July 24, 2006

Municipality of Anchorage Geotechnical Advisory Commission
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Dear GAC Members,

I am writing as a concerned citizen to express opinions over current plans to develop a very large sheet pile structure as the centerpiece of an expansion project for the Port of Anchorage. I hope to convince you to endorse a thorough independent technical review of the project.

To date the project has been run very much like a political campaign. There has been a lot of emphasis placed on the promise of large amounts of federal funding. Garnering political support and funding are certainly very important aspects of any large public works project. However, I believe that, in this case, these factors have been allowed to color the technical aspects of the project. I believe that the technical aspects of a project such as this need to be separated from the political ones. There are many reasons for this not the least of which is that the laws of physics do not bend themselves to the whims of any administration. I believe there is a strong need for a science based reality check on the technical merits of the sheet pile wall. I believe this should come in the form of an independent review. The specific areas of concern that I have are in regards to the global stability and seismic performance of the sheet pile wall. Also, I believe that the pile supported dock alternative has not been fairly evaluated. In fact I believe that this alternative has been subjected to a kind of political "straw-man" dismissal.

My concerns are directly linked to the fact that proposed project includes a very high (an unprecedented height of some 85 feet freestanding!) wall and will therefore impound a huge mass of earth. Regardless of any sophisticated analysis, the force on the wall in a seismic event will be related to the mass and acceleration as expressed in the laws of physics (from any high school text book) F= MA. Of course the lateral loads due to seismic are directly related to the size of the event and are typically expressed in percentage of gravity (0.2 g for example). On a very large mass such as the proposed fill the forces can be quite high. The amount of lateral acceleration to design for is the subject of much discussion and debate. It is interesting to note that Kobe Japan had designed their wharf system for 0.1g. When the magnitude 6.8, 1995 earthquake hit that port, lateral accelerations of 0.8 g in the N.S. direction and 0.6 g in the E.W. direction as well as vertical accelerations of 0.3g were recorded. Of course the entire port suffered major damage including lateral displacements of the earth filled walls (that were measured in meters), subsidence (again measured in meters), derailed and collapsed container cranes etc. That port was shut down for a number of years and never fully recovered from this event as other routes were developed for the cargo. In other locations we now have records of seismic events that have produced lateral accelerations of over 1.0 g!

During initial work on the port expansion a sheet pile wall was evaluated by two separate and experienced geotechnical engineering firms (under contract to the port) and found to be not feasible. The fundamental reasoning behind the predicted poor performance was global stability due to existing soil shear strengths in the 2000 psf range. These soils properties were based on over 100 historical test holes in the port area. The initial analysis showed the static factor of safety to be around 1.05 (a minimum of 1.5 is generally required). Of course the factors of safety for seismic were much less, around 0.6 (indicating large failure). The initial analysis showed that soils with shear strengths in the 4000 psf range would be required for the sheet pile dock to be feasible. Also at this time an independent technical review pointed to a pile supported platform type dock as the best alternative for the site.

An argument was advanced that these historical soils reports did not adequately characterize the soils 400 feet from the face of the dock etc and that a new soils exploration program be advanced. The port undertook this program. Although they did not uncover any fundamentally different soil properties from the

previous work, the conclusions are now 180 degrees for the earlier work. Now, somehow, the conclusions from the previous work have been stood on their heads and suddenly the sheet pile dock has been found to be feasible. Not only that but, incredibly, the pile supported dock has now been found to be NOT feasible and is reported to be "too flexible". It seems that the conclusions are based *not on new soils* found in the area but on *a new set of analysis* by a different team. I am afraid that these new conclusions are politically motivated and are designed to position certain business enterprises for a large federally funded project.

I contacted some of the experienced geotechnical engineers who did the original work and asked them if their opinions have changed with the availability of the "new" data. The answer was no. If fact they explained to me their concerns for *a potential large failure* if the sheet pile wall is built. Incredibly I have heard directly from no less than five separate experienced and nationally recognized engineering firms who believe that the large sheet pile wall if built will result in a catastrophic failure! Several of these engineers expressed these opinions to the Port, to their consultants, and (I believe), to the GAC. This is not idle chatter or political rhetoric; it is the technical opinion of experienced engineers who have looked in detail at this project.

The pile supported dock alternative, previously seen as the best alternative for the site, is now dismissed as being too flexible. The amount of flexibility expected is not outlined in the various reports. (Please note that the amount of flexibility in a structure is largely controlled by the structural engineer by the type of construction, size, configuration, and number of members etc.) Of course all the major container ports on the west coast including Seattle, Tacoma, Portland, Oakland, Long Beach and others rely primarily on pile supported wharfs. There are many reasons for this including predictable behavior, comparative light weight, redundancy, ductility etc. Are these all too flexible? Portions of the existent dock at the Port of Anchorage survived the 1964 earthquake. Is it too flexible?

Two fundamental concepts in modern structural and seismic engineering are ductility and redundancy. Ductility is related to the ability to absorb energy and deflect without rupture. It is considered a good thing in seismic design. Redundancy is the availability of multiple load paths. Modern pile supported docks can be designed to be both ductile and highly redundant. I do not think the same can be said for earth filled sheet pile docks. Incredibly these fundamental concepts were not discussed by the port in dismissing the pile supported dock alternative. Incredibly what is seen as state of the art in other west coast ports has been specifically excluded from the work at the Port of Anchorage.

Again, while I hesitate to come right out and say it, the advancement of the sheet pile dock alternative at the specific exclusion of all other alternatives including what is seen as state of the art in other locations smacks of political motivation rather than a technically complete and non-biased opinion. Our port is vital to the economy in south central Alaska. Developing the port to keep pace with growth and technology is a must. I hope that the enthusiasm to build the project will not outweigh sound engineering and good judgment. I recommend a thorough science based independent review of the project.

Sincerely,

John C. Daley
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Concerned Citizen
Registered Professional Engineer
Member ASCE COPRI Seismic Design of Container Wharf Committee
Member Earthquake Engineering Research Institute