BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1: SUMAS ENERGY 2 GENERATION FACILITY	Exhibit _____ (YS-T) PRE-FILED TESTIMONY OF YAROSLAV SHUMUK

Q: Please introduce yourself to the Council?

A: My name is Yaroslav Shumuk.

My business address is UMA Engineering, Ltd., 200-415 Gorge Rd. E, Victoria, British Columb

Q: What is the subject of your testimony?

A: My testimony relates to the project's potential to exacerbate flood impacts in British Columbia.

Q: What is occupation and employment status?

A: I am a Senior Water Resources Engineer in the Water Management section of UMA Engineering, L a part of UMA Group, Ltd., which is an international firm with 30 offices throughout North Americ engineering, construction and management services to a broad base of public and private marke provides civil, structural, mechanical, electrical and other engineering services. I am responsible f involving hydrology, hydraulics, river engineering and computer modeling. In these projects I p groups of engineers and technologists who report to me.

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Q: Please describe your education and experience.

A: I graduated from the University of British Columbia with a Bachelor of Applied Science degree in Civil Engin Specialty, in 1976. After graduation I worked in the Hydrology Section of BC Hydro for three years, then on Engineer for a coal mining company. Twenty-one years ago, I joined a consulting engineering firm called Ker, P Ltd. that later became KPA Engineering, Ltd., and then was bought out by my current employer, UMA Engi

In the 26 years since graduation I have worked in the water resources field, primarily on projects or studie hydraulics, river morphology, and computer simulation of hydrologic and hydraulic processes. In the last 1 several floodplain mapping projects and studies that seek solutions to flooding problems in developed floodplai I have used or supervised the use of unsteady flow models in several of these studies. One of these studies is t Hazard study that we became involved in two years ago. My experience and education are further described provided as Exhibit ___ (YS-1).

Q: What materials have you reviewed in preparation for your testimony?

A: I have reviewed portions of the following documents related to flooding and a description of the project:

1. Various letters containing comments on the Draft Environmental Impact Statement
2. Prefiled Testimony of Paula J. Cooper 23 June, 2000
3. Prefiled Rebuttal Testimony of David Carlton
4. Prefiled Direct Testimony and Prefiled Rebuttal Testimony of Katy Chaney
5. Sumas Energy 2=s Post-Hearing Brief dated 5 September, 2000
6. [Proposed] Findings of Fact, Conclusions of Law, and Order dated September, 2000
7. Final Environmental Impact Statement
8. Council Orders 754, 759 and 760
9. Second Revised Application for Certification
10. Letters dated 21 August, 2001, 31 August, 2001 and 13 September, 2001 from Perkins Coie LLP to EFSEC regarding scheduling of future unsteady flow modeling SE2=s flood consultants
11. Applicant=s Prefiled Direct Testimony of Douglas Sovern
12. Applicant=s Amended Prefiled Direct Testimony of Hsueh-Ju Chang
13. Draft Supplemental Environmental Impact Statement.

Q: Would you please summarize the key points of your testimony.

A: Yes. Essentially, I'll be making five points. One, the Second Revised Application fails to analyze flood events larger than the 100-year flood, even though analysis of larger floods is called for by EFSEC's rules and standard flood management

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practice in British Columbia.

Two, SE2's proposed fill of the site could cause a change in the routing of floodwaters to British Co has not been analyzed and should be by use of an unsteady state model.

Three, SE2's proposed fill of the site will increase the height of flood waters in British Columbia. A is necessary to accurately quantify the extent of this impact.

Four, this area is prone to very severe flood damage in British Columbia. There is a real concern th capacity in this area will exacerbate this problem. Typically, flooding problems are exacerbated wh a time. No single fill=s impact on flood levels by itself seems particularly noteworthy. But the impacts can be devastating. It is this incremental loss of flood storage capacity that is a major th

Fifth, SE2 has offered nothing to mitigate for these flood-related impacts.

Q: What are the features of the floodplain at the SE2 site that are relevant to your testimony?

A: The SE2 site is located in the floodplain of Johnson Creek, which becomes the Sumas River floodplain farther downstream. The upstream end of the Johnson Creek floodplain is near the bank of the Nooksack River near Everson. During large floods on the Nooksack River, a portion of the Nooksack River flow crosses the divide into the Johnson Creek floodplain and flows north into Canada, therefore this floodplain also serves as a corridor for the Nooksack River overflows.

The Nooksack River drainage basin above the overflow point near Everson is about 13 times larger in surface area than the combined drainage area of the Sumas River and Johnson Creek upstream of the Canadian border. Therefore a minor portion of the Nooksack River flow can be many times greater than the total flow originating in the Sumas River / Johnson Creek basin. Because of this, when a large flood occurs on the Nooksack River, the overflows from the Nooksack River overwhelm storm runoff flows that originate in the Sumas / Johnson basin. These overflows travel down the Johnson and Sumas River floodplains into Canada, where they are typically detained for a time in a lowland area upstream of the Barrowtown Pumpstation before eventually draining to the Vedder and Fraser Rivers.

The occurrence of these Nooksack River overflows makes the flood characteristics at the SE2 site unique. During small storm events, the streamflows in Johnson Creek at the SE2 site originate from the Johnson Creek drainage basin only. However, once the Nooksack River exceeds the threshold level at which overflows begin, the magnitude of the overflow discharge increases very rapidly with relatively small increases in the

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Nooksack River level. The result is that the Johnson Creek and Sumas River floodplain experiences relatively benign flood impacts from small storm events, but suffers widespread and severe flood impacts from huge volumes of overflow from the Nooksack River during the large events. Such a large increase in the severity of flood impacts does not exist for typical streams in this region.

Q: Does the Second Revised Application acknowledge or discuss the site=s vulnerability to flooding from both Johnson Creek/Sumas River floods and Nooksack River floods?

A: No, the Second Revised Application does not appear to recognize the phenomenon that I described in my prior answer. I am not saying that the flood analyses carried out for the 100-year flood ignored the Nooksack overflows, but the fact that larger floods, such as the 200-year or 500-year, would be vastly more severe than the 100-year flood, in comparison to typical streams in the region, is not recognized. This is significant because the standards for flood analysis are developed for typical stream flood behavior, and the floodplain at SE2 is not typical. I believe that analyses for floods with higher return periods than 100 years are warranted for this site.

Q: Please describe ongoing studies and efforts to develop a management plan for flooding in this area.

A: As a result of the large flood that occurred in November 1990, which caused an estimated $7.4 million (CAD) in damage in the Johnson / Sumas basin on both sides of the border, the Nooksack River International Task Force was formed with the objectives of reviewing the flood history of the area and providing recommendations on potential projects and solutions to alleviate flooding on both sides of the border. The Task Force is still active in that latter objective today, coordinating two series of flood studies, one on each side of the border.

The US study began in 1993, with Whatcom County as the lead agency receiving funding assistance from the Department of Ecology. KCM, Inc., a consultant from Seattle, was engaged to carry out the main engineering study of the flood problems on the Nooksack River downstream from Deming, including the Johnson Creek / Sumas River overflow corridor from Everson downstream to the border with Canada. More recently, Dr. Delbert Franz of Linsley, Kraeger and Associates, Ltd. has been retained by the county to develop a one-dimensional, unsteady flow model for the entire Nooksack River downstream of Deming, including the Johnson / Sumas overflow corridor to the Canadian border.

The Canadian studies began in 1994, with participation and funding from the British

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Columbia Ministry of Environment and the District of Abbotsford. As part of these studies, a one-dimensional, unsteady flow model was developed for the Sumas River floodplain downstream of the US border. The flood modeling work was carried out by Ken Wilson, who was employed by the Ministry until 1996 or 1997, then continued the work as principal of Wilson Hydrotechnical, Ltd. In 1999, as a result of the retirement of Ken Wilson, UMA Engineering, Ltd. was retained to continue the flood modeling.

Due to the different funding schedules on both sides of the border, the studies have been delayed several times. At present, both the US and Canadian models are nearing the end of their development phase. In the next phase, it is anticipated that the models will be used to simulate 100-year and 200-year flood events to test various mitigation options that could alleviate the flooding problems in the Johnson/Sumas floodplain.

Q: What size floods are being evaluated by the Task Force?

A: The standard return period for several floodplain management tools, such as floodplain mapping, in the Province of British Columbia is 200 years. In Washington State, a 100-year return period is commonly used. To address this difference, current flood hazard studies that are being coordinated by the Nooksack River International Task Force are committed to analyzing both the 100-year and the 200-year events, so that the regulatory needs on both sides of the border are satisfied. All the work done by the Applicant (or proposed to be done in the future by the Applicant) for analyzing the impacts of the SE2 site uses a 100-year or lesser return period. These analyses should also be done for the 200-year event because the project impacts a jurisdiction (British Columbia) in which this is the standard for analysis and administration for floodplain management purposes.

Q: Does the Second Revised Application address the 200-year flood which is the standard for floodplain management in British Columbia?

A: No. Nor does it address the 500-year flood. In the Second Revised Application, the first page of Section 3.3 quotes the WAC 463-42-322 requirement for an application=s coverage of water issues. One of these requirements is that the applicant identify the 5-year, 100-year, and 500-year flood boundaries, and all protective measures to protect against possible flood damage to the site and to the facility. WAC 463-42-322(3). However, there is no analysis of the 500-year event in the Second Revised Application nor does the application provide any explanation for this omission. Given the unique nature of flood behavior in the Johnson / Sumas floodplain, and that the site is directly in the path of flood waters during an Nooksack River overflow event, the requirement for the analysis of the 500-year event should not be waived. A facility designed to withstand a 100-year event with some freeboard (i.e., additional flood storage capacity)

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may be vulnerable to release of waterborne contaminants during a 500-year event. This is more likely if the magnitude of a 500-year flood is greatly increased over a 100-year flood, as it may be near the SE2 site, given the unique flood behavior caused by the Nooksack River overflows.

Q: Based on your review, what effects of the filling of this site need to be addressed from a flood hazard perspective?

A: There are two issues here. One, consideration must be given to the potential for filling of this site to reroute flood waters in directions different than they would take without the fill. Second, consideration has to be given to the loss of flood storage capacity if this site is filled.

Q: Let=s take the first item first. How could filling of this site result in a rerouting of flood waters?

A: The topography near the SE2 site and downstream is gently undulating with low ridges and swales that direct overland flows in a complex pattern. In addition to the stream channels, railways and roads also have the potential to guide flood flows and add to the complexity. It is not possible from inspection of maps and past flood photos to determine how the fill at SE2 will affect the flow pattern. There is a small but definite possibility that the fill could divert the flows during very large floods in the vicinity of the SE2 site in a way that would redistribute the flows crossing the border into British Columbia. Because much of the length of the Sumas River in British Columbia has natural levees on both sides of its channel, this redistribution at the border could have consequences on the pattern of flooding for a considerable distance in British Columbia.

Q: Does the Second Revised Application address this issue?

A: No. Nor is it addressed in any of the other materials I have reviewed.

Q: What would it take to analyze this issue?

A: The only way to determine whether or not there are significant consequences to British Columbia as a result of the fill=s potential to reroute flood waters is to analyze the flow distribution with an unsteady model containing sufficient detail to simulate the different flow routes. This model should test the effects of the fill over a large range of flood events, such as the 10-year to 500-year floods.

Q: Is there any particular type of unsteady flow model that should be used for this

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purpose?

A: The model must be sufficiently detailed to be able to reliably account for the impacts of the proposed fill in this hydraulically complex area. A model that is too coarse in its detail can provide misleading or meaningless results. Also, to address the Province=s concerns, the unsteady state model must extend into British Columbia at least as far as the Barrowtown Pumpstation to determine the impacts and effect of potential mitigation there.

Q: How much time should be allotted for conducting this computer analysis?

A: In our experience, the time required to set up, debug, calibrate, and run the models to determine impacts and test mitigation options is substantial. It would not be unusual for a study of this magnitude to require a period of six months or more, after all the required data is available.

Q: Let=s turn to the second impact you mentioned. Would the SE2 project cause a loss of flood storage capacity?

A: Yes. The project would result in a net fill volume of approximately 130,000 cubic yards in the floodplain. The volume of this fill will occupy a three dimensional space that otherwise would store flood waters during a flood event. This displacement will undoubtedly occur during both small and large flood events, and will cause local and downstream peak water levels to increase.

Q: Will the increased water levels impact British Columbia?

A: Yes. During a flood involving Nooksack River overflows into Canada, the flood water typically becomes trapped for a time in the Sumas River floodplain between the border and the Barrowtown Pumpstation and floodgates, located about 10 miles (direct distance) into British Columbia. Flood water that is displaced by the SE2 fill will accumulate here and increase peak water levels in this area. Because the area of flooding is large, this increase in flood volume would be spread over a wide area and the incremental increase in peak flood heights would be small. However, specifying the magnitude of this impact with an appropriate degree of precision or certainty requires the use of an unsteady state model.

Q: If the incremental increase in peak flood height in Canada would be small, do we need to be concerned with this issue?

A: Yes. There is a major cumulative effects concern here. This fill would be one of many small incremental increases caused by other existing and future developments that,

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taken together, could create a significant increase to flood hazards in the floodplain. Current trends in floodplain management tend toward prohibition of any piecemeal filling in a floodplain so that regulatory agencies may defend against this creeping increase in flood risk.

Q: Can you provide examples of this trend toward avoiding piecemeal loss of flood storage capacity?

A: Yes. In 1990 King County in the State of Washington adopted a new restriction on floodplain development called a Azero-rise floodway@. This restriction prohibits development within the 100-year floodplain that would cause a perceptible rise in the flood level during a 100-year flood. The following quote from Customer Information Bulletin 38 of the King County Department of Development and Environmental Services describes the intent of this restriction:

A*Development activity must not reduce the effective storage volume of the floodplain.*@

In the mid-1990=s the City of Surrey in British Columbia prohibited the placement of fill in a floodplain area known as the Serpentine B Nicomekl lowlands, specifically because the City recognized that placing fill on one parcel of land would make the effect of flooding worse on other parcels of land in the floodplain. It is planned that this policy will continue at least until a flood control project is completed that would bring an increased level of flood protection to all landowners in the floodplain.

KCM, Inc. in their Lower Nooksack River Comprehensive Flood Management Plan proposed three concepts to reduce the existing flood problem in the Johnson / Sumas floodplain. One of these concepts was to create more flood storage along this corridor to reduce the peak flow reaching the city of Sumas and entering Canada. To allow the fill for the SE2 plant would directly work against this possible solution to the existing flood problem.

Q: Has the applicant proposed to create new flood storage or otherwise mitigate the impact of its displacement of flood storage in the Nooksack River floodplain?

A: No. While Mr. Sovern suggests mitigation could easily be accomplished (Ex. 187 at 5:37 - 6:2), it likely would require a considerable amount of work to develop an adequate mitigation proposal and the prospects for complete mitigation are far from certain. First, if mitigation involved acquiring land or acquiring the right to increase the flooding on another owner=s land, then this could be costly and it might be difficult to find landowners willing to cooperate. Further, the location of the compensating storage site would be critical. Acquiring a right to flood an equal

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amount of land somewhere else in the floodplain would not necessarily mitigate the impact of losing this flood storage capacity at this particular location. Floods are dynamic events, and the compensating storage must be effective at the same stages of the flood that the fill will displace. It would take a great deal of work to determine not only how much compensating flood storage capacity is required but also where it needs to be located in three dimensional space to offset the loss of flood storage capacity represented by the filling of this site.

END OF TESTIMONY

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