Ted Stevens Anchorage International Airport

M E M O R A N D U M

State of Alaska, Department of Transportation & Public Facilities

To: Distribution List

Date: July 1, 2008

From: Scott Lytle
Environmental Manager

Telephone: 266-2129

Subject: Requirements or Agreements Regarding Lake Levels.

At the June 23, 2008 meeting to discuss the Lake Hood (LHD) erosion project, it was requested that I look into the agreements or requirements affecting the lake level. It was mentioned that in the time period between 1968-75, there were flooding problems that prompted limitation on the lake level.

Discussion

I was able to locate some documents from the 1970's regarding the lake and flooding. In addition, Mike Lee contacted Jim Moody, the former Central Region, Special Assistance to Director who worked during this time frame.

Based on the materials reviewed, this is what I was able to determine.

In the early 70's, there were concerns about the drainage from Lake Spenard increasing due to development at the airport. There appears to be discussion between the Airport, ADOT&PF and GAAB (Greater Anchorage Area Borough) on the volume of water from Lake Spenard and the capacity of the storm drain system to be installed. The concerns were lessened by digging a canal and installing a weir at the north end of Lake Hood to increase flow from the Lake Hood.[1] Originally, the flow from Lake Hood was not channelized in any way. It flowed through wetlands to Jones Lake.

In a Corps 1997 report, it notes that legal drainage rights have been documented in various letters and reports between 1972 and 1980. These documents generally indicate that the lakes have generally been maintained at 67.8 feet above mean sea level (MSL).[2]

In 1979, there was an investigation by the State's Ombudsman regarding flooding in houses (two complaints) off Aero Drive. The ombudsman looked into the flooding and determined that various things contributed to the flooding problem. The ombudsman

[1] Unknown, *Lake Spenard Outfall,* (Partial copy of report), 1975 (estimated).
[2] U.S. Army Corps of Engineers, Alaska District, *Shoreline Erosion and Shoaling Investigation of Lakes Hood and Spenard*, revised July 1997, p. 4.

recommended, in part, that the Airport and DOT do two main things to reduce flooding in the future: (1) inspect and maintain outlet from Lake Spenard, and (2) increase bank levels along the north shore of Lake Spenard. This is summarized in a May 19, 1980 letter from the Ombudsman.[3]

In August 1980, the Airport engineer stated that the weirs are to be set "so that the lake elevation will not exceed elevation 68.5 feet as per a Corps of Engineer report."[4] I have not been able to find this referenced report. There is little data in the memo other than it is a Corps report.

In 1997-8, the Corps was commissioned by the Airport to study the shoaling and erosion in the lakes. The final report discusses the history of the lakes and makes two main statements that are relevant to this discussion. The first is that in the 1970's there was discussion between, the Corps, GAAB, Airport, and ADOT&PF regarding the discharge of the lakes.

The second is that the lake level was set at 68.5 feet in 1980 by the airport engineer and since 1988 has been maintained at 69 feet. No mention as to why the change in elevation in 1988.

Over all the report stated that the lakes have a "normal level of about 69 feet MSL."[5]

Currently the weirs for the Lakes are set at 69 feet MSL. The operational memo for the Lake Hood Well states that the normal lake level is 69.1 feet, with a low level of 69.0 feet when the pump should be turned on.[6]

The 2006 ALP for LHD states the water level as 71 (estimated).[7] The LHD 2006 Master Plan also lists the water level at 71 feet.[8]

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[3] Frank Flavin, Ombudsman, *Letter to Patrick P. Ryan, Deputy Commissioner, Department of Transportation Maintenance and Operations, Re: Ombudsman Complaints A79-0459 and A79-1243*, May 19, 1980

[4] Brooks Wade, International Airports Engineer, *Memo thru James J. Rhode, Chief Design Engineer to William Chambers, Airport Manager, Anchorage International Airport, Subject: Outlet Structures for Lake Hood and Lake Spenard Spenard (sic), ANC.*, August 21, 1980.

[5] U.S. Army Corps of Engineers, Alaska District, *Shoreline Erosion and Shoaling Investigation of Lakes Hood and Spenard*, revised July 1997, p. 5.

[6] CH2MHill, Technical Memorandum from Kathy Flowers, P.E, to Ralph Kiehl/ANC, *Standard Operating Procedures for Lake Level Management at Lakes Hood and Spenard*, p.4.

[7] ANC, *Lake Hood Seaplane Base, Airport Layout Plan*, December 18, 2006, sheet 1 of 12.

[8] ASCG Incorporated of Alaska, *General Aviation Master Plan for Lake Hood Seaplane Base and Anchorage International Airport*, September 2006, page 1-9.

Conclusion

It appears that the lake level is historically had an average level of 67.8 to 69.1 feet; a 1.3 foot difference. There does not appear to be any requirement for maintaining the lake at a set level or range however.

The current set point of the weirs at 69 feet appears to be with in the normal range for the 'normal' lake level.

Attachments:

1) 1980 Ombudsman Letter
2) 1980 ANC Engineer Memo
3) 1975 Lake Hood Outfall

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May 15, 1980

Patrick P. Ryan
Deputy Commissioner
Department of Transportation
Maintenance and Operations
Pouch 6900
Anchorage, Alaska 99502

Dear Mr. Ryan:

RE: Ombudsman Complaints A79-0459 and A79-1243

The State Office of the Ombudsman has received two complaints from property owners north of Lake Spenard. Each of the residences owned by the complainants suffered water damage in 1979 due to seepage coming up from under the buildings. The seepage is alleged to have been caused by the water level maintained in the lake. The staff of this office has investigated these complaints by reviewing Department of Transportation (DOT) files pertaining to the Lake Hood/Lake Spenard complex from 1970 to the present, interviewing DOT/Aviation personnel, conferring with the Corps of Engineers (Corps), determining the role played by the Municipal of Anchorage (formerly the Greater Anchorage Area Borough (GAAB)), and listening t the presentations of the complainants. Based on all of the above, this office makes the following findings and determination.

ALLEGATION: Underground water seepage into residences north of Lake Spenard in spring 1979 was due to a high water level maintained in the lake.

FINDINGS: In the early 1970's, along with the increase in population in the Anchorage area, there came an increase in the demand for float plane tie-down spaces. At that time the principal existing spaces were located around the perimeters of Lakes Hood and Spenard. In response to the need for more spaces and more taxiways, DOT developed a plan to widen Hood Canal, eliminate Bog Lake, and dig out five new tie-down channels.

Since federal funding was being sought, an environmental statement was required. The degree of scrutiny and extensiveness of findings of that statement in part relate to the problems found. The June 12, 1972, document sent to the Federal Aviation Administration (FAA), dealing with the lake work and unrelated roadwork, was characterized as a "Negative Declaration," asserting that

> ...no adverse environmental effects are expected to result from construction activities. Our evaluation of this project is that it is not controversial and it is not likely to generate controversy from an environmental standpoint...and will not adversely effect [sic] the water table of the area.

Copy to Reviewers 5-19-80/A

There was nothing found in the files of DOT which indicated the basis for this finding. Further, in subsequent years when DOT was corresponding with GAAB and the Corps regarding the area's water flow, no mention was ever made of any study done by DOT for the lake complex project. We must therefore have some concerns about the original environmental study performed.

In the DOT files, this office noted an August 4, 1972, letter from GAAB to the Office of the Governor setting forth some of its concerns during the A-95 review process. In part, the borough expressed

> a concern that both the surface and underground drainage patterns might possibly be disturbed or changed. The area surrounding Lake Hood and Lake Spenard has a very unique and complex drainage system which maintains the levels of the various lakes in the area...care has to be taken not to disturb or change the water table or the surface or underground flow of water. The "sponge" character of the surrounding land provides a recharge or water retention mechanism for many of the lakes, including Lake Hood and Lake Spenard.
>
> However, because we do not have a professional hydrologist on our staff and the information here provided lacks some detail, we cannot offer definitive evidence that the project would have an adverse environmental impact.

In October 1973 a meeting was held between representatives of DOT's Division of Aviation and members of the U.S. Geological Survey (USGS) who had reviewed the situation. The results of that meeting, as reported in a November 6, 1973, memorandum, were that it was

> felt that there would be little effect on either the water table or runoff due to the limited area and flat gradients involved.

Shortly after this meeting, in November 1973, FAA approval was granted.

During the construction season of 1975, approximately March through July, the execution of the Lake Spenard/Lake Hood complex project was carried out. Contractor's Weekly Report #12 gives some idea of the competing concerns over the water level in Lake Spenard:

> Maintenance people are unhappy because there is two [sic] much water leaving the lake and no water being turned into the project site. The main office is unhappy because there is not enough water being released from the lake, and private airplane owners are unhappy because of the water leaving the lake and because we turned some water into the project site. Local home owners are unhappy because their basements are flooding and they are looking for someone to blame. All in all it has been a successful week.

Beginning in April 1972, correspondence between DOT and GAAB was exchanged over the existence of any state "desire to enter into an agreement with the Borough to include a control structure on Spenard Lake." The lake had a

history of overflow problems, and since road and drainage maintenance in the area north and east of the lake were borough responsibilities, GAAB was developing a master drainage plan. When it found DOT about to embark on a project relating to its own, GAAB sought the assistance and cooperation of the state.

Letters and memoranda passed between the two agencies for the next three years on this issue. The state frequently leaned toward saying "No," but kept the door open. The last state letter found on this subject was dated October 6, 1975, from Director Ryan of DOT to Mr. Holtan of GAAB, stating that

> We will give further consideration to your proposal after we have reviewed the Corps of Engineers findings.

A May 5, 1976, DOT internal memorandum gave authorization to "proceed with a design study of the Lake Spenard outfall system...." However, no study was found in succeeding files for the lake complex. As best we can understand the subsequent history, the Municipality of Anchorage went forward on its own with the drainage system into Fish Creek, but maintenance of the weir and the pipe under Lakeshore Drive seems to have been a state matter.

In December 1975, the Corps submitted the report previously requested by DOT. The request had followed spring 1975 complaints by residents of Aero Acres, the subdivision north of Lake Spenard. These residents complained that water was seeping up into their basements due to the work being done on the lake. The Corps later found, however, that

> it can be concluded by our examination that the flooding of the basements in the problem area was due primarily to poor surface drainage in the area. There was also a large amount of precipitation and spring snow melt during this spring. There could have been some contributory flooding from the high lake level at this time.

Five recommendations were made. In summary they were:

(a) A storm drainage system for Aero Acres to assist the otherwise poor surface and subsurface drainage;

(b) Sump pumps for the individual residence basements;

(c) A new outlet structure for Lake Spenard which would accommodate greater water flow, maintain a more constant lake elevation, and be less susceptible to clogging;

(d) An accurately maintained lake elevation of 68.5 feet; and

(e) Additional freeboard along the road at the north end of the lake.

Certain specific findings of the report are also important in understanding the situation as it was evaluated by the Corps' engineers and hydrologists.

1. For April 1975 there was a combination of the highest precipitation in the

previous ten years along with the greatest amount of snow on the ground on April 1 for the previous ten years.

2. Water drains from the hill in the center of Aero Acres to the lower surrounding areas. (We note that our complainants' residences are in the "surrounding areas.") Further, the water table under the hill is lower than it is in the surrounding areas where it is close to the ground surface.

3. April 1975 was a cool month, with the average temperature for the month recorded at 32.9 F. The ground therefore remained frozen in most places for three to ten feet, except around dwellings, where a "thaw bulb" phenomenon occurs. (A "thaw bulb" is basically the ground area around and under a warm structure where frozen ground has thawed and there is the opportunity for water to flow.)

4. During the period of flooding, the lake elevation was estimated to have been 70.0 feet above mean sea level (MSL).

The water damage that our findings concern themselves with occurred in spring 1979. For one complainant this has been a recurring problem, and for the other, this was the first time any damage has been suffered in 15 years of living in the same location.

How were the circumstances different in 1979 as compared to 1975? Of the five recommendations made by the Corps,

(a) No storm drainage system had been put in for Aero Acres; this would have been a responsibility of the Municipality of Anchorage, not of the state;

(b) Individual sump pumps for residences are the responsibilities of the homeowners, and their need would be apparent. DOT's files do indicate that at least one individual who had complained to DOT in 1975 received a full copy of the Corps report;

(c) The outlet structure in place at the beginning of spring 1979 was basically of the same form and size it had been since before 1968. Action, which will be discussed later, was taken in spring 1979 to make the weir and outlet pipes less susceptible to clogging, however;

(d) While it is virtually impossible to maintain a lake at a specific elevation at all times, the invert elevation of the weir at the northeast corner of Lake Spenard is at 67.8 MSL. Thus, at equilibrium, the lake level is below that recommended, but still high enough for float plane parking. When more water is coming into the lake than is flowing out, however, the lake level rises above the invert elevation until it drains out; and

(e) Some additional freeboard has been filled between the lake and the road, but not all of the distance. Fill has been placed on the basis of specific overflows, but there has not been a general plan created.

The climatological conditions for April 1979 were as follows:

-- precipitation for the month was the third highest of the preceding ten years;

-- snow depth on April 1 was a tie for the second highest of the preceding ten years; and

-- average temperature for the month was 38.8° F.

There was one additional factor which helped create, and was perhaps principally responsible for, the bad year in 1979. It was that a person or persons unknown managed to block up the Lake Spenard weir with plywood and block up the outlet pipe with miscellany to such an extent that virtually no water could flow through the outlet. This damming effect seriously raised the lake level. Once this situation was realized, the Field Maintenance Office of the Division of Aviation removed the wood, cleared out the debris, and later replaced the pipe under Lakeshore Drive.

This spring, after the problems experienced last year, the head of Field Maintenance has been making rounds of the lake system two or three times a week to check the lake level and the outlets. According to him, this year has been the easiest breakup since about 1970. No complaints have reached their office or this office by the date of this report.

DETERMINATION: The Office of the Ombudsman finds the complaints made to us to be partially justified. There are a large number of factors which we recognize as contributing to the problems faced by the two complainants. From a physical standpoint, the land north of Lake Spenard is land beset with both surface and subsurface drainage problems. Additionally, the climatological conditions of spring 1979 were predisposed toward water problems. While this office has not come to believe that the problems arose from the mere existence of an altered Lake Spenard, we do believe that in past years closer attention to lake conditions during breakup could have been beneficial. Given the history of complaints about water north of Lake Spenard, we feel more attention could have been paid to the day-to-day conditions of the lake during the progress of spring. The principal cause of last year's problem was the blockage of the weir, a condition which lasted for an unknown period of time before it was discovered. This year such an incident could not happen, as several times each week the head of Field Maintenance drives the circuit of the lakes, checks the water level on the shore and inspects the two outlets. On this basis, we also find the complaints to be partially rectified.

SUGGESTION: This office urges the Division of Aviation to develop and implement comprehensive plans both for the Spenard Lake outfall and for freeboard fill along Lakeshore Drive. The restructured weir spot filling that has been done in the past may have actually solved the problems, but no one knows at present. We believe it to be a better practice to plan for contingencies rather than wait until problems arise and attempt to patch them up. Additionally, we hope that Field Maintenance will continue to carry out rounds of the lake system during the critical periods of succeeding springs.

With respect to the environmental study originally done by DOT for the project, this office finds the matter to have been inadequately studied. Even though later findings bore out the "Negative Declaration," we view that as a merely fortuitous coincidence. We strongly urge DOT to better investigate and document their environmental studies.

As no formal recommendations are made in this report, a response from the Department of Transportation is not required. If there are any comments or questions that this report raises, please communicate them to us, and we will respond to them.

We would lastly take this opportunity to commend the cooperativeness shown to the staff of this office by the many employees of DOT who were contacted during this investigation.

Sincerely,

Frank Flavin
Ombudsman

Norm Bosman

FF:NB:jjb

cc: Dale Mattingley

MEMORANDUM State of Alaska

TO: William Chambers
Airport Manager
Anchorage International Airport

DATE: August 21, 1980

FILE NO: 211H

TELEPHONE NO:

THRU: James J. Rhode
Chief Design Engineer

FROM:

SUBJECT: Outlet Structures for Lake Hood and Lake Spenard Spenard, ANC.

FROM: Brooks Wade
International Airports Engineer

As per our phone conversations on August 19 and 20, 1980, the following is my understanding of your request for design work on the subject project.

1. You are requesting that the Aviation Design Section design outlet structures for Lake Hood and Lake Spenard so your Field Maintenance personnel can construct them.

2. The structures will be designed so that the lake elevation will not exceed elevation 68.5 feet as per a Corps of Engineers report.

3. The structures will have adjustable crest elevations.

4. Work can be performed on the private property surrounding the outlet to Lake Spenard. Leasing will coordinate right of entry when plans are complete.

5. You are requesting a Capital Improvements Project to which labor, equipment and materials can be charged.

6. Project should be complete before freeze-up.

If any of the above is not correct, please respond.

BW:jem 3678

Lake Spenard Outfall

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COMMENTS ON LEGAL DRAINAGE RIGHTS

The Corp of Engineers, U.S. Geological Survey, and Department of Natural Resources were contacted with respect to historic drainage rights from the Lake Spenard outfall to Fish Creek. The following people at these agencies provided input.

C.O.E.	George Moen (In Charge of Real Estate)
U.S.G.S.	Ray George
Dept. N.R.	Dean Nation (Also a member of the Water Board)

These names are provided for informational purposes only. They were giving their personal opinions based on their past experiences and were not speaking for their employers.

Mr. Moen was the most definite in his belief that the Division of Aviation had definite historic rights regarding the runoff from Lake Spenard. He felt we had obtained substantial and vested rights due to historical use. He cautioned however, that any change in our method of controlling the runoff or in the outlet control structure would be a different situation and that we should not take unilateral action without approval of the Municipality and other concerned parties. Mr. Moen did not feel the development of the airport and therefore greater runoff due to more paved areas was of any consequence.

Mr. George generally agreed with Mr. Moen's opinion but did not want to commit himself. He suggested contacting Mr. Nation of the Department of Natural Resources.

Mr. Nation offered essentially the same opinion as George Moen.

Hal Gazaway of the Attorney General's Office was also contacted. He gave the opinion that as long as we did not change the manner or amount of runoff we would not have any problems.

Conclusion

If the Division of Aviation wants to improve or change the manner of controlling runoff from the lake system, we should coordinate all work with the Municipality of Anchorage. Any independent action on our part could leave us in a poor legal position.

PRESENT AND FUTURE STATUS
OF LAKE SPENARD OUTFALL

The Municipality of Anchorage Public Works Engineering Section was contacted as to the future status of the Lake Spenard outfall ditch. We were given a preliminary sheet titled "Wisconsin Extension". Apparently the right of way for this project has already been purchased. This project is presently scheduled for 1977 construction. However, the recent defeat of Municipality bonds at the polls could affect this schedule.

The proposed storm sewer and cul-de-sac shown in red was indicated by the engineering staff (Municipality) to reflect present thinking. The land through which the ditch lies is obviously too valuable to be used for an open ditch. One engineer said the inlet of the proposed storm drain would have an enlarged inlet to handle peak flows.

Conclusion

The construction of the Wisconsin Extension should alleviate many of the present problems associated with the Lake Spenard outfall.

MAXIMUM RUNOFF
AND EXISTING CULVERT CAPACITY

The maximum runoff for Lake Spenard is shown by the letter from the GAAB dated June 16, 1972. The GAAB shows that the spring runoff during March creates the maximum runoff. Snow and glaciating in open ditches enlarge the problems caused by the runoff.

The assumption made in computing the runoff for Lake Spenard is that all runoff going directly into Lake Hood will be taken care of by Lake Hood overflow to the ~~south.~~ North

The maximum capacity of the existing 30" CMP Municipality storm drainage system is as shown on the chart, (Figure 4-46). Q = 19 CFS.

The maximum capacity of the existing 24" culvert is shown on the attached chart, (Figure 4-20). Q = 18 CFS***

***This is the capacity with the existing bolted wier removed or with the canal gate cranked completely down.

You will note that the capacities of the Municipality's system and the outfall culvert are approximately the same. This of course is logical and is the reasoning for the sizing of the Municipality's storm drain system.

weir is 1.5' above invert of CMP

In the GAAB's workup for June 16, 1972 they state that if we would allow the lake to fluctuate 3.25' their 30" CMP system could handle the runoff. The existing outfall culvert invert is 67±. This elevation gives about 2.9 feet of depth over the culvert invert before the runoff will top the road. Therefore in most situations if maintenance is right on top of things and has the culvert thawed out and the bolted wier removed there is no problem. This year was an exception since the runoff was less than usual and maintenance was instructed to let the water go. In 1975 maintenance retained the runoff out of concern that the new channels required the additional runoff, this action was apparently largely responsible for the flooding problem. Since the Municipality system has only been in existance since the fall of 1973, the above theory may be tested in future years.

The outfall profiles of Lake Hood and Lake Spenard would indicate that when optimum lake level is exceeded this overflow is at least partially taken care of by the Lake Hood outfall. The runoff workup by the GAAB does not include that which goes directly to Lake Hood. We determined this area from our Topographic maps to be 570 acres or about 85% of the Lake Spenard area. The Lake Hood outfall has a vast area north of Lake Hood, west of the general aviation strip and east of the service road to settle in. This runoff eventually goes to Jones Lake then through a ditch to the Municipality's storn drain system under Northern Lights.

One alternative to an improved system at Lake Spenard would be to lower the culvert at Lake Hood and construct a ditch from Lake Hood to the

culvert inlet. A wier could be placed at the inlet and the lake level could be adjusted at both outlets. Constructing the ditch only along with the wier would improve the outfall without lowering the culvert. Again the Municipality would have to be consulted to see if the Jones Lake-Northern Lights system could handle additional runoff, and if they agreed with this appreach.

The runoff to Lake Hood could be increased significantly in future years with the construction of the North-South Runway and associated lot development. There are large areas north of the existing North-South Runway and west of the new post office site where the runoff just gathers on the tundra. An improvement in the Lake Hood outfall could be in order concurrently with the North-South Runway construction.

Conclusion

Planning, design, and construction efforts should be concentrated on improving the drainage from Lake Hood. We are pretty much locked in on what we can do at Lake Spenard. Increased runoff in the future from the North-South Runway construction and lot development seems to dictate an improved drainage system from Lake Hood to the inlet.