arrival and departure times don't overlap with parent drop-off and pick-up times and they have sufficient staff posted at the drop off locations to help children get to where they need to be safely and expediently. A few other things that are worth noting from a parent's perspective - they provide healthy snacks and hot lunches for all campers and an overall amazing environment for children. They teach "STARFISH" values which encourage well-rounded campers; my daughter loved earning her charms and I found this to be a wonderfully executed program. (http://www.southamptoncc.com/future-families/starfish-values has more information in case you are interested in checking it out) The camp hires extremely talented and qualified staff. I must give credit to their swim instructors, my daughter learned how to swim her first summer attending the camp and I am forever grateful. We don't have a pool at home and she was too scared to learn in the bay the previous year, now she is a confident swimmer and I can rest easier knowing she has the skills to stay afloat! C35-2

I have attended both public hearings so far and I must say I've been disheartened by some of the claims that have been made about the camp that I know to be untrue. I struggle to see the things the way that some of those who are opposed do. I certainly don't feel like there is any malicious intent on behalf of anyone at the camp to harm the environment or mislead the community. I've had conversations with the camps owner and management staff, they have always availed themselves to the parents of campers for any questions. I genuinely believe the camp is looking to do what is right for the environment and the community, including the neighbors, if given the chance. The camp operates for a relatively short amount of time during the year, and for that matter each week... camp is 8 weeks long and runs from 9am-3:30pm Monday-Friday only. The camp does not allow the children to use Little Fresh Pond for any camp activities and I believe they have taken several steps to ensure the pond is not harmed by camp activities. It seemed to me that the plan they presented was comprehensive and included many additional steps that they would take towards this same goal of maintaining the pond's ecosystem and an overall safe environment, taking into consideration concerns that were raised. C35-3

As a resident & parent I know that the camp is needed. As a parent of children who have had (and look forward to continuing to have) the opportunity to attend, I certainly hope that the Southampton Camp and Club will be allowed to continue as requested. If the camp were to close it would certainly impact my family directly. I hope you consider our comments and allow the camp to continue to benefit Southampton's children – they are the future!

Sincerely,

Stacy & Christopher Dimon
340 North Main St
Southampton, NY 11968
(631) 283-2462 / (631) 603-6466

C36

114 Little Fresh Pond Road
Southampton, New York 11968
631-283-8767
nwpotap@earthink.net

Town of Southampton - Planning Board
116 Hampton Road
Southampton, New York 11968

January 26, 2017

MAR - 7 2017

Re: "Southampton Country Day Camp" Pending DEIS & Application/
DEIS Public Hearing - SCTM No. 900-97-3-17.1

Dear Planning Board Members:

As a resident of Little Fresh Pond Road for decades, with a sincere interest in seeing that our area is not over-developed, I wish to briefly comment on the pending matter involving the DEIS, the proposed day camp, which really is a Mega-Camp, and the change of use in this residential single family neighborhood.

Those who have been following our David-and-Goliath struggle over the years know that there is a built-in unfairness here, one that pits the local community against a deep-pockets and well connected developer. I also believe there is some doubt as to whether the developer can pass minimal tests of candor and truthfulness in any submission to this Board, in my opinion. [see his 'bending' of laws in EastHampton on what is done on his properties and his arrogance in thinking he can get away with it, similar to his trying to overpower our voices with 'free scholarships' to locals with this camp and of course, the lawsuit against us which he lost. (He knows laws completely well, since he is a lawyer in NY state)

But let me directly move to what I think is the most critical issue before you: none of the homeowners in the Little Fresh Pond area have ever received **any assurance that the proposed Mega-Camp will not lower our quality of life, not harm the lake waters and habitats, and not directly increase its already growing noise, nuisance and traffic levels for residents around Little Fresh Pond. His plan and what can result from it places the neighborhood in harm.**

Yes, we've seen studies and projections. But, **what IS still lacking for this impeding DEIS decision is any guarantee by the developer that this proposed Mega-Camp, through its imposing size and its potentially limitless growth, will not result in harmful change to our lake and our North Sea neighborhood.** It's hard to conceive any manner in which this 500 to 700 visitors per day juggernaut would not wreak a tremendous amount of collateral damage and all but consume our small community.

C36-1

I am not an expert in environmental law, but from my understanding of the DEIS process, there is a burden placed on the developer to provide clear, convincing proof that our neighborhood will remain unscathed if and when the proposed Mega Camp is in place, and that in two years or five years, no one who lives here now will have barely noticed its operations. So far the developer has not met this simple standard. On that basis alone, I respectfully submit the plan before you should be rejected.

Otherwise, we are faced with more buildings, larger staff, hundreds of visitors per day, our tiny lake teeming with kayaks instead of waterfowl. Not to mention overtaxed sewage and run off, noise and traffic. Without rejection by the Board now, can anyone say that in 3 years, our neighborhood and our lake will be unharmed? If not, then why should the rights of one property owner outweigh the rights of our dozens of homeowners? It is unfair to permit the developer to modify a small tennis club permit into a Mega Camp without assurance the Little Fresh Pond area will be no worse off than before. This is just the incorrect place for his planned expansion. He has proven in numerous occasions to not be a trustworthy neighbor and he has already put the neighborhood at risk with his changes to the site.

Sincerely,

Nadya Potapchuk
[full time resident, owned current home since 1972]

Memo to Southampton Planning Board

From Dr. Roslyn Siegel, 18 Wolf Swamp Lane, Southampton

1/31/17

Re: proposed camp on Little Fresh Pond

I have been a home owner on Big Fresh Pond for 15 years and love the beauty and tranquility of both Little Fresh Pond and Big Fresh Pond. My children and grandchildren have learned to identify the calls of different birds, admired the enormous turtles that swim undisturbed in our lakes, marveled at the fish that swim next to them in the clear water.

On both these lakes, we can swim, fish, study and admire the wild life without the interruptions, and noise of the outside world.

Because of the beauty of our beaches and the lakes, more and more visitors have discovered The Hamptons and traffic has increased to the point where it is already difficult to get from beach to town , from lake to town, and certainly from NYC to town.

The proposed camp on the shores of Little Fresh will bring increased, choking traffic, noise and pollution , changing the delicate balance of nature we, the residents of both lakes, have tried so hard to preserve. C37-1

A camp can be set up anywhere. Our lakes are rare and beautiful examples of nature and must be preserved for present and future generations to enjoy. C37-2

Please deny permits to build the proposed camp.

Sincerely,

Roslyn Siegel

JAN 31 2017

C38

LAUREN WEDELES
128 Big Fresh Pond Road
Southampton, NY 11968

January 31, 2017

Southampton Town Planning Board
Southampton Town Hall
116 NY-27A,
Southampton, NY 11968

FEB - 6 2017

Re: use of former tennis camp site as a camp site

Dear Planning Board Members,

I'd like to register my concern as a longtime resident and visitor to the Hamlet of North Sea. The peacefulness and tranquility and cleanliness of both Little Fresh Pond and Big Fresh Pond have been a haven for me, my friends, neighbors and visitors.

That tranquility, as well as the environment, are threatened by the proposed day camp. I ask that you thoroughly consider all the various kinds of negative impact that would result from approval of this site as a campsite.

C38-1

Thank you for your consideration,

Sincerely,

Lauren Wedeles

CC PB

C39

CC: PB

Patricia Boudreau-Sullivan

From: Barbara Peterson [barbaracmp@optonline.net]
Sent: Saturday, February 11, 2017 10:55 AM
To: Patricia Boudreau-Sullivan
Subject: SAVE LITTLE FRESH POND!

For the past 39 years I have resided near Little Fresh Pond. 39 years ago the quality of the water was absolutely and positively beautiful. Not so now. LITTLE FRESH POND IS ON THE DEC's "ENDANGERED LIST"! The camp should not be where it is. It should not be allowed to expand. C39-1
We do not need another Lake Agawam. We do not need another Mill Pond. We do not need another Georgica Pond. SAVE LITTLE FRESH POND!

Barbara Peterson

FEB 13 2017