May 27, 2021
11:30 AM, all doors locked.
Mailed USPS certified.

Mayor Emily Larson
City Hall, Room 422
411 West First Street
Duluth, MN 55802
218-730-5230

Dear Mayor Larson,

This is an urgent and earnest request from one "true admirer of Lake Superior" (as shared on your City's webpage) to another. Please, please change course on your decision to continue the practice of using harbor dredge spoils to be disposed of onto Lake Superior shorelines as "beach nourishment."

I'm moved to write this letter directly to you out of my concerns that as Mayor you may not have been well served by several entities on whose advice you have come to rely in matters of Lake Superior water quality and Minnesota Point erosion. And I appeal directly to your better judgment based on what I know to be your commitment to make the city of Duluth the greenest city in the country and as such, a stalwart guardian of Lake Superior and Minnesota Point, the largest freshwater lake barrier island ecosystem of its kind in the world.

Allow me to address lake water quality and beach erosion separately, beginning with the lake.

<u>Lake Superior Water Quality -</u>
As you are aware, Duluth is known worldwide for having the world's largest and finest freshwater lake at its doorstep. Lake Superior's outstanding water quality was vitally instrumental in founding the Environmental Protection Agency's National Water Quality Laboratory here in 1966, to utilize the finest source of un-polluted water in the world. This high quality water source was essential to the lab's research. This research has been used as the gold standard for measuring fresh water quality for our entire country and the world over.

Over fifty years of research by 50 to 100 scientists working full time have produced a wealth of new peer-reviewed data for understanding water pollution effects, remediation and prevention. The USEPA lab has developed an expansive database from adding polluting chemicals to water and observing the effects on aquatic organisms. The least amount of a chemical causing an adverse effect on living aquatic organisms determines the water quality criterion water concentration or level for that chemical. Water quality criteria (WQC) defines the no-adverse effects for all

freshwater aquatic life. Exceedences above criteria levels will cause negative effects on aquatic life and for the defined use of the water.

These WQC have since provided the scientific underpinnings not only for the Federal Clean Water Act, but for all state's water quality standards including Minnesota's. From these criteria, regulatory standards are developed to protect aquatic life as well as for protecting the municipal, industrial, agricultural and recreational uses of these waters.

I spent my 33 year public-service career at this lab as a research chemist solving technical problems for the USEPA, and 9 yrs as Board Member for WLSSD. From this experience, I can tell you that even as a pristine lake, Lake Superior has a multitude of stresses to contend with in order to maintain its high quality characteristics. Lake Superior's pressing problems have been mounting for decades and each are of human cause or origin. The total quantities of substances being added to or flowing into the lake will ultimately diminish the quality of the lake's water when added to the lake in amounts over-whelming the natural processes that keep the water clear and clean. That's the fundamental reason and need to limit pollutant inputs wherever possible and to implement removal treatment at the source(s) of all pollution.

Lake Superior, as with all the downstream Great Lakes, is under growing anthropomorphic stresses from watershed sourced sediment and nutrient loading, industrial chemical loading, over extraction, habitat loss, invasive species and climate change. More and more fish consumption advisories continue to be posted while blooms of undesirable (toxic) algae are becoming more frequent and severe while desirable algae (diatoms) are inexplicably shrinking, potentially disrupting the entire Great Lakes food web.[1] Forage fish population declines threaten both commercial and recreational fishing industries.[2]

What EPA Water Quality Lab scientists do know is that the content of water defines its quality and any chemical additions to water will have the potential to degrade it. Therefore, the amounts of chemicals found in harbor sediments and placed on a beach

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[1] *The Disrupted Food Web of the Great Lakes* & *America's Most Valuable Resource is at Risk* – National Geographic Nov 2020 at: https://www.nationalgeographic.com/magazine/graphics/see-how-the-great-lakes-food-web-is-in-trouble & https://www.nationalgeographic.com/magazine/article/north-americas-most-valuable-resource-is-at-risk-feature?loggedin=true

[2] "*Fisheries Researchers Say There's a Double Whammy Hitting Lake Superior Cisco" – Minnesota Public Radio News at:* https://www.mprnews.org/story/2015/12/03/lake-superior-herring

or in-water will become part of the lake's water, but may be assessed by sampling the material and analyzing its content in advance of its placement.

The results of a sediment sampling effort by USACE contractors are shown in Table 1, enclosed, showing the content of each item measured in sediments scheduled to become spoils and include my calculations of the estimates of the total loadings onto the beach and to the lake from the 2020 Park Point sediment placement. Each component will become part of the lake system and determine the content of water in contact with sediment spoils and in the water column above. The totals of each component are needed to evaluate the concentration levels within the project area that defines the volume of water potentially affected by the total magnitude of the masses of solids and constituents placed in-water and covering the lake bottom. Water in direct contact with sediments will become the most affected, first by dissolved components transported into the water column by diffusion and then by exchange across the sediment-water interface. Organisms living in or spawning on and/or burrowing into the bottom sediments will be in direct contact with spoil's pore water and be the most affected. Water currents moving over and away from the project area will transport component materials out of the contact area.

Some of the measured components in the 2020 sediments dredged will cause the water quality to be degraded when the WQC for that component is exceeded. The most probable dredge spoils constituents expected to exceed USEPA's WQC within the project area are listed for each component and its WQC: arsenic, 0.0022 ug/l; copper, 9.3 ug/l; iron, 300 ug/l; manganese, 50 ug/l; mercury, 1.5 ng/l; polyaromatic hydrocarbons, 2.8 ng/l; benzo(a)pyrene, 2.8 ng/l; polychlorinated biphenyls, 0.079 ng/l; and dioxins, 0.013 pg/l. In addition, other qualities of water are affected including aesthetic qualities, suspended solids, turbidity, clarity, temperature, and dissolved oxygen. The criteria for these are described in USEPA's Red and Gold Books, Table 1 references.

Negative impacts to aquatic organisms are expected and consequent losses of assigned uses of the water will follow. Fishable, swimmable and drinkable water uses are to be protected by adhering to the water concentrations not to be exceeded as specified as quality criteria for water.

Pollutant caused adverse effects have also been documented and studied in real world of ecosystems outside the laboratory. Ecosystems' impacts are far more complex and those impacts arising from chemical and biological agents in the 2020 beach and in-lake dredged spoil deposition spread over 1-2 square miles of Lake Superior surface water and lake bottom have not yet been studied or assessed to fully understand the impacts of lake disposal of the harbor dredged spoils. Evaluative hypotheses are needed to measure and assess the following conditions in Lake Superior:

a) The presence of biological contaminants including bacterial and viral pathogens and invasive species;
b) Suspended solids and turbidity causing reduction of sunlight penetration, clogging of fish gills, blocking fish migration and accelerated warming of lake water;
c) Sediment deposition smothering bottom dwelling aquatic organisms, altering the lake bottom (benthic) habitat and covering fish spawning areas;
d) Legacy chemical compounds and elements with toxicity to bottom dwelling aquatic food chain organisms and fish;
e) Stimulating cyanobacteria growth in lake sediments and in-water blue-green algae while suppressing vital diatom population necessary to primary production at the base of the food chain;
f) Secondary physical and chemical reactions reducing dissolved oxygen and releasing of elements and compounds to the water column in toxic concentrations;
g) Enhancing mercury food-chain bioaccumulation, (US FDA mercury fish action level is 1 ppm mercury, i.e., one pound of mercury is enough to contaminate a million pounds of fish.);
h) Enhancing forever chemicals (PFAS) concentrations and food-chain bioaccumulation;
i) Tainting drinking water at Superior and Cloquet municipal lake water intakes (from south shore placements).

Please note that the Table 1 data summation presented here is derived from the USACE's own sampling data, specifically selected for being the most representative available samples, and have been closely reviewed for accuracy. The USACE has not disputed these calculations. Their focus has instead been to present their view of the safety of the spoils for humans on the beach. The Human Health Risk Assessment (HHRA) (Appendex N in USACE (2), Table 1) for the 2019 south beach placement is based only upon one toxic component, dioxin, and not the entire simultaneous dose of the many components contained in the dredged spoils placed in 2019.

From my experience, the 2019 HHRA is woefully incomplete and inadequate for assessing the beach placement of dredged spoils and future placements given lack of similarity of the spoils contents, the multitude of contaminants not assessed (both known and unknown), and the actual exposure conditions between the two sites where metal, glass and plastic shards are more likely present now at the north beach site. Duluth must demand and enforce the highest standards for the total environment of its most highly popular beach park in the city for the recreational experience expected by the 6 million annual out-of town visitors. The USACE can not, and will not guarantee the cleanliness of the harbor dredged spoils placed on the beach.

The net result of dredged spoils containing the measured contaminants being deposited into the lake will degrade the quality of the lake water and are clearly not recommended for beach placement and open water disposal. The facility built for proper treatment of such contaminated dredge spoils is the Erie Pier Confined

Disposal Facility which still has an unused capacity for an additional 500,000 cubic yards.

The USACE data for 2021 beach placement have not been made available to me but from the samples surveyed in 2015 and 2018 from which the data in Table 1 was provided, there is an indication of similar toxicity in the samples from the planned areas to be dredged, including at least two elements which would be exceed the water quality criterion for iron and manganese in the proposed project area and will remain on the lake floor covering the existing lake sediments. Turbidity and suspended solids criteria and standards would certainly be exceeded again as well.

Minnesota Point Erosion-

Beyond these biological and chemical environmental concerns for Lake Superior I have significant and long-standing concerns for the physical integrity of Minnesota Point beaches.

I have been concerned about erosion on Park Point from the time when I went down the path to the beach to find a four foot drop to the beach behind my home at 3215 Lake Ave South. That was about 1950, and I was 10 years old. Since that time the beach dunes have filled back up by wind-blown beach sand with fifty foot wide and six foot high berm of new sand and dune grass. The current erosion is not yet a threat to the property.

But the opposite is true for the high-energy wave action North and South ends of the Point where many feet of dune sand and beach grass are now gone forever. Many the old-growth white and red pines are being undermined and washed into the lake at the south end of the Point, partially destroying a zone designated by the MnDNR as a high-value Scientific and Natural Area.

A partial solution to this erosion problem is to undo the impacts of the canal structures changing water current flows and blocking the natural flows of materials that built the Point in the first place. Gravel flowing from the North Shore rivers and shore needs to be deposited on the north beach of the Point all the way down to where historic surveys show the entire north end of Minnesota Point was composed of lake gravel to about 13th St and Lake Avenue. That flow of lake and river gravel is now piling up at shoreline docks, including Glensheen's, and under water at the corner of the Lakewalk. A portion of this blocked gravel flow is apparently responsible for plugging up the storm sewers of the Freeway posing a significant cleanout expense for the city and MnDOT.

On the south end of the Point, the Superior entry break-wall structures are doing the same by blocking the flow of lake sand from the slowly eroding South Shore of Lake Superior and accumulating it by building out the beach-dunes areas on the Wisconsin Point side of the break-walls. That accumulation of sand needs to be reintroduced

onto the south beach of the Point where lake wave action can distribute it further down the point as it used to do naturally.

Since this clean solution has not been recognized or adopted, the short-term band aids that have been applied have proven to not work, in every case, for different amounts, time after time and storm after storm. The design specifications for the $30 million 12 ft concrete wall with boulder protection for the Lakewalk may be achieved by different means, but until tested by a strong Lake Superior storm, may not provide the answer for protecting the rest of Minnesota and Wisconsin Points given our changing climate conditions.

What we do know for sure is that polluted dredged spoils will not stay on the beach for long and as Table 1 reveals, will ultimately pollute the lake.

Given the shredded tin and aluminum cans, broken glass bottles and sharp plastic shards that were deposited in 2020 and 2019, please change course and require the USACE dispose of the dredged spoils properly - not on the beach or in open water.

Please join with the City of Superior and with the Park Point Community Club to pursue the new efforts by the Division of the Detroit USACE that oversees Section 111 of the Rivers and Harbors Act and pursue permanent proper methods and funding for restoring and protecting the Minnesota and Wisconsin Points as the invaluable natural and recreational resources of the Lake Superior ecosystem they are.

I stand ready to help you better understand the information I've presented here and to work collaboratively with the City and Park Point Community toward realizing the long-needed more sustainable and less polluting options before us. Past practices have proven expensive, futile, harmful and regretfully divisive.

Thank you for your consideration and for your service to our extraordinary City.

Sincerely,

Signed:

Gary E. Glass, Ph.D, Duluthian, Member HTAC & PPCC
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Enclosure: Tables 1.
E-copies to HTAC, IWLA, MPCA, PPCC, USEPA, & USACE

Table 1. Dredge Spoil Contaminant Loadings into an Outstanding International Resource Water: Concerns (1) for Lake Superior's Degradation. USACE data (2**).**

Harbor Dredged Sediments Composition for 2020 PP North Beach Placement: USACE data (2, 3)	Beach/ Water Loading Per Cubic Yard dry wt (3, 4)	2020 Total Beach-water Loading Per 48,000 cy Covering project area, 1-2 sq miles of L. Sup. sediments(3, 4)	Lake Superior Sediments 2018 Composition Near Shore North Beach before 2020 placement (5)
Sed. Depth 2ft 18% course, 62% fine, 10% silt, 0.1% clay	1,087 kg/cy 2,396 lbs/cy	**184 million lb, wet wt** **115 million lbs, dry wt**	Surface 0.5ft, 7.2% course-medium 92.7% fine; 0% silt, 0% clay
Organic Carbon, tot.. 18 gm/kg	20 kg/cy	**2,100,000 lbs**	None detected, < 2 gm/kg
Oil & Grease: 210 mg/kg	230 gm/cy	**24,000 lb**	None detected, < 150 mg/kg
Poly Aromatic Hydrocarbons: 3.1 mg/kg	3.4 gm/cy	**353 lb**	None detected, < 0.04 mg/kg
Benzo(a)Pyrene: 0.27 mg/kg	0.29 gm/cy	**31 lb**	None detected, < 0.04 mg/kg
TCDD (dioxin): 5.4 ng/kg	5.9 microg/cy	**0.0007 lb**	None detected, <0.45ng/kg
Nitrogen (Kjeldahl): 695 mg/kg	755 gm/cy	**79,000 lb**	Non detected < 30 mg/kg
Phosphorus: 185 mg/kg	201 gm/cy	**22,000 lb**	97 mg/kg
As, arsenic: 3.1 mg/kg	3.4 gm/cy	**353 lb As**	2.3 mg/kg
Cr, chromium: 20.3 mg/kg	22 gm/cy	**2,400 lb Cr**	3.3 mg/kg
Cu, copper: 19.3 mg/kg	21 gm/cy	**2,200 lb Cu**	1.7 mg/kg
Fe, iron: 17,700mg/kg	19,000 gm/cy	**2,000,000 lb Fe**	2,800 mg/kg
Hg, mercury: 0.091mg/kg	0.099 gm/cy	**10.6 lb Hg**	None detected, < 0.007mg/kg
Mn, manganese: 380 mg/kg	410 gm/cy	**44,000 lb Mn**	44 mg/kg
Ni, nickel: 16.3 mg/kg	18 gm/cy	**2,000 lb Ni**	2.3 mg/kg
Pb, lead: 17 mg/kg	18 gm/cy	**2,000 lb Pb**	0.9 mg/kg
Zn, zinc: 67.3 mg/kg	73 gm/cy	**7,700 lbs Zn**	8.0 mg/kg

(1) Concerns arising from 2020 beach and in-lake dredged spoils deposition over 1-2 square miles of Lake Superior's surface water and bottom sediments: a) Presence of biological contaminants including bacterial and viral pathogens & invasive species; b) Suspended solids and turbidity causing reduction of sunlight penetration, clogging of fish gills, blocking fish migration and accelerated warming of lake water; c) Sediment deposition smothering bottom dwelling aquatic organisms, altering benthic habitat and covering fish spawning areas; d) Legacy chemical compounds and elements with toxicity to bottom dwelling aquatic food chain organisms and fish; e) Stimulating cyanobacteria growth and in-water blue-green algae while suppressing vital diatom population necessary to primary production; f) Secondary physical and chemical reactions reducing oxygen and releasing of elements and compounds to the water column in toxic concentrations; g) Enhancing mercury food-chain bioaccumulation, (US FDA mercury fish action level is1 ppm mercury); h) Enhancing forever chemical (PFOS) concentrations and food-chain bioaccumulation; i) Tainting drinking water at Superior and Cloquet municipal lake water intakes (from south shore placement).

(2) Data source: USACE FY2019 Minnesota Point Monitoring Plan Final Report to MPCA, Oct. 28, 2020, 5,924 pp**, in** Appendix L, 2862 pp.; g = gm, grams; mg = milligrams, 1/1000 g; ug = micrograms, 1/1,000,000 g; ng = nanograms, 0.001 ug; kg =1000 gm.

(3) Loadings calculations above are based primarily on analyses averages of three 2 ft core samples. The estimates are calculated for 48,000 cubic yards (cy) of dredged sediments from Anchorage Area Five E & F (USACE 2), of approximately 25 acres in size, off shore from 14th to 18 th Sts., in 27-29 ft of water, moved by barge, and pumped mixed with bay water (15% slurry) onto the north beach beach from 7th-10th Sts. of Park Point next to the Duluth Ship Canal, Aug-Sept. 2020, by USACE contractors. Total amounts in 48,000 cy of harbor sediments dredged: sediment density, 19 lb/gal; one cubic yard x (202gal/cy) = 3838 lbs wet wt/cy; 3838 lbs/cy x 48,000 = 184,000,000 lbs wet sediments plus 200 million gallons of bay pump water. Sediment percent solids, 62.3%; one cy sediment, dry wt basis = 1,087 kg-dry wt/cy x 48,000 = 52.2 million kilogms-dry wt. = 115 million pounds- dry weight.

(4) Data for samples within the 2020 dredged area were selected for evaluation are as follows: Sample numbers DS-15-102, -106, -108. Core sample -107 was sampled but not reported. Management Unit (MU) composites DS-15-MU-21 and MU- 22 were checked and data used to fill gaps where core data were not reported. The MU-21 sample is made up of 1/5 volume of samples DS-15 -100 thru -104 (composed on one 2 ft core, DS-15-102, and four 0.5 ft Ponar samples); MU-22 is made up of 1/5 volume of samples DS-15-105 thru -109, (composed of three 1.8 ft cores, DS-15-106. -107, -108, and two 0.5 ft Ponar samples).

(5) Lake Superior sediment sample, DS-18 -50, six inch sediment depth, in 4.5 ft water off PP north beach; Ponar sampler, Data source: USACE(2).

The measured components in the 2020 sediments deposited will cause the water quality to be degraded when the WQC for that component is exceeded. The most probable dredge spoils constituents expected to exceed USEPA's WQC within the 1-2 sq. mile project area are listed for each component and its WQC: aesthetic qualities,, suspended solids, turbidity, clarity, temperature, oxygen see RB, oil & grease, no visable signs; arsenic, 0.0022 ug/l; copper, 9.3 ug/l; iron, 300 ug/l; manganese, 50 ug/l; mercury, 1.5 ng/l; polyaromatic hydrocarbons, 2.8 ng/l; benzo(a)pyrene, 2.8 ng/l; polychlorinated biphenyls, 0.079 ng/l; and dioxin, 0.013 pg/l. Reference: USEPA Quality Criteria for Water, Red Book, 1976, 256 pp. & USEPA Quality Criteria for Water 1986, Gold Book, 477 pp. EPA 440/5-86-001.