U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: CG-3PWB
Phone: (202) 372-1511
Fax: (202) 372-1914

16591
November 22, 2006

M[redacted]
Steptoe & Johnson, LLP
1330 Connecticut Avenue, NW
Washington, DC 20036-1795

Dear Mr. [redacted]

This is in response to your letter dated November 20, 2006, in which you disagreed with the Coast Guard's obligation to consider potential transboundary impacts to the City of Windsor, Ontario, as a result of the proposed Ambassador Bridge project. As defined by the *Council on Environmental Quality (CEQ) Guidance on NEPA Analyses for Transboundary Impacts*, dated July 1, 1997, the National Environmental Policy Act (NEPA) "requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States". As you outlined in your letter, the Coast Guard permits only the portion of a bridge within the borders of United States, however, the portion of the bridge in the United States would not be constructed without the portion in Canada. Therefore, analysis of the impacts on Windsor must be included in the Environmental Assessment.

Should you have additional questions concerning this matter, please contact me.

Sincerely,

[redacted]
Chief, Office of Bridge Administration
U. S. Coast Guard
By direction of the Commandant

Copy: [redacted]D-9(dpb)

STEPTOE & JOHNSON LLP
ATTORNEYS AT LAW

[redacted]

1330 Connecticut Avenue, NW
Washington, DC 20036-1795
Tel 202.429.3000
Fax 202.429.3902
steptoe.com

November 20, 2006

Mr[redacted]
Chief, Office of [redacted]ridge Administration
U.S. Coast Guard
2100 2nd Street, SW
Washington, DC 20593-0001

Re: Environmental Review of Ambassador Bridge Second Span Proposal

Dea[redacted]

This letter will set forth the views of the Detroit International Bridge Company ("DIBC") on certain environmental review issues raised by the City of Windsor, Ontario. In September 14, 2006 letters submitted by attorneys for Windsor to the Coast Guard, the argument is made that the Coast Guard is obligated by the National Environmental Policy Act (NEPA) to consider the local impacts to the City of Windsor of the proposed construction of a second span of the Ambassador Bridge. Specifically, the City urges that an Environmental Impact Statement be prepared that describes the impacts of a proposed second span in Windsor to that Canadian City's traffic, air quality, noise and cultural resources, among other local impacts.

We respectfully disagree that the Coast Guard is obligated by NEPA to assess such impacts of a second span to Windsor or any other point in Canada. While there may be situations in which transboundary impacts of an action that occurs in the United States might need to be assessed under NEPA, this is not such a case. Thus, while construction of a power plant, for example, on the U.S. side of the border might have impacts in Canada that need to be assessed in a NEPA document, a cross-border bridge is fundamentally different. That is because a bridge by its nature is being built in both the U.S. and the bordering nation, namely, one half in each. Each government will be permitting only its half of the bridge – the Coast Guard will be permitting only the portion of the bridge in the United States and Canadian authorities the portion of the bridge in their nation. In this situation, any environmental

0002

impacts of the bridge in Canada (and specifically in Windsor) are the result not of any actions taking place in the U.S., but of the construction of the Canadian half of the bridge.

In short, if there are impacts to traffic, air quality, cultural resources and other matters in Canada, they are the result of the construction of the Canadian half of the bridge and the traffic that will flow over that half of the bridge. Since they are not the result of actions occurring in the United States or being permitted by the Coast Guard, these impacts need not be assessed in any detail in the Coast Guard's NEPA analysis.

Turning to Windsor's specific arguments, a September 14, 2006 submission made on behalf of Windsor by the law firm of Thompson Hine argues at page 4 that "the Coast Guard has recognized the obligation to assess the impact of its actions on a foreign nation", citing pages 5 and 16 of a Coast Guard Order entitled "Procedures of Considering Environmental Impacts", Order DOT 5610.1C (9-18-79) ("Order"). This Order is also cited at pages 8-9 in the September 14 submission made for Windsor by the Gowlings law firm, which claims that on the basis of the Order, "[t]he Coast Guard's obligation in addressing NEPA therefore must include an assessment of effects on the environment in Canada and in particular within the City of Windsor." The claims made by Windsor's lawyers are overbroad and ignore the well-established limits that the law imposes on a NEPA analysis of impacts outside the United States.

The Coast Guard Order on which Windsor places such heavy reliance very plainly states as relevant that, "[t]he provisions of this Order do not apply to actions that have an impact primarily outside the United States, except for those actions significantly *affecting the environment of a foreign nation not participating in the action*, or ecological natural resources designated for protection by the President or Secretary of State, or the global commons." Order at 5 (emphasis added). See also Order at 16, which refers to the fact that the requirements of the Order apply to, as relevant, "[m]ajor Federal actions significantly *affecting the environment of a foreign nation not participating in the action or otherwise involved in the action.*" (emphasis added).

By contrast to the situation referenced in the Order, the proposed construction of a cross border bridge between the U.S. and Canada is plainly an action in which the foreign nation (Canada) *is very much* participating – Canada will not only have to approve the construction of the bridge in its territory, but will do so only after a thorough environmental review undertaken under Canadian law. Thus, this is not a case of an "innocent bystander" nation to which the Coast Guard Order is directed, and for that reason the Order does not require that the environmental impacts in Canada be considered by the Coast Guard.

This result is consistent with Executive Order 12114, 44 Fed Reg. 1957 (Jan. 4, 1979) ("Executive Order"), on which the Coast Guard Order is explicitly based. That Executive Order only requires that environmental impacts be taken into account with respect to major federal actions significantly affecting the environment that (a) are outside the jurisdiction of any nation; (b) affect the environment of a foreign nation not participating with the United States and not otherwise involved in the action; (c) result in a product or emission strictly regulated by federal law in the U.S. due to its toxic effects or radioactive nature; or (d) affect some resource of global importance. See Executive Order, Section 2-3 (a)-(d).

Again, the construction of a bridge that must be approved by the U.S. and Canada meets none of these criteria from the Executive Order. Rather, as Windsor has acknowledged, the Canadian government is significantly involved in this action, will need to approve any second span before it can be constructed and, we understand, will be preparing its own environmental review of the bridge expansion under the Canadian Environmental Assessment Act. Further, and as noted above, the Coast Guard's action in this matter will not extend into Canada at all – any permit it issues will do no more than authorize the construction of a bridge over U.S. land and territorial waters. For that same reason, the Gowlings law firm letter submitted for Windsor is also off the mark to the extent that it argues that NEPA jurisdiction extends to both ends of a bridge – this is true only if both ends are in the United States.

The Thompson Hine letter at page 3 also points to the Council on Environmental Quality (CEQ) Guidance on NEPA Analyses for Transboundary Impacts (July 1, 1997). The CEQ Guidance, however, explicitly applies only to "*those proposed actions currently covered by NEPA that take place within the United States and its territories*." Guidance at 1. Transboundary impacts are described in the CEQ Guidance as impacts generated by activity *in the United States* that literally cross the border, such as water quality impacts to a watershed shared by both nations or the impacts in another nation of a dam or pipeline built in the United States. The bridge, on the other hand, will be built both in the U.S. and in Canada. To the extent that there are impacts in Canada, they are the result of the part of the bridge that would be built in that nation. Indeed, Windsor does not and could not reasonably argue that it is the part of the bridge being built in the United States that might have some environmental impact in Canada. The CEQ Guidance therefore does not support its position.

The case law in this area supports the distinction between actions taken in the United States that might have some impact outside the United States and actions taken in foreign nations. For example, in *Manitoba v. Norton*, 398 F. Supp. 2d 41 (D.D.C. 2005), cited by Windsor's attorneys, the Court remanded a matter for preparation of a more complete EA due in part to potential impacts of a water transfer project in the United States to a watershed shared by the US and Canada. That case thus involved a classic transboundary impact of an action that would take place in the U.S.; the bridge situation is different because the action will take place in both nations and requires approval from both nations. Similarly, in *Wilderness Society v. Morton*, 463 F.2d 1261 (D.C. Cir. 1972), the Court granted the Government of Canada intervention in a NEPA appeal because potential impacts of the pipeline to be built in the United States included oil spills that could impact Canadian waters. There is nothing in these cases that suggests that an agency of the United States Government would be required under NEPA to consider purely local impacts in Canada, such as traffic impacts in the City of Windsor, where those impacts will result from the construction of a bridge in Canadian territory.

U.S. courts also have recognized that NEPA does not require unlimited review of environmental impacts in foreign nations. For example, in *Consejo de Desarrollo Economico de Mexicali, AC v. U.S.*, 438 F.Supp.2d 1207 (D. Nev. 2006), a Federal District Court held that a federal water project in the U.S.

near the Mexican border did not require the Bureau of Reclamation to prepare a Supplemental Environmental Impact Statement considering environmental impacts of the project in Mexico since Mexico is a sovereign nation over which the U.S. has no control and preparation of such an SEIS would serve no useful purpose. Similarly, in *Greenpeace USA v. Stone*, 748 F.Supp. 749 (D. Hawaii 1990), a court held that NEPA did not require a study of actions undertaken by the U.S. Army in Germany, which had approved of the actions at issue. The Court noted that Executive Order 12114 only requires environmental evaluation of "major Federal actions significantly affecting the environment of a foreign nation *not participating with the United States and not otherwise involved in the action*", which was not the case in *Greenpeace* and is not the case here.

Windsor makes no effort to mask the fact that its real complaint is with its own nation's environmental laws. At pages 9-10 of the September 14 letter submitted by the Gowlings firm, Windsor's attorneys critique as insufficient the level of environmental review that the bridge will receive in Canada and the procedures under which that review will be carried out under the Canadian Environmental Assessment Act. Of course, if Windsor is dissatisfied with Canadian procedures, its recourse is to complain to its own federal government, not to the U.S. Coast Guard. Windsor points to no legal principle, and there is none, that requires that the U.S. undertake a review of impacts of actions that will take place in a foreign nation (i.e., the construction of the Canadian half of the bridge) where a party feels that the foreign nation's own environmental assessment may be less than what it might like. Such a principle is absurd on its face. Indeed, it would trench on Canadian sovereignty for a U.S. agency to assume the role of assessing purely local impacts in Windsor of actions taking place in Canada.

Further, Windsor argues that the Coast Guard should undertake an Environmental Impact Statement with respect to the construction of the new span to the bridge. DIBC strongly disagrees that there will be impacts here sufficient to warrant an EIS. Plainly, however, this argument is premature since a determination of whether an EIS is warranted should await the completion of the Environmental Assessment that is going to be undertaken in this matter. Further, it also bears note that most of the impacts that the City of Windsor argues are significant are socioeconomic impacts -- such as concerns related to traffic into the City. As a general proposition, socioeconomic impacts only need to be considered by the Coast Guard if they are interrelated with environmental impacts. To the extent (as we believe is the case) there are few or no significant transboundary environmental impacts expected from this project, the Coast Guard is not required to consider its potential socioeconomic impacts. *See* CEQ Regulations, 40 CFR § 1508.14 ("economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment.").

We look forward to further discussing this matter with you.

Sincerely,

[redacted]
Attorney for Detroit International Bridge Company

cc: [redacted] USCG
[redacted] USCG
[redacted] Department of State
[redacted] Detroit International Bridge Co.

[redacted]

From: [redacted]
Sent: Wednesday, June 07, 2006 10:54 AM
To: [redacted]
Cc: [redacted]
Subject: Ambassador Bridge -- June 19 Meeting in DC

[redacted]-- As I informed your assistant, a meeting has been scheduled for the Ronald Reagan Building at 10 am on June 19 between my client, the Detroit International Bridge Company, and representatives of the CBP ([redacted] and others who work with her), DHS Private Sector Office [redacted] and likely a GSA representative. The discussion will focus on an update on developments concerning the planned new bridge span, as well as facilities issues.

We thought it appropriate to let you know about the meeting should you wish to attend. Please let me know if you or any of your colleagues might attend and I will pass along the room number as soon as I receive it.

Regards. [redacted]

[redacted]
Steptoe & Johnson LLP
1330 Connecticut Avenue, N.W.
Washington, DC 20036
202.429.8063 Direct
202.261.0565 Direct Facsimile
202.429.3902 Central Facsimile
[redacted]

0007

[redacted]

From: [redacted]
Sent: Wednesday, August 25, 2004 12:07 PM
To: [redacted]
Subject: RE: No permit required....

Will do.

[redacted]
Chief, Office of Bridge Administration
202-267-[redacted]

-----Original Message-----
[redacted]
Sent: Wednesday, August 25, 2004 11:41 AM
To: [redacted]
Subject: FW: No permit required....

[redacted]
I know the answer, but will let you be the messenger to represent CG response. I know you are on the list of recipients, but I just want to rattle your cage.
[redacted]

-----Original Message-----
From: [redacted]
Sent: Wednesday, August 25, 2004 11:38 AM
To [redacted]
Subject: RE: No permit required....

Any clue how this would or would not apply to the US/Mexico border? Is it a broad interpretation?

-----Original Message-----
From [redacted]
Sent: Tuesday, August 24, 2004 2:28 PM
To: [redacted]

0008

[redacted]
Subject: No permit required....

Well, dig long enough and you just may strike oil -- or pay dirt, in this case.

In 1993, State Legal, aware of the then upcoming plans to build a second span on the Blue Water Bridge, determined that the 1972 International Bridge Act should be interpreted in such a way as to negate any requirement for "repair, replacement, or enlargement" of any bridge previously authorized by Act of Congress and that this understanding extended to the construction of a second span at Blue Water, and hence no Presidential permit would be required there. Subsequently (in 1998) the Department informed the Peace Bridge folks that no Presidential permit would be required for the proposed second span at Peace Bridge, Buffalo.

I guess that settles that! And of course it would apply at Ambassador Bridge Detroit as well.

If anyone needs a more formal document than this e-mail, please let me know.

evelyn

[redacted]
Economics & Trade
Office of Canadian Affairs
U.S. Department of State
Phon[redacted]
Fax:[redacted]

This message is unclassified in accordance with EO 12958.

0009

[redacted]

From: [redacted]
Sent: Wednesday, August 25, 2004 11:38 AM
To: [redacted]
Cc: [redacted]
Subject: RE: No permit required....

Any clue how this would or would not apply to the US/Mexico border? Is it a broad interpretation?

-----Original Message-----
From: [redacted]
Sent: Tuesday, August 24, 2004 2:28 PM
To: [redacted]
Subject: No permit required....

Well, dig long enough and you just may strike oil -- or pay dirt, in this case.

In 1993, State Legal, aware of the then upcoming plans to build a second span on the Blue Water Bridge, determined that the 1972 International Bridge Act should be interpreted in such a way as to negate any requirement for "repair, replacement, or enlargement" of any bridge previously authorized by Act of Congress and that this understanding extended to the construction of a second span at Blue Water, and hence no Presidential permit would be required there. Subsequently (in 1998) the Department informed the Peace Bridge folks that no Presidential permit would be required for the proposed second span at Peace Bridge, Buffalo.

I guess that settles that! And of course it would apply at Ambassador Bridge Detroit as well.

If anyone needs a more formal document than this e-mail, please let me know.

[redacted]

[redacted]
Economics & Trade
Office of Canadian Affairs
U.S. Department of State
[redacted]

0010

This message is unclassified in accordance with EO 12958.

[redacted]

From: [redacted]
To:
Sent: Wednesday, August 25, 2004 12:04 PM
Subject: Read: No permit required....

Your message

To: [redacted]
Subject: FW: No permit required....
Sent: 08/25/2004 12:01 PM

was read on 08/25/2004 12:05 PM.

0011

[redacted]

From: [redacted]
Sent: Monday, August 30, 2004 2:18 PM
To: [redacted]
Subject: FOIA - Ambassador Bridge

I spoke with [redacted]f American Consulting Engineers of Florida, engineering company representing Ambassador Bridge an[redacted]hairman of the Bridge. We were on conference call and both said there is no problem with releasing the document. In fa[redacted]is going to send me additional copies so we can provide copies as necessary without going through copy/finance rigors.

[redacted]

[redacted]
Chief, Bridge Branch
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060
tele: 216-902-6085
fax: 216-902-6088
email: RBloom@d9.uscg.mil

Tracking:

Recipient	Delivery	Read
[redacted]	Delivered: 08/30/2004 2:18 PM	
	Delivered: 08/30/2004 2:18 PM	
	Delivered: 08/30/2004 2:18 PM	Read: 08/30/2004 2:19 PM

0012

[redacted]

From: [redacted]
Sent: Wednesday, July 13, 2005 7:50 AM
To: [redacted]
Subject: Comments to [redacted] from Transport Canada

Attachments: NDYZ02!.DOC

Untitled Attachment

NDYZ02!.DOC (37 KB)

0013

[redacted]

From: [redacted]
Sent: Friday, September 30, 2005 12:10 PM
To: [redacted]
Subject: RE: Inquiry from Senator Levin's Office

Attachments: Picture (Metafile)

Picture
Metafile) (472 KB

You are very welcome. Thank you for the excellent work and for the feed back. I gave her the same information, however, she wants paperwork.

[redacted]
Chief, Office of Bridge Administration
202-267-0377

>______________________________
>From: [redacted]
>Sent: Friday, September 30, 2005 11:54 AM
>To: [redacted]
>Subject: Inquiry from Senator Levin's Office
>
>Good Morning [redacted]...........
>
>[redacted] and I discussed latest info in regard to the Ambassador Bridge with [redacted] before we received the call from [redacted] of Senator Levin's office. Her number: [redacted] In response to her questions, we:
>
>+Explained the application process.
>+Stressed that we had NOT received a completed application from the International Bridge Company.
>+Provided [redacted] phone number and suggested that she request of copy of their document from him.
>
>+She seemed pretty knowledgeable of the status quo. To wit:
> -understood the Presidential Permit ramifications and asked whether the State Department had determined the need for an additional permit. I declined to speak for the State Department. She said that she would call them directly.
> -discussed (in broad terms) the environmental requirements of a permit
>application
>
>[redacted] made a SECOND call to inform:
> -Senator Levin will request in writing all that was discussed today. When I offered to hav[redacted] call in lieu of a Congressional inquiry, she said that "the Senator just wanted something tangible in regard to latest information".
>

0014

[redacted]

From:	[redacted]
Sent:	Monday, October 03, 2005 5:49 AM
To:	[redacted]
Subject:	Delivery Status Notification (Success)
Attachments:	ATT414350.TXT; RE: Docket CGD09-05-080, Sturgeon Bay Drawbridge Operation Regula tions

ATT414350.TXT (404 B)   RE: Docket ⊃09-05-080, Stur

This is an automatically generated Delivery Status Notification.

Your message has been successfully delivered to the following recipients.

[redacted]

0015

[redacted]

From: [redacted]

Sent: [redacted] 12, 2006 4:33 PM

To: [redacted]

Subject: Ambassador Bridge and the Peace Bridge getting the facts straight.

Attachments: etokaJ08.pdf; image002.jpg

etokaJ08.pdf (89 KB) image002.jpg (3 KB)

[redacted] I thought you might be interested in the attached article by the manager of the Peace Bridge. It sets a lot of things straight concerning the Ambassador bridge's practices.

[redacted]

0016

[redacted]

From: [redacted]
Sent: Wednesday, June 28, 2006 2:39 PM
To: [redacted]
Subject: Border crossing expansion

Hello [redacted]

I am trying to ascertain the U.S. Coast Guard's review process for applications to expand a border crossing. Specifically, I am interested in applications to expand the Ambassador Bridge, which connects Detroit, MI and Canada. Is there opportunity for community input in the process? Any information you can share regarding this issue is greatly appreciated.

Thank you for your time and attention to this matter.

[redacted]
Director of Legal Services and Policy
COMMUNITY LEGAL RESOURCES
313.964.4130, xt.227
313.309.1241 direct
[redacted]
"Connecting Lawyers and Communities"

[redacted]

0017

[redacted]

[redacted]

From: [redacted]
Sent: Thursday, October 19, 2006 6:21 PM
To: [redacted]
Cc: [redacted]
Subject: RE: Meeting

[redacted] Thanks for advising us about the meeting. Dan and I will be pleased to attend on November 21.
Regards. [redacted]

From: [redacted]
Sent: Wednesday, October 18, 2006 2:17 PM
To: [redacted]
Subject: Meeting

[redacted] and [redacted]

I had forwarded [redacted] the most recent email, with attachment of Windsor Resolution, from [redacted] and I talked and decided that we need to have a meeting with [redacted] to set the record straight as to what our jurisdictional limitations are for the Ambassador Bridge project. It will not be an adversarial meeting, but rather one of information sharing and discussion of limitations of all parties. We have set the meeting for 21 November at 9:30 a.m. in our District Office at 1240 E. Ninth St. Cleveland, Ohio. The conference room will be the one in which [redacted] has previously given us presentations. If your schedules permit, [redacted] and I would very much appreciate the two of you attending. Of course, when I say the two of you, I really mean three because [redacted] is welcome at any of the meetings since he is the lead rep for the process in representing the Ambassador Bridge.

I apologize that we could not have a selection of dates from which we all could pick and agree to. It is a matter of [redacted] having a very tight schedule for travel throughout the country and November 21 was the only date I could get him into Cleveland.

I will await your reply. [redacted] has replied that he will be in attendance and with him will be the City of Windsor's Chief Planner and the General Manager of Public Works.

[redacted]

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060
tele: 216-902-6085
FAX: 216-902-6088
[redacted]

0018

Striffler, Scot

From:	[redacted]
Sent:	Monday [redacted] 10:30 AM
To:	[redacted]
Cc:	[redacted]
Subject:	RE: Comments on EA

[redacted]

Good morning. I talked to [redacted] this morning and mentioned a section of the Draft EA that covers transboundary issues and references in the EA. There are a couple of items below that should be changed or incorporated into the Final EA. Thanks for your attention to this:

The Council on Environmental Quality (CEQ) Guidance on NEPA Analyses for Transboundary Impacts, dated July 1, 1997, "requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their analysis of proposed actions in the United States". Please cite this guidance in Section 3.13.1 in lieu of Executive Order 12114 and DOT Order 5610.1C. The Executive Order 12114 and DOT Order 5610.1C do not apply to this project.

Please reference Section 3.4 – Mitigation. "March 26, 2007 (see Appendix G)" should be cited instead of "May 26, 2007 (see Appendix F)." Also, in Section 3.13.1 – Canadian Environmental Review, a copy of the environmental assessment by Transport Canada should be included in Appendix M for review, accompanying the Environmental Assessment.

[redacted]
Bridge Management Specialist
Ninth Coast Guard District
(216) 902-6087
(216) 902-6088

0019

General

File

as of July 26, 2007

GOWLINGS

[redacted]

November 30, 2006

[redacted]
Bridge Program Manager
United States Coast Guard
U.S. Department of Homeland Security
1240 East Ninth Street
Cleveland, Ohio 44199-2060

Dear [redacted]

Re. Application for Bridge Permit by Canadian Transit Company/Detroit International Bridge Company for Second Ambassador Bridge

The City of Windsor and I wish to extend our thanks to you for inviting us to attend at the Coast Guard office in Cleveland on November 21, 2006 to provide a power point presentation focussed on the highlights of the City of Windsor's concerns with respect to the Ambassador Bridge Second Bridge Proposal and the environmental issues connected to that matter that flow from the *National Environmental Policy Act.*

Please find enclosed two CD copies of the power point presentation which we gave on November 21st to you. I will send the Sam Schwartz presentation by e-mail.

Let me know if there is anything else that we can usefully provide to you at this time.

Because of the City of Windsor's direct and substantial interest in this matter, we would expect and appreciate to be advised in a timely way and copied by the Coast Guard on further developments and communications as they occur in this matter.

Thanks again for the opportunity to answer your questions.

Yours sincerely,

[redacted]

0021

[redacted]
Certified Environmental Law Specialist

DE:tp
Enclosures

(enclosing CD)
cc: [redacted]

TOR_LAW\ 6460644\1

0022

[redacted]

From: [redacted]
Sent: Tuesday, May 29, 2007 1:51 PM
To: [redacted]
Subject: Re: comment on Ambassador Bridge twinning

Great - thank you sir!

Gregg

On 5/29/07, [redacted] wrote:

[redacted]

It sure is possible. Use this email address and you will be on record. By the way, we have extended the comment period and will accept comments until 17 JULY. That provides a forty-five day extension to the original notice.

[redacted]

-----Original Message-----
Fro[redacted]
Sent: Tuesday, May 29, 2007 12:40 PM
To: [redacted]
Subject: comment on Ambassador Bridge twinning

Afternoon:

Is it possible to submit EA comments electronically for the Ambassador Bridge twinning project? Thank you.

[redacted]

[redacted]
Detroit-Windsor Truck Ferry

0023

[redacted]

From: [redacted]
Sent: Wednesday, May 02, 2007 11:01 AM
To: [redacted]
Cc: [redacted]
Subject: RE: ACHP notification

[redacted] - FYI, we mailed our letter to Advisory Council in DC today. A copy is in the mail to you. We took the sections of the EA concerning Section 106 and SHPO and attached it to the letter, including copies of the CD's. SHPO was also mailed a copy today.

[redacted]

[redacted] ment Specialist
Ninth District Bridge Program
Office: (216) 902-6087
Fax: (216) 902-6088
[redacted]

0024

[redacted]

From: [redacted]
Sent: Thursday, November 02, 2006 2:52 PM
To: [redacted]
Subject: RE: Ambassador Bridge

Sounds go[redacted]

Sent from my GoodLink synchronized handheld (www.good.com)

-----Original Message-----
From: [redacted]
Sent: Thursday, November 02, 2006 01:43 PM Eastern Standard Time
To: [redacted]
Subject: FW: Ambassador Bridge

[redacted]
The meeting on Monday 20 November with SHPO by Ambassador Bridge people will be 2PM. So, I will let [redacted] know I am (you,too, from my office) available for teleconference..

[redacted]

-----Original Message-----
[redacted]
Sent: Friday, October 27, 2006 5:19 PM
T[redacted]
Subject: Ambassador Bridge

[redacted]

When we last spoke about a week ago about the Ambassador Bridge project, I mentioned that I has been working with [redacted] at American Consulting Engineers about arranging a meeting to discuss the project. We have settled on Monday, 11/20/06 at 2:00 p.m., and we will meet here at our office at the Michigan Historical Center in Lansing.
As I indicated in our phone conversation, I think that, as the Federal Agency involved in this undertaking, the Coast Guard should be represented in these discussions. If you or someone from you office is not able to attend physically, I would like to see about setting up a conference call so that you may participate. I will be out of the office between 10/30 and 11/10 and I will contact you when I return on 11/13. If you have any immediate concerns during my absence, you may contact Diane Tuinstra or Martha MacFarlane-Faes at our office at (517) 335-2721.

Thank you,

0025

[redacted]
Environmental Review Specialist
Michigan Historical Center-SHPO

[redacted]

From: [redacted]
Sent: Wednesday, October 18, 2006 3:58 PM
To: [redacted]
Subject: City of Windsor meeting with USCG Nov 21

[redacted] I am glad there is some flexibility on the time as I think it would be a good idea to assume the meeting might go to noon.

Could you send us a map of how to find your office? Thanks again for arranging this.

-----Original Message-----
From [redacted]
Sent: October 18, 2006 1:23 PM
To: [redacted]
Subject: RE: City of Windsor Resolution Directed to U.S. Coast Guard Re Detroit International Bridge Co/Canadian Transit Co Permit Application for Second Bridge

[redacted]

Am very happy you have been able to adjust your schedule to make it to Cleveland. Of course you can bring the gentlemen with you. Will be a pleasure to meet all of you. Yes, I would assume the meeting would go at least two hours. If it is necessary to go longer to develop a better understanding of the process we are bound to administer, and to hear from you and the city officials, that will be no problem. While we may not be the ones to be able to be instrumental in resolving issues that Windsor is encountering, at least we all will be able to leave the meeting with a better understanding of our regulatory limitations. Again, we look forward to meeting you.

[redacted]

From [redacted]
Sent: Wednesday, October 18, 2006 11:26 AM
T [redacted]
Subject: RE: City of Windsor Resolution Directed to U.S. Coast Guard Re Detroit International Bridge Co/Canadian Transit Co Permit Application for Second Bridge

[redacted] thanks very much for your message and the invitation to come to Clevland to present views on impacts and jurisdictional limitation. I think that will be a very useful step. I am available for the November 21st meeting in Cleveland. How long do you think we would have for this meeting - a couple of hours? If so, I would also like to also bring with me two senior officials of the City of Windsor, likely the Chief Planner and the General Manager of Public Works, to help present information on potential impacts. I think that would be useful. Would that be ok?

-----Original Message----- 0026
From [redacted]
Sent: October 18, 2006 9:03 AM
To: [redacted]
Subject: RE: City of Windsor Resolution Directed to U.S. Coast Guard Re Detroit International

[redacted]

From: [redacted]
Sent: Monday, April 02, 2007 11:24 AM
To: [redacted]
Cc:
Subject: FW: Section 106 review response from Michigan SHPO

Attachments: SHPO Section 106 Determination.pdf

SHPO Section
)6 Determination

Enclosed is a letter from the SHPO regarding the Ambassador Bridge Enhancement Project since you haven't received it yet. After you have had a chance to read, we would be interested in speaking with you about where we go from here.

[redacted]
Principal
American Consulting Engineers of Florida, LLC
[redacted]

-----Original Message-----
From[redacted]
Sent: Thursday, March 29, 2007 3:45 PM
[redacted]
Subject: Section 106 review response from Michigan SHPO

Please see attached:

In short: They are asking for soil borings to determine the potential presence of archeological resources and have determined that the new bridge will have an adverse impact on the appearance of the historic bridge.

[redacted]

<<SHPO Section 106 Determination.pdf>>

0027

[redacted]

From: [redacted]
Sent: Wednesday, August 30, 2006 2:01 PM
To: [redacted]
Subject: FW: Ambassador Bridge Project - Your 22 August ltr.

FYI,
[redacted] Executive Director of Southwest Detroit Environmental Vision, located in Detroit, Michigan.
[redacted]

>____
>From: [redacted]
>Sent: Wednesday, August 30, 2006 2:00 PM
>To: [redacted]
>Subject: Ambassador Bridge Project - Your 22 August ltr.
>
[redacted]
>We are in receipt of your letter of 22 August 2006, received by FAX and by U. S. Postal Service, addressing the Ambassador Bridge project and our public notice.
>
>To insure all parties are afforded the opportunity to comment and respond to our public notice, we have extended the comment period. We will accept all comments post marked not later than 14 September 2006.
>
>The Coast Guard Bridge Administration Program guidelines establish that existing bridges being modified or added to, as in this case, are classified as Categorical Exclusions under the provisions of NEPA. Accordingly, no public hearings are held. A public hearing can be considered by the Coast Guard if, after we receive comments to our public notice, it is established by us that there are significant and controversial issues to be resolved and a hearing would be the only way to gather required information and data to further address those issues.
>
>The Coast Guard, as the sole federal permitting agency for bridges to be constructed across navigable waterways of the United States, considers each permit application on its own merits and determines whether a permit will be issued based upon impacts upon environment and navigation. We are not in a position to consider various initiatives and be the authority to designate which one will prevail. If we receive any number of applications for bridges across a given waterway, each will be considered and permits issued or denied based upon the merits of each for the selected crossing site. Effectively, permits could be approved for more than one proposal.
>
>I understand your concern that pubic safety, national security, navigation, and air and water quality impacts are some of the areas that must considered with thoughtfulness and a review process. Those areas are inherently considered within our permit process and will be given appropriate consideration by us in this particular case.
>
>For your information, we are not using the FONSI prepared by the FHWA/MDOT for the Gateway Project as a basis for environmental review of this proposal. It will be considered on its own merit and independent of the Gateway Project, although data within that particular environmental review may be reviewed and studied by us.
[redacted]
>[redacted]
>Bridge Program Manager
>Ninth Coast Guard District

0028

[redacted]

From: [redacted]
Sent: Wednesday, August 30, 2006 12:59 PM
To: [redacted]
Subject: FW: Detroit International Bridge Company

From: [redacted]
Sent: Wednesday, August 30, 2006 12:59 PM
To[redacted]
Subject: RE: Detroit International Bridge Company

[redacted]
The standard thirty-day comment period applies to all parties who want to comment on our public notices, with no exceptions being granted based upon the affiliation or governmental status of a commenter. However, we do realize there may be organizations or individuals who were not in receipt of the notice in time to respond within the allotted thirty-day period which ends on 31 August. Therefore, we have extended the comment period and will accept for the record comments that are post marked not later than 14 September 2006.

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060
tele: 216-902-6085
FAX: 216-902-6088
ema[redacted]

F[redacted]
Sent: Wednesday, August 30, 2006 12:44 PM
To[redacted]
Subject: Detroit International Bridge Company

0029

[redacted]

The Detroit City Council has number of concerns with regard to the permit application and corresponding review process for the DIBC's proposed second span of the Detroit River. I learned of the DIBC application just prior to our City Council's summer recess and informed them thereof. However, this was in advance of the USCG formal public notice and posting of a comment period (I just learned that it ends today or tomorrow). Therefore, the Council was not made aware of the comment period, nor has it been in session where it would have the opportunity to address the matter. Can the comment period be extended to accommodate an

[redacted]

From: [redacted]
Sent: Wednesday, May 02, 2007 4:55 PM
To: [redacted]
Cc: [redacted]

Subject: Ambassador Enhancement Project SEMCOG Meeting

Attachments: 070502 Scan.pdf

070502 Scan.pdf
(43 KB)

<<070502 Scan.pdf>> Gentlemen,

We met with the SEMCOG yesterday and discussed the Ambassador Enhancement Project in detail. I am enclosing a copy of the sign up sheet and the business cards of those in attendance who provided them.
We verbally answered many questions and they indicated that they would submit a letter in writing regarding many of these questions after they completed their review of the EA that they had already received. The Executive Director, Paul Tait, indicated that the regular May meeting of their executive committee was canceled and they would not be holding the next one until October. Since it is at this meeting that projects are added to the Regional Plan, our project could not be listed until then.
I will give you a call to discuss this timing in more detail.

[redacted], PE, SE
Principal
American Consulting Engineers of Florida, LLC
[redacted]

-----Original Message-----
Fro[redacted]
Sent: Wednesday, May 02, 2007 4:14 PM
To[redacted]
Subject:

0030

[redacted]
Administrative Assistant
American Consulting Engineers of Florida, LLC
[redacted]

[redacted]

From: [redacted]
Sent: Monday, July 31, 2006 11:34 AM
To: [redacted]
Subject: RE: Information

Than[redacted]

[redacted]
Director of Legal Services and Policy
COMMUNITY LEGAL RESOURCES
313.964.4130, xt.227
313.309.1241 direct
[redacted]
"Connecting Lawyers and Communities"

-----Original Message-----
[redacted]
Sent: Monday, July 31, 2006 11:31 AM
T[redacted]
Subject: RE: Information

[redacted]
You are on the mailing list to receive copy of the public notice. Their application is nothing more than a letter stating they officially are making application for consideration of a Coast Guard Bridge and refer to the document that I previously sent to you. That is the scope and depth of what represents the complete application. Our public notice will expire 31 August, having provided the 30-day period for written comments to be provided to this office. However, we will not be able to make any permit determination at any time soon. The process will be held in abeyance after the 30-day period until such time the Bridge Company has completed coordination with the State Historic Preservation Officer, the State DEQ for Water Quality Certification, and the State of Michigan Department of Transportation, to name a few. Only upon our receipt of those reports/waivers/certifications will we then be able to review all received and determine whether or not a permit will be issued.

[redacted]

Fr[redacted]
Sent: Monday, July 31, 2006 11:18 AM
[redacted]
Subject: Information
[redacted]

0031

We received notice last week from the Coast Guard that the Detroit International Bridge Company filed an application for construction of a second bridge. My organization would like to obtain a copy of the complete application. Is it necessary to file a FOIA request? If so, should the request be directed to you?

Thank you.

[redacted]

From: [redacted]
Sent: Thursday, June 29, 2006 4:44 PM
To: [redacted]
Cc: [redacted]
Subject: Letter Concerning [redacted]

Attachments: Ambassador Bridge Letter.pdf

Ambassador
·idge Letter.pdf

([redacted] -- I have attached a letter that addresses certain issues relating to environmental review of the Gateway Project and the construction of a second span, which was contemplated as part of that project. We thought that this would be useful background for you and your colleagues. You will receive by Federal Express the attachments that are referenced in this letter. If you need additional copies, please advise. I am also forwarding the attachments to Jan. Nick and Bob already have these attachments.

Regards, [redacted]

<<Ambassador Bridge Letter.pdf>>

[redacted]

0032

[redacted]

From: [redacted]
Sent: Thursday, June 29, 2006 5:49 AM
To: [redacted]
Subject: RE: Border crossing expansion

Opportunity for input from agencies and concerned individuals will be when we receive an application for a new bridge and that application contains information required for us to issue a public notice for a thirty-day period to solicit written comments. We are not a permitting authority for the expansion of the plazas; those authorities are the Michigan Department of Transportation and the Federal Highway Administration. Our jurisdiction and permitting authority in this particular project will be limited to the bridge owner's plan to construct a bridge to twin the existing Ambassador Bridge. Any permit approved by the Coast Guard will be specific to the bridge itself and not the plazas.

[redacted]
Bridge Program Manager
Ninth Coast Guard District
[redacted]
tele: [redacted]
FAX: [redacted]
[redacted]

F[redacted]
Sent: Wednesday, June 28, 2006 2:39 PM
T[redacted]
Subject: Border crossing expansion

Hello [redacted]

I am trying to ascertain the U.S. Coast Guard's review process for applications to expand a border crossing. Specifically, I am interested in applications to expand the Ambassador Bridge, which connects Detroit, MI and Canada. Is there opportunity for community input in the process? Any information you can share regarding this issue is greatly appreciated.

Thank you for your time and attention to this matter.

[redacted]
"Connecting Lawyers and Communities"

0033

U.S. Department of Homeland Security
United States Coast Guard

Commander (obr)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16593
B-084/sms
July 22, 2004

[redacted]

Dear [redacted]

I am writing in regards to your letter dated July 14, 2004, concerning the Ambassador Bridge Enhancement Project, Preliminary Review Permit Application.

We have reviewed the document you submitted. We would be interested in participating in early coordination meetings and discussions to address the various environmental and navigational issues related to the proposed project. Based on the preliminary review you have submitted, a Coast Guard bridge permit would be required. The Coast Guard may also be the lead federal agency for satisfying the requirements of the National Environmental Protection Act (NEPA).

I would further recommend that you include the International Joint Commission (IJC) in Washington, D.C. in your preliminary correspondence and discussions. This agency is involved in international border crossings and may have requirements that have not been addressed.

If you require further assistance in this matter, please contact me at (216) 902-6085.

Sincerely,

[redacted]
Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

U.S. Department of Homeland Security

United States Coast Guard

Commander (dpb)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6085
FAX: (216) 902-6088

16590
B-060/sms
June 26, 2007

[redacted]nce Section
[redacted]

Re: Proposed Ambassador Bridge Enhancement Project – Detroit, Wayne County, Michigan

[redacted]

I am responding to your letter of May, 22, 2007 regarding the referenced project and your decision to participate in this consultation with U.S. Coast Guard (USCG), Michigan State Historic Preservation Officer (MI-SHPO), and the Detroit International Bridge Company (DIBC).

Since the date of your letter, additional communications have occurred between [redacted] representing DIBC, and [redacted] of your office to provide additional information on the project. This office has been compiling the additional information that you have requested. Responses to your specific questions are outlined below:

1. What is the Coast Guard permit program that is responsible for issuance of the permit for the project?

The Coast Guard Bridge Administration Program is responsible for the issuance of Bridge Permits for construction, reconstruction, or alteration of bridges across navigable waters of the United States. The laws relating generally to the protection, preservation and safety of the Nation's navigable waterways are found in Section 9 of the Act of March 3, 1899, as amended, 33 U.S.C. 401; the Act of March 23, 1906, as amended, 33 U.S.C. 491; the Act of June 21, 1940, as amended (Truman-Hobbs Act) 33 U.S.C. 511-523; the General Bridge Act of 1946, as amended, 33 U.S.C. 525; and the International Bridge Act of 1972, 33 U.S.C. 535. The Code of Federal Regulations for Bridge Administration and permit processing are found in 33 CFR 114-118.

2. What is the Area of Potential Effect (APE) for the proposed undertaking?

The APE is the same as the area illustrated in Graphic 11 of the package that was included in our May 2, 2007 letter. This graphic is included as enclosure (1) of this letter.

3. What is the status of the archaeological survey requested by the Michigan Sate Historic Preservation Officer (SHPO) in his letter of March 26, 2007?

The Phase I archaeological survey requested by MI-SHPO is still being organized, and has been tentatively scheduled to be completed before July 13, 2007. Once that survey has been completed we will schedule further meetings with MI-SHPO and ACHP to continue coordination. DIBC has indicated that there is an opportunity to shift the proposed location of the bridge piers in the event that any historical resources are found during the survey. However, the location of the new span relative to the old span, however, is not a matter to which there are any prudent and feasible alternatives to the project as presented by DIBC.

4. What consulting parties has the Coast Guard identified for purposes of Section 106?

There are several community groups in the area that have expressed interest in this project, including the Southwest Detroit Business Association, the Mexicantown Business Association, and the Bagley Housing group. To date, DIBC has made an effort to contact these groups and others, and has enlisted the help of MI-SHPO to identify consulting parties and include them in the process.

DIBC sent nineteen letters to Native American groups requesting review of potential impacts and comments related to the proposed project. DIBC has received two direct responses to these letters from Native American groups, both stating that they have no information concerning the presence of properties in the project area. The Bureau of Indian Affairs Michigan Agency also responded stating they have no trust lands within the project area. Copies of this correspondence are included in the Draft EA with no additional correspondence since the Draft EA was issued. The SHPO adverse effect letter specifically listed concern for potential effect to archaeological resources between Fort Street and the riverbank in the vicinity of a known area of former Potawatomi presence. Although this Native American group has been contacted by correspondence, they have not provided a response to the letters. Potawatomi groups will be directly contacted again for possible comments.

The MI-SHPO, subsequent to their March 26, 2007 letter, requested additional information from the applicant regarding project alternatives. This information has been provided to MI-SHPO, a consulting party in this undertaking, by DIBC.

On May 24, 207 a public meeting was conducted at a local elementary school to solicit comments in regards to Section 106 issues and to provide the opportunity for member of the local community to comment on design options for the new bridge. Attendees were presented with a number of artist's renderings for bridge design considerations and asked to submit their preferences. The meeting was attended by approximately twenty-five members of the general public. Eighteen submissions were received with individual preferences for tower configuration, texture and color, railings and roadway lighting, and overall bridge lighting.

A copy of the announcement for the meeting, and one sample of the design options presented, are included as enclosures (2) and (3) to this letter. These options continue to be posted on the DIBC website at www.ambassadorbridge.com with opportunity for additional public input.

5. What alternatives have the Coast Guard considered in consultation with Michigan SHPO to avoid the adverse effect of the project as proposed?

As of this date, DIBC has indicated that they are prepared to discuss design alternatives with MI-SHPO to minimize or mitigate any adverse effects of the project. However, a date for those discussions has not been identified. It is our intention to propose a meeting with MI-SHPO in the last half of July 2007, after the archaeological survey has been completed.

The Coast Guard will continue coordination and consultation with the applicant, MI-SHPO, and your office to satisfy the requirements of Section 106 of the National Historic Preservation Act. We will contact your office when the next meeting with MI-SHPO is scheduled.

Re: Proposed Ambassador Bridge Enhancement Project – Detroit, Wayne County, Michigan

Please contact me at (216) 902-6085 if you have any questions or require additional information. Thank you.

Sincerely,

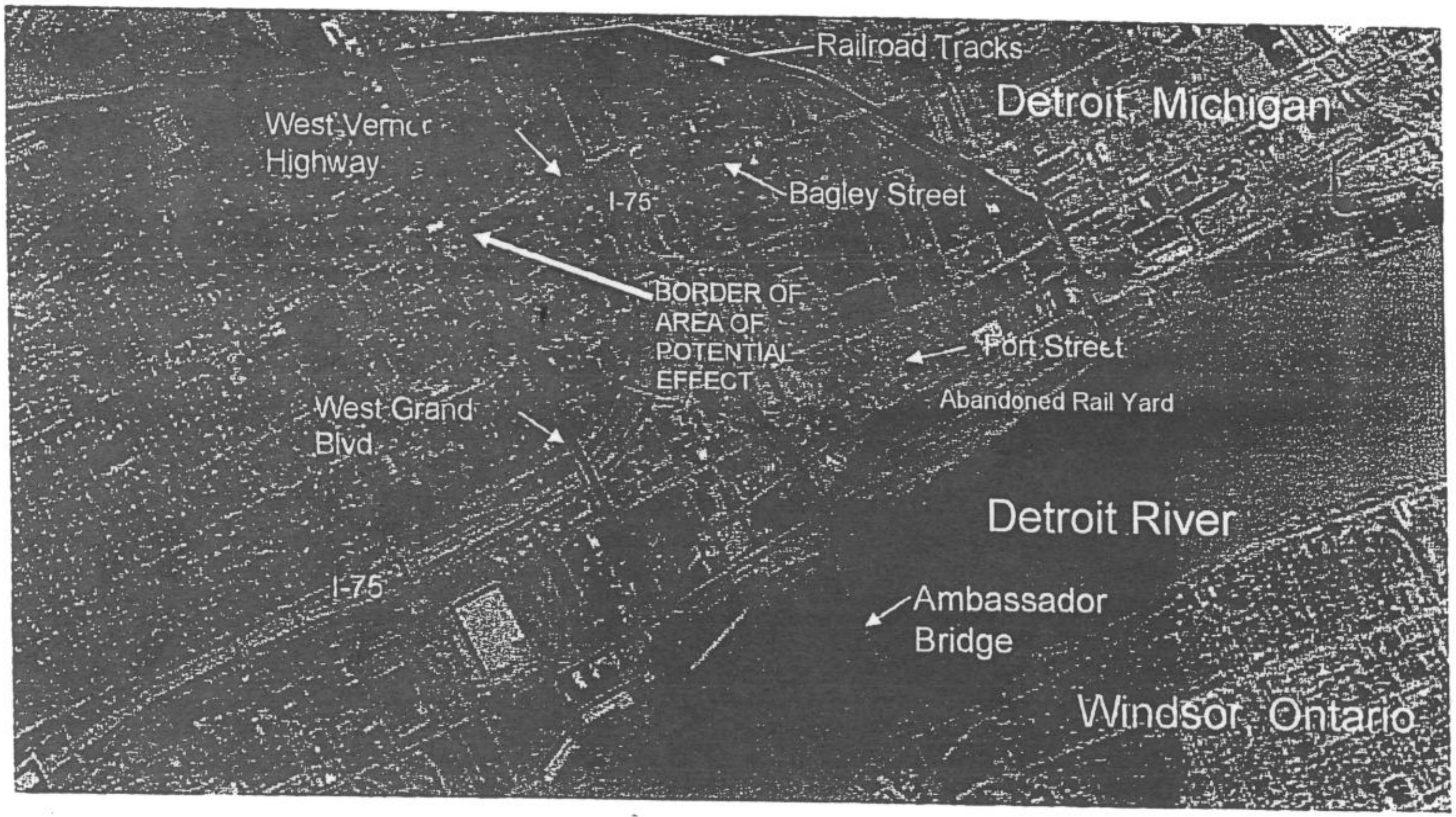
[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: Detroit Ambassador Bridge Company, Detroit, Michigan
Michigan State Historical Preservation Officer, Lansing, Michigan

0037

Attachment IIIb – Graphic 11
Location and Area of Potential Effect



AMBASSADOR
AMBASSADOR BRIDGE

ENCLOSURE 41

Classifieds

1-1 of 1 Classified

The Ambassador BridgeEnhancement ProjectPublic Workshop NoticeTAKE NOTICEthat the Detroit International Bridge Company (DIBC) will hold a Public Workshop on Thursday, May 24th, 2007, at 6:30 p.m. at Earhart Middle School located at 1000 Scotten Street, Detroit, Michigan 48209. The workshop will be an open design charrette to solicit public input on alternative project designs. The U.S. Coast Guard is serving as the lead agency for the Environmental Assessment review process. At this workshop, information will be provided and comments will be received on alternative designs within the Proposed Ambassador Bridge Enhancement Project. In part, comments will be received to provide public input as part of the Section 106 consultation process currently taking place. The Section 106 process is being conducted by the Michigan State Historic Preservation Office.PROJECTBACKGROUND: DIBC is proposing to construct a 6-lane cable stayed bridge over the Detroit River, just west of the existing Ambassador Bridge. The new bridge will connect directly into the existing plazas in both Detroit and Windsor. The new structure will be 102.5 feet wide and 6,200 feet long, with approximately 2,200 feet traversing the Detroit River. Supporting structures (piers and towers) will be not placed in the Detroit River or its floodplain. The bridge will be a minimum of 152 feet above the ordinary high water mark, to meet the minimum navigational clearance requirements for deep draft vessels. No dredge or fill activities are proposed in the river with this project. Once the new structure is completed, the existing Ambassador Bridge will be taken out of service in order to evaluate and make repairs deemed necessary and economically feasible. The project is located in T2S, R11E, Section 4, City of Detroit, Wayne County, Michigan.Additional Information is available at the following locations:DIBC - Detroit Office2000 Howard StreetDetroit, Michigan 48226(313) 965-1184DIBC - Warren Office12225 StephensWarren, Michigan 48089(586) 939-7000DIBC Websitewww.ambassadorbridge.com

Categories: General Classified

1-1 of 1 Classified

Advance

Keywords: Ambassad

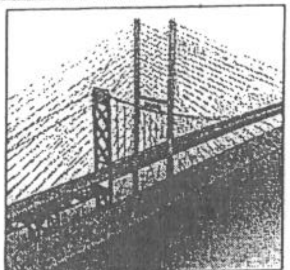
Category: Select Ca

searc

THE AMBASSADOR BRIDGE ENHANCEMENT PROJECT

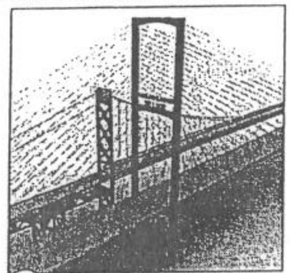
DESIGN CHARRETTE

Options For Tower Configuration Concepts (please select your preferred tower option)

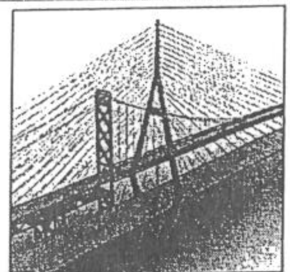


Dual Columns

Center Pylon



Rectangle



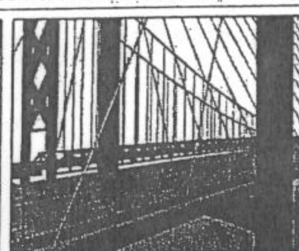
Diamond

IN YOUR OPINION, RATE THE IMPORTANCE OF THE TOWER CONFIGURATION: 1 2 3 4 5 6 7 8 9 10
LEAST MODERATE MOST

Options for Tower Texture and Color (please select your preferred tower texture and color option)

Concrete

Pattern



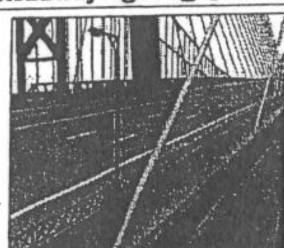
Ornate

Smooth

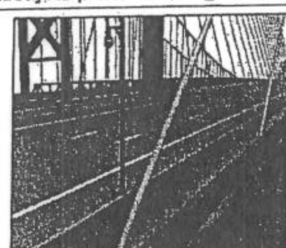
IN YOUR OPINION, RATE THE IMPORTANCE OF THE TEXTURE AND COLOR: 1 2 3 4 5 6 7 8 9 10
LEAST MODERATE MOST

Options For Railings and Roadway Lighting (please select your preferred railings and roadway lighting option)

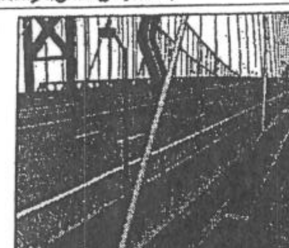
Conventional



Traditional



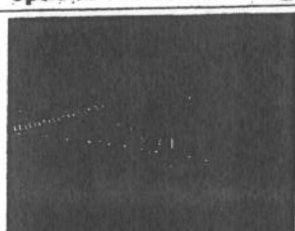
Gothic



Art Deco

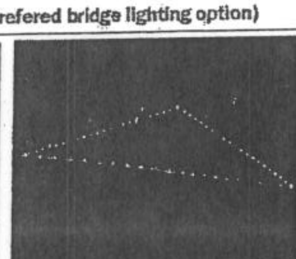
IN YOUR OPINION, RATE THE IMPORTANCE OF THE RAILINGS AND LIGHTING: 1 2 3 4 5 6 7 8 9 10
LEAST MODERATE MOST

Options For Overall Bridge Lighting (please select your prefered bridge lighting option)

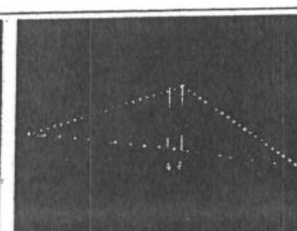


Tower Lighting

Cable Lighting



String of Pearls



Full Spectrum

IN YOUR OPINION, RATE THE IMPORTANCE OF THE OVERALL LIGHTING: 1 2 3 4 5 6 7 8 9 10
LEAST MODERATE MOST

0040

ADDITIONAL COMMENTS:
PEWABIC TILE
Can the cable lighting be configured to slowly rotate or move across the bridge – Can't it be painted?

Preserving America's Heritage

May 22, 2007

[redacted]
Chief, Bridge Branch
Ninth Coast Guard District
U.S. Coast Guard
1240 East Ninth Street, Room 2019
Cleveland, OH 44199-2060

REF: *Proposed Ambassador Bridge Enhancement Project*
Detroit, Wayne County, Michigan

Dea[redacted]

On May 7, 2007, the Advisory Council on Historic Preservation (ACHP) received notification of the U.S. Coast Guard's (Coast Guard) determination that the referenced undertaking may adversely affect the Ambassador Bridge, a property determined eligible for listing in the National Register of Historic Places by the Keeper of the National Register, as well as other historic properties. In accordance with 36 CFR §800.6(a)(1) of the ACHP's regulations, "Protection of Historic Properties," the ACHP has concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases,* of the regulations apply to this undertaking. The ACHP, therefore, will participate in this consultation. We have provided notice of our decision (enclosed) to the Secretary of Homeland Security as required by 36 CFR §800.6(a)(1)(iii).

As we prepare to participate in the Section 106 consultation for this undertaking, we would appreciate receiving additional information regarding planning activities for the proposal to date, including the following:

1. What is the Coast Guard permit program that is responsible for issuance of the permit for the project?

2. What is the Area of Potential Effect (APE) for the proposed undertaking?

3. What is the status of the archaeological survey requested by the Michigan State Historic Preservation Officer (SHPO) in his letter of March 26, 2007?

4. What consulting parties has the Coast Guard identified for purposes of Section 106?

5. What alternatives has the Coast Guard considered in consultation with the Michigan SHPO to avoid the adverse effect of the project as proposed?

[redacted]

We look forward to consulting with the Coast Guard, the Michigan SHPO, and others, including the interested public, to resolve potential adverse effects of this undertaking. If you have any questions or wish to discuss this matter further, please contact [redacted] or via e-mail at [redacted]

Sincerely,

[redacted]

Assistant Director
Office of Federal Agency Programs
Federal Permitting, Licensing, and Assistance Section

Enclosure

[redacted]
Chairman
[redacted]
Vice Chairman
[redacted]
Executive Director

Preserving America's Heritage

May 22, 2007

Honorable Michael Chertoff
Secretary of Homeland Security
Washington, DC 20528

Dear Mr. Secretary:

In response to a notification by the U.S. Coast Guard, we wish to inform you that the Advisory Council on Historic Preservation (ACHP) will participate in the consultation to develop a Memorandum of Agreement for the proposed Ambassador Bridge Enhancement Project in Detroit, Michigan. Under Section 106 of the National Historic Preservation Act and the ACHP's implementing regulations, "Protection of Historic Properties" (36 CFR Part 800), the U.S. Coast Guard is required to provide the ACHP a reasonable opportunity to comment and to consult with the Michigan State Historic Preservation Officer, Indian tribes, and other consulting parties to develop and evaluate alternatives or modifications to its undertakings that could avoid, minimize and/or mitigate potential adverse effects on historic properties. Our decision to participate in this consultation was made based on Appendix A to Part 800, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, and our understanding that this proposed undertaking may have the potential to have substantial impacts on important historic properties.

As required by 36 CFR § 800.6(a)(1)(iii), we provide this notice to you, as head of the Department of Homeland Security. We have also notified Mr. Robert W. Bloom, Jr., of the U.S. Coast Guard. At this time, we are requesting no further action from your office.

We look forward to working with the U.S. Coast Guard and other parties in this consultation.

Sincerely,

[redacted]

Executive Director

Enclosure

0043

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpb)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6085
FAX: (216) 902-6088

16590
B-043/sms
May 2, 2007

Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 809
Washington, D.C. 20004

Dear Mr. Sir or Madam,

In accordance with 36 CFR 800.6(a)(1), I am writing to advise you of an adverse effect determination made by the Michigan State Historic Preservation Officer (MI-SHPO) for the proposed Ambassador Bridge Enhancement Project in Detroit, Michigan. A copy of the March 26, 2007, MI-SHPO letter is enclosed. The U.S. Coast Guard is the federal agency of record for this proposed project.

A subsequent phone conference was conducted on April 16, 2007 among the applicant, U.S. Coast Guard, and MI-SHPO. The phone conference resulted in MI-SHPO requesting additional information from the applicant regarding the purpose of the project and possible alternatives. The MI-SHPO has requested this information, along with additional archeological studies, to complete their review of the project. The applicant will perform the additional studies and supply the requested data. Additionally, a public workshop has been scheduled for May 24, 2007 to expand public involvement in the process. An announcement has been published in the Detroit Free Press and Detroit News regarding this workshop.

The applicant has also released a Draft Environmental Assessment (EA) for the project, including a description of the project and efforts taken so far to address historical and cultural impacts. The portions of the EA that describe these efforts are enclosed. The Coast Guard has also issued a press release to the same Detroit newspapers announcing the adverse effect determination made by SHPO, and to request additional comments from the public.

The Coast Guard will continue coordination and consultation with the applicant and MI-SHPO to satisfy the requirements of Section 106 of the National Historic Preservation Act.

Please contact me at (216) 902-6085 if you have any questions or require additional information. Thank you.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

0044

Copy: Detroit Ambassador Bridge Company, Detroit, Michigan
Michigan State Historical Preservation Officer, Lansing, Michigan

Classifieds

1-1 of 1 Classified

The Ambassador BridgeEnhancement ProjectPublic Workshop NoticeTAKE NOTICEthat the Detroit International Bridge Company (DIBC) will hold a Public Workshop on Thursday, May 24th, 2007, at 6:30 p.m. at Earhart Middle School located at 1000 Scotten Street, Detroit, Michigan 48209. The workshop will be an open design charrette to solicit public input on alternative project designs. The U.S. Coast Guard is serving as the lead agency for the Environmental Assessment review process. At this workshop, information will be provided and comments will be received on alternative designs within the Proposed Ambassador Bridge Enhancement Project. In part, comments will be received to provide public input as part of the Section 106 consultation process currently taking place. The Section 106 process is being conducted by the Michigan State Historic Preservation Office.PROJECTBACKGROUND: DIBC is proposing to construct a 6-lane cable stayed bridge over the Detroit River, just west of the existing Ambassador Bridge. The new bridge will connect directly into the existing plazas in both Detroit and Windsor. The new structure will be 102.5 feet wide and 6,200 feet long, with approximately 2,200 feet traversing the Detroit River. Supporting structures (piers and towers) will be not placed in the Detroit River or its floodplain. The bridge will be a minimum of 152 feet above the ordinary high water mark, to meet the minimum navigational clearance requirements for deep draft vessels. No dredge or fill activities are proposed in the river with this project. Once the new structure is completed, the existing Ambassador Bridge will be taken out of service in order to evaluate and make repairs deemed necessary and economically feasible. The project is located in T2S, R11E, Section 4, City of Detroit, Wayne County, Michigan.Additional Information is available at the following locations:DIBC - Detroit Office2000 Howard StreetDetroit, Michigan 48226(313) 965-1184DIBC - Warren Office12225 StephensWarren, Michigan 48089(586) 939-7000DIBC Websitewww.ambassadorbridge.com

Categories: General Classified

1-1 of 1 Classified

For more information contact:
External Affairs
U.S. Coast Guard
voice: (216) 902[redacted]
fax: (216) 902-6027
1240 E. 9th Street
Suite 2073
Cleveland, OH 44199
externalaffairs@uscg.mil

Ninth District External Affairs
U.S. Coast Guard

U.S. Department of Homeland Security
United States Coast Guard

Press Release

Date: May 1, 2007

Contact: [redacted]
(216) 902[redacted]

COAST GUARD SEEKS PUBLIC COMMENTS ON AMBASSADOR BRIDGE PROPOSAL

DETROIT -- The U.S. Coast Guard, the lead federal agency for the proposed project, announces the availability of the Draft Environmental Assessment (EA) for the construction of an additional bridge span to be constructed to the west side of the existing bridge spans of the Ambassador Bridge, between Detroit and Windsor, Ontario.

The Coast Guard is seeking comments as part of the National Environmental Policy Act (NEPA) process. The EA evaluates the environmental and socioeconomic impacts of the Proposed Action. The Coast Guard is also seeking additional comments as part of the public involvement process under Section 106 of the National Historic Preservation Act (NHPA).

The Michigan State Historical Preservation Officer (SHPO) determined that the proposed project would result in an adverse effect to the existing Ambassador Bridge due to visual and other aesthetic impacts in a letter to the project applicant dated Mar. 26, 2007. The existing bridge structure is eligible for listing for the National Register of Historic Places. The Coast Guard requests public comments on the proposed design of the planned bridge and potential impacts to the existing Ambassador Bridge.

The Draft EA is available for viewing or downloading on the Ambassador Bridge web site at:

www.ambassadorbridge.com/ambassador-project.html

Comments should be submitted in writing and must reach the Coast Guard by June 1, 2007. Please mail comments to the following address:

Commander (dpb)

Ninth Coast Guard District

The Ambassador Bridge Enhancement Project

Public Workshop Notice

TAKE NOTICE that the Detroit International Bridge Company (DIBC) will hold a Public Workshop on Friday, March 1st, 2007, at 6:30 p.m. at Earhart Middle School located at 1000 Scotten Street, Detroit, Michigan 48209. The workshop is to assist in the preparation an Environmental Assessment for the project, in which the U.S. Coast Guard is serving as the lead agency for the EA review process. At this workshop, information will be provided and comments will be received on the Proposed Ambassador Bridge Enhancement Project.

PROJECT BACKGROUND: DIBC is proposing to construct a 6-lane cable stayed bridge over the Detroit River, just west of the existing Ambassador Bridge. The new bridge will connect directly into the existing plazas in both Detroit and Windsor. The new structure will be 102.5 feet wide and 6,200 feet long, with approximately 2,200' traversing the Detroit River. Supporting structures (piers and towers) will be not placed in the Detroit River or its floodplain. The bridge will be a minimum of 152 feet above the ordinary high water mark, to meet the minimum navigational clearance requirements for deep draft vessels. No dredge or fill activities are proposed in the river with this project. Once the new structure is completed, the existing Ambassador Bridge will be taken out of service in order to evaluate and make repairs deemed necessary and economically feasible. The project is located in T2S, R11E, Section 4, City of Detroit, Wayne County, Michigan.

Additional Information is available at the following locations:

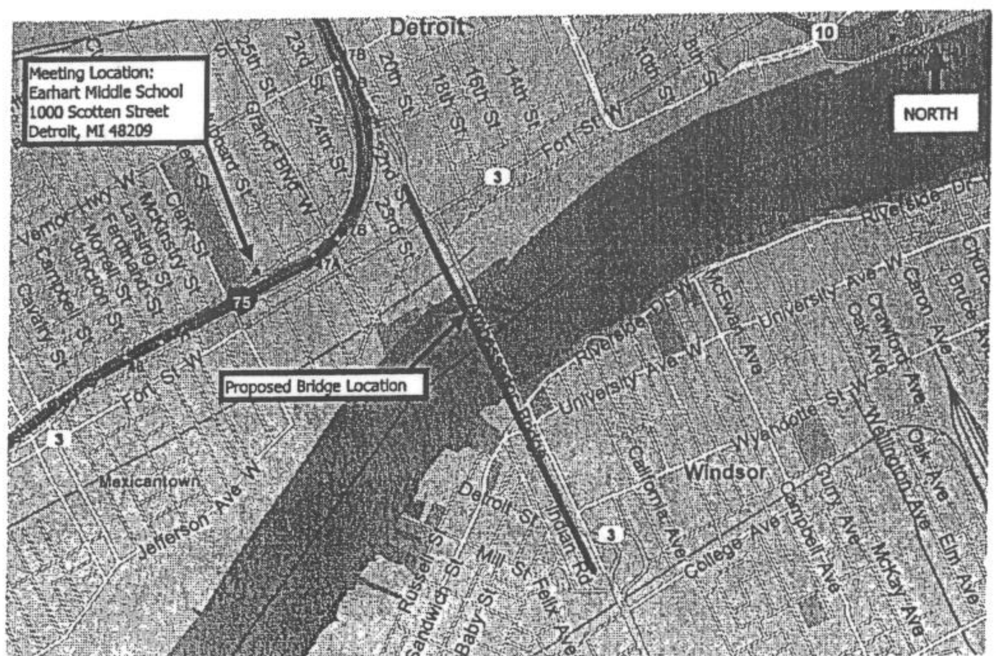
DIBC – Detroit Office
2000 Howard Street
Detroit, Michigan 48226
(313) 965-1184

DIBC – Warren Office
12225 Stephens
Warren, Michigan 48089
(586) 939-7000

DIBC Website
www.ambassadorbridge.com

AMBASSADOR

AMBASSADOR BRIDGE



Ambassador Bridge Enhancement Project
PUBLIC WORKSHOP NOTICE

PROJECT BACKGROUND: Ambassador Bridge is proposing to construct a 6-lane cable stayed bridge over the Detroit River, just west of the existing Ambassador Bridge. The new bridge will connect directly into the existing plazas in both Windsor and Detroit. The New structure will be 31.24 metres wide and 1889.76 metres long, with approximately 670.56 metres traversing the Detroit River. No supporting structures (piers and towers) will be placed in the Detroit River. Once the new structure is completed, the existing Ambassador Bridge will be taken out of service in order to evaluate and make any repairs necessary.

TAKE NOTICE: the Ambassador Bridge will conduct a series of Public Workshops on the Enhancement Project at the times and places noted below:

Monday **April 14 at 6:30 pm**	**Tuesday** **April 17 at 6:30 pm**	**Wednesday** **April 18 at 6:30 pm**	**Thursday** **April 20 at 6:30 pm**
Royal Canadian Legion 3920 Huron Church Road Windsor, Ontario	St. Francis Elementary 477 Detroit Street Windsor, Ontario	Caboto Club 2175 Parent Avenue Windsor, Ontario	Essex High School Gymnasium 244 Talbot Street North Essex, Ontario

These meetings are being held as part of the public consultation process for the preparation of a Federal Environmental Assessment (EA).

For further information, please contact:

P. Leigh Whyte
Chief Urban Planner
Avalon Consulting Professionals of Ontario, LLC
Tel. 1-866-807-5113
Email lwhyte@acp-on.ca

AMBASSADOR
AMBASSADOR BRIDGE

Ambassador Bridge: www.ambassadorbridge.com

	Monday	Tuesday	Wednesday	Thursday	Friday
	April 2, 2007	April 3, 2007	April 4, 2007	April 5, 2007	April 6, 2007
7:00					
7:30			Can Am Indian		
8:00			Friendship Centre		
8:30				Green	
9:00				Corridor	
9:30				Group	
10:00		Town of			
10:30		LaSalle			
11:00					
11:30		Windsor &	Building Trades Council	Downtown	
12:00		District	Int. Union of Operating Engineers	Windsor	
12:30		Chamber of	United Brotherhood of Carpenters & J	BIA	Easter
1:00		Commerce			Friday
1:30					
2:00					
2:30	Media			Town of	
3:00	Brief		University of	Lakeshore	
3:30			Windsor		
4:00					
4:30		Windsor &	Greater Essex		
5:00		Dist Labour Cou	School Board	LaSalle	
5:30				BIA	
6:00					
6:30					
7:00			County		
7:30			Meeting		
8:00					
8:30					
9:00					
9:30					
10:00					

	Monday	Tuesday	Wednesday	Thursday	Friday
	April 9, 2007	April 10, 2007	April 11, 2007	April 12, 2007	April 13, 2007
7:00					
7:30					
8:00					
8:30					
9:00		Chatham & Dist			
9:30		Chamber			
10:00			Labourer's Int		
10:30			Union (Sarnia)		
11:00					
11:30					
12:00					
12:30					
1:00	Easter			Not	Available
1:30	Monday				
2:00					
2:30					
3:00					
3:30					
4:00					
4:30					
5:00					
5:30					
6:00					
6:30					
7:00		Town of	Windsor		
7:30		Tecumseh	Heritage		
8:00			Committee		
8:30					
9:00					
9:30					
10:00					

	Monday	Tuesday	Wednesday	Thursday	Friday
	April 16, 2007	April 17, 2007	April 18, 2007	April 19, 2007	April 20, 2007
7:00	Organization	Organization	Organization	Organization	Organization
7:30	Meeting	Meeting	Meeting	Meeting	Meeting
8:00					
8:30					
9:00					
9:30					
10:00	Teamsters	Organization	Ottawa St	Organization	Organization
10:30	880	Meeting	BIA	Meeting	Meeting
11:00					
11:30					
12:00				Heavy	
12:30	Organization		Organization	Construction	Organization
1:00	Meeting	St. Clair	Meeting	Association	Meeting
1:30		College			
2:00					
2:30	Organization	Organization	Organization	Organization	Organization
3:00	Meeting	Meeting	Meeting	Meeting	Meeting
3:30					
4:00					
4:30					
5:00					
5:30					
6:00			Central		
6:30	LaSalle	Sandwich	Windsor	Essex County	
7:00	Public	Public	Public	Public	
7:30	Meeting	Meeting	Meeting	Meeting	
8:00					
8:30					
9:00					
9:30					
10:00					

	Monday	Tuesday	Wednesday	Thursday	Friday
	April 23, 2007	April 24, 2007	April 25, 2007	April 26, 2007	April 27, 2007
7:00					
7:30					
8:00					
8:30					
9:00					
9:30					
10:00					
10:30					
11:00					
11:30					
12:00					
12:30					
1:00					
1:30					
2:00					
2:30					
3:00					
3:30					
4:00					
4:30					
5:00					
5:30					
6:00					
6:30					
7:00	Municipality				
7:30	of				
8:00	Leamington				
8:30					
9:00					
9:30					
10:00					

	Monday	Tuesday	Wednesday	Thursday	Friday
	April 30, 2007	May 1, 2007	May 2, 2007	May 3, 2007	May 4, 2007
7:00					
7:30					
8:00					
8:30					
9:00					
9:30					
10:00					
10:30					
11:00					
11:30					
12:00					
12:30					
1:00					
1:30					
2:00					
2:30					
3:00					
3:30					
4:00					
4:30					
5:00					
5:30					
6:00					
6:30					
7:00					
7:30					
8:00					
8:30					
9:00					
9:30					
10:00					

	Monday	Tuesday	Wednesday	Thursday	Friday
	May 7, 2007	May 8, 2007	May 9, 2007	May 10, 2007	May 11, 2007
7:00					
7:30					
8:00					
8:30					
9:00					
9:30					
10:00					
10:30					
11:00					
11:30					
12:00					
12:30					
1:00					
1:30					
2:00					
2:30					
3:00					
3:30					
4:00					
4:30					
5:00					
5:30					
6:00					
6:30					
7:00	Town of				
7:30	Kingsville				
8:00					
8:30					
9:00					
9:30					
10:00					

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpb)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6085
FAX: (216) 902-6088

16590
B-015/sms
February 20, 2007

[redacted]
United States Fish and Wildlife Service
East Lansing Field Office (ES)
2651Coolidge Road – Suite 101
East Lansing, Michigan 48823-6316

Dear [redacted]

I am writing in regards to your letter dated August 29, 2006, and the ongoing permit process for the proposed second structure to the existing Ambassador Bridge across Detroit River in Wayne County, Detroit, Michigan.

The applicant for this proposed project, the Detroit International Bridge Company, has received a permit from Michigan Department of Environmental Quality (MDEQ), dated January 17, 2007, to construct six additional lanes over Detroit River adjacent to the west side of the existing bridge and connect directly into the existing plazas. The permit does not list any state-listed threatened or endangered species that may be affected by the proposed project. The permit does not specifically identify any expected impacts to the northern riffleshell mussel, which was identified by your office as a federally listed endangered species that may occur in the vicinity of the project. The applicant is required to employ siltation barriers during construction, but there are no other significant impacts or requirements in the MDEQ permit.

The United States Coast Guard, as lead federal agency for a possible federal Bridge Permit for this project, does not believe that the project, as proposed, will impact any federally or state listed threatened or endangered species. This determination is based on the documentation received and the fact that the proposed project would not require the placement of piers in Detroit River.

I am writing to obtain your concurrence with this determination to conclude coordination pursuant to Section 7 of the Endangered Species Act of 1973, or for you to provide additional information regarding this proposed project.

Thank you for your consideration of this matter. Please contact [redacted] of this staff by calling (216) 902-6087 for further discussion.

Sincerely [redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

WYANDOTTE NATION

[redacted]
Chief
[redacted]

[redacted]
2nd Chief
[redacted]
Phone: [redacted]
Fax: [redacted]

June 12, 2007

4 - FORAC

Untied States Coast Guard 9th District
Captain Joseph R. Castillo, Chief of Staff
1240 E. Ninth St. 2025
Cleveland, OH 41999-2060

Dear [redacted]

The Wyandotte Nation would like to address the project:

Ambassador Bridge, Sandwich Ontario Site.

The Wyandotte Nation has a great concern in the project due to the cultural impact on scared burial sites.
The site involved is a known burial site of many tribal ancestral graves. These graves would be impacted by any future development on the proposed site.

The Wyandotte Nation is in support of local Windsor residents who have expressed their concerns on the environmental and cultural in this area due to this pending project.

After documenting proof of ancient Wyandotte burial sites in the proposed project area, we are requesting these sites not be disturbed as these remains of our ancestors are scared to our way of life. In short, we anticipate a response of how this unfortunate situation will be handled going forward.

Sincerely,

[redacted]

[redacted] N.A.G.P.R.A. Representative, Wyandotte Nation

DETROIT - WINDSOR TRUCK FERRY, INC.

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-

May 29, 2007

Re: Ambassador Bridge Enhancement Project

Dear Sir:

The lack of clear federal authority over safety and security issues at privately owned international bridges increases the risk potential for security and environmental incidents to occur and impact the Marine Transportation System. On this basis I oppose the issuance of the Coast Guard bridge permit for the twinning of the Ambassador Bridge.

The National Hazardous Material Routing Registry (NHMRR) restricts certain hazard classes of material from crossing the privately owned Ambassador Bridge. The Michigan State Police confirm the routing restrictions are valid. In a direct challenge to government authority, the owners of the privately owned Ambassador Bridge give out permission letters to certain companies to transport restricted goods across their facility in/out of Canada.

Please review the attached Congressional testimony from February 15, 2007 before the Subcommittee on Coast Guard and Maritime Transportation where this issue is detailed on pages 5-7 under the header HAZARDOUS MATERIALS and in attachments A-G.

Thank you for considering my comments.

Sincerely,

[redacted]

Vice President

0603

P.O. Box 09033 • Detroit, MI 48209
Phone 313-842-2088 • Fax 313-842-2091

DETROIT-WINDSOR TRUCK FERRY, INC.
P.O. BOX 09033
DETROIT, MI 48209
PHONE: 313-842-2088

THE DEVELOPMENT OF SHORT SEA SHIPPING IN THE UNITED STATES

SUBCOMMITTEE ON COAST GUARD AND MARITIME TRANSPORTATION
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
U.S. HOUSE OF REPRESENTATIVES

EXECUTIVE SUMMARY

STATEMENT O[redacted] VICE PRESIDENT
DETROIT-WINDSOR TRUCK FERRY

FEBRUARY 15, 2007

Short Sea Shipping provides a genuine opportunity to relieve congestion in certain freight corridors and at border crossings, expand national highway freight capacity and improve the security and safety of our transportation system in a environmentally sustainable manner.

Challenges holding back the development of Short Sea Shipping in the United States include:

- Harbor Maintenance Fee
- APHIS AQI Fees
- Binational Issues such as Canada Customs Cost Recovery Fees, Canadian Icebreaking Fees and Highway signage.
- Lack of enforcement of existing National Hazardous Materials Route Registry (NHMRR) restrictions.

The following actions are being asked of Congress to promote the development of Short Sea Shipping in the United States:

- Support H.R. 891, the Great Lakes Short Sea Shipping Act
- Enforce the NHMRR at the border.
- End preferential tax treatment of land border crossings.
- Harmonize NAFTA border security, safety and tax policies.
- Demand from all operators of international border crossing transparency, accountability and compliance with federal security priorities.

DETROIT-WINDSOR TRUCK FERRY, INC.
P.O. BOX 09033
DETROIT, MI 48209
PHONE: 313-842-2088

THE DEVELOPMENT OF SHORT SEA SHIPPING IN THE UNITED STATES

SUBCOMMITTEE ON COAST GUARD AND MARITIME TRANSPORTATION
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
U.S. HOUSE OF REPRESENTATIVES

**STATEMENT OF [redacted] VICE PRESIDENT
DETROIT-WINDSOR TRUCK FERRY**

FEBRUARY 15, 2007

It is a true honor to come before you today to speak about Short Sea Shipping.

On Earth Day 1990 the Detroit-Windsor Truck Ferry service was started by my father and me. We chose this start up date 16 years ago to symbolize our commitment to environmental stewardship and a belief that marine transportation can help reduce highway congestion, air pollution and the consumption of finite fossil fuels. The company operates a border crossing between Detroit, Michigan and Windsor, Ontario. Using a flat deck barge and a tugboat, trucks roll-on, cross the river and roll off again on the other side. We transport mainly hazardous material laden trucks that are restricted by US regulations from crossing the Ambassador Bridge and the Detroit-Canada Tunnel. The alternative <u>legal</u> crossing for these vehicles requires a detour of 165 miles. The types of hazardous materials crossing our facilities include flammables, acids, radioactive materials and explosives. We also move those transports too large or heavy for the other crossings. At times of significant congestion at the bridge, we provide surge capacity to vehicles carrying critical automotive freight. With a one-mile crossing of the Detroit River, we are natural extension of the highway.

My comments today will refer mostly to the Great Lakes region and as a point of reference, the Detroit area. Establishing a freight border crossing is filled with many obstacles and learning experiences. The challenges our company has faced and some yet overcome, may help chart a course for developing of Short Sea Shipping in the United States. I am cautiously optimistic about the opportunities to establish a robust, self-sustaining marine highway program. With regulatory coordination between the US Department of Transportation, Customs and Border Protection, and our neighbors North and South, Short Sea Shipping can develop into an important part of the North American Transportation System.

Short Sea Shipping is an opportunity to relieve congestion on certain highways, expand national highway freight capacity and potentially reduce travel times. Heavily congested routes along the coast and at border crossings can be served with marine alternatives to keep freight moving and provide redundancy to critical infrastructure. Marine assets can be put into service in a relatively short period of time.

NATIONAL SECURITY: A tremendous amount of U.S. and Canada trade moves by truck mostly over bridges. In Detroit alone 10,000-12,000 trucks cross the bridge each day. Borders are vital conduits of trade as well as symbolic and economic targets for those who wish our nation harm. The loss of a single cross border bridge because of a terrorist action, serious accident or natural disaster would have a devastating and cascading affect on our national economy. The Department of Homeland Security national strategy to prevent, protect and respond to all hazards is integrally linked with the word recovery. For our nation to overcome any breakdown in the Northern border system there needs to be alternate systems in place for the seamless transfer of cargo and people.

Short Sea Shipping can add significant and immediate redundancy and resiliency to our transportation network. Within the Great Lakes, we can establish water routes parallel to North-South trade corridors and most obviously near fixed border crossings.

A recent DOT study confirmed short sea shipping has significant potential to carry hazardous material shipments. Removal of this cargo from high availability/high consequence critical infrastructure and trade corridors helps protect system integrity, improves anomaly detection for law enforcement and decreases potential public exposure.

TRANSPARENCY: Three Port Security grants have allowed our company to design and develop an advanced notification system software application for law enforcement to know all critical data elements of what is being moved before entry into the country. Even as a private company, our operations are transparent to law enforcement – from cameras in our terminals and offices to detailed customer and traffic information. The cycling of vessel arrivals allows enforcement authorities time to analyze vessel manifest and invoice data – which includes detailed driver, passenger, cargo and vehicle information, make critical pre-arrival decisions and physically examine 100% of all inbound and outbound transports. This high-level of security and domain awareness is not possible at fixed crossings. At the land border, law enforcement's primary interaction with vehicles occurs after they have already crossed the bridge and tunnel.

HIGHER LEVEL OF GOVERNMENT OVERSIGHT: Another reason for dangerous cargoes to move by water is the higher level of government oversight. Unlike the privately owned and operated Ambassador Bridge, a private marine operator like the truck ferry is subject to extensive government oversight and actual physical inspection of vessels and facilities from both the United States and Canadian authorities. Soon the Transportation Worker Identification Card will add another layer of security to marine operations that is absent at the fixed border crossings.

ENVIRONMENT: The environmental benefits of marine transportation are immediate and well-defined by research. In 16 years of operation, our small truck ferry service has removed tens of millions of miles off the route of hazardous material laden and oversize transports - reducing the risk of accidents, highway congestion, wear-and tear to roads, consumption of finite fossil fuels and air emissions. Operations are as simple as a parking lot on each side of the river and a floating platform to carry trucks across. Located on an industrial brownfield site, we are removed from population centers and close to the highway system. To expand the service requires only adding a second vessel, the terminal footprint remains the same.

SURGE CAPACITY: The experience of September 11 proved the value of redundancy in cross-border transportation options. In particular, the merit of cross border marine links was evident by the success of the Detroit-Windsor Truck Ferry in helping to avert post 9/11 plant closings in the automotive industry.

With back ups at the Ambassador Bridge and the Blue Water Bridge exceeding 14 hours, it was incumbent on logistic managers to identify and implement alternative transportation plans for meeting the just-in-time requirements. Beginning September 11, the auto companies used the ferry to carry low risk/critical freight across the border as well. Working cooperatively, automotive companies and suppliers, transporters and the truck ferry managers were able to prioritize shipments based on need. The impromptu ranking assessment was as simple as which production line would be halted or which plant would close without a shipment. That shipment was then moved to the front of the line.

General Motors, in a letter to US Customs following September 11, stated, "The Detroit-Windsor Truck Ferry became our only alternative that would enable General Motors to continue operation of the Detroit/Hamtramck Assembly Plant." (Over 3,400 employees)

At the border, diverse crossing options are essential if manufactures are to continue operations during crisis. The marine industry is a viable substitute for a portion of the traffic that moves on rubber down the highway.

CHALLENGES:

THE SINGLE MOST IMPORTANT IMPEDIMENT TO THE DEVELOPMENT OF SHORT SEA SHIPPING IN THE UNITED STATES IS THE HARBOR MAINTENANCE FEE (HMF)

The HMF applies, with limited exceptions, to domestic and foreign marine cargo unloaded at a U.S. port, including waterborne cargo arriving from our NAFTA partners. The HMF is not assessed on the harbor or port, nor is it assessed on the vessel's operator or owner. The tax is set on the value of the cargo, and is to be paid by the shipper or importer of the cargo.

Not subject to the HMF is domestic highway freight and imported cargoes arriving in the U.S. by a land border - highway, bridge or tunnel.

So when you think of SSS as a viable transportation alternative, you must consider the added cost element of the HMF. The tax is $125 for every $100,000 in (domestic) merchandise or import value. Because of the HMF, the seamless diversion of traffic from congested highways and bridges to waterborne services will be unlikely, expensive and require extraordinary coordination among the carrier, shipper and import community.

To use a SSS carriage alternative, the highway carrier must contact every shipper with freight in the trailer to seek permission to subject each shipment to the HMF at the expense of the shipper or importer. The domestic shipper/importer will calculate the added cost (HMF) of shipping by water and make a business decision whether the time and money saved on the congestion avoidance route (SSS) is worth the added tax and document filing obligation. If it agrees to incur the added costs associated with the HMF, the domestic shipper/importer will need to declare accurately the shipment contents and value of the merchandise shipped. Shippers of freight and carriers are business operators, not social engineers. They make shipping decisions based on convenience, price and service.

For example, most of freight transports crossing the truck ferry from Canada are empty hazardous material shipments which are still subject to the National Hazardous Materials Routing Registry restrictions. These empty transports have zero declared value, so they are not charged the HMF. Depending on the value of the hazardous material shipment, it is sometimes less expensive for shippers to detour 4-5 hours and 165 miles to a bridge than take the 20 minute crossing of the truck ferry and pay HMF. Even during severe border congestion at the Ambassador Bridge, some companies remain idling in long queues, to the detriment of the environment and transportation efficiency, instead of diverting to the truck ferry for a scheduled crossing of the river. Time and again the coordination and cost burden of the HMF are identified as the problem.

Unless the issue of the Harbor Maintenance Fee is addressed, a robust SSS system <u>will not develop</u> in the United States.

APHIS: US Department of Agriculture, Animal and Plant Health Inspection Service will begin in March 2007 requiring payment of Agriculture and Quarantine Inspection fees from commercial vessels, trucks and railroad cars entering the United States from Canada. Because we operate a truck ferry service, APHIS AQI fees are collected twice – once on the vessel ($490.00) and then again on the truck ($5.25). If a truck crosses a bridge or tunnel, the fee only applies to the truck ($5.25).

BINATIONAL ISSUES

Canada Customs: A serious challenge to developing Short Sea Shipping within the Great Lakes region will be the Canadian government policy of charging any new international marine operation the full cost recovery of customs services. These identical services are provided to bridges and tunnels without charge. Until late 2005, the Detroit-Windsor Truck Ferry was the only freight border crossing in Canada subject to these fees. It was only after extensive litigation that our company no longer pays these fees which averaged about $10 for every truck transported by ferry. Any new operation is subject to these same fees - only at a higher rate.

Canadian Icebreaking Fees: The Detroit-Windsor Truck Ferry is in litigation with the Canadian government over icebreaking fees. To make a one-mile crossing of the Detroit River, (which has the international boundary in the middle) the Canadian government charges a $3,100 transit fee for ice breaking services. These fees are capped at three transits a month per vessel. It does not matter if there is ice in the river or the fact that our privately owned truck ferry service in not legally eligible to receive dock to dock icebreaking transit assistance. Further, ice breaking in the Detroit River is a shared responsibility of the United States Coast Guard and the Canadian Coast Guard. Thus we are being charged fees by Canada for icebreaking services conducted by the United States government and funded by US taxpayers. During the four month ice season, these fees equal about $17 a truck transported.

Signage: On the Canadian side of the border, directional signage to the ferry exists on highways as well as county and local roadways. These signs identify the **U.S.** hazardous material restrictions at the border and provide excellent trailblazing to the truck ferry terminal. On the U.S. side of the border before the entrance to the bridge and tunnel, not a single sign exists on the state, county or local roadways providing information on the US National Hazardous Materials Route Registry restrictions or the alternate hazardous material crossing of the Detroit-Windsor Truck Ferry.

HAZARDOUS MATERIALS

The final and most important challenge to the Detroit-Windsor Truck Ferry is the lack of transparency for hazardous materials crossing the border between Detroit and Windsor. Security of movement and the safety of infrastructure are imperiled without continuous and effective situational awareness of hazardous material. Unfortunately there is no coordinated regional policy for the enforcement of existing regulations when they apply to a privately owned bridge.

To illustrate this point please consider the following:

- Since 1929, hazardous material routing restrictions have been in place to restrict certain hazardous materials from crossing the Ambassador Bridge and Detroit-Canada Tunnel. [Attachment A – National Hazardous Materials Route Registry for Detroit]
- The Detroit-Windsor Truck Ferry was established in 1990 to eliminate the circuitous detour route trucks took when transporting restricted cargoes to avoid the local bridge and tunnel.
- Following September 11, 2001, the Detroit media showed video footage of 13,000 gallon fuel tankers and trucks with hazardous materials illegally crossing the Ambassador Bridge – a critical lifeline for the US economy.
- The National Hazardous Materials Route Registry is enforced by the State in which the restrictions take place. However the Michigan Department of

Transportation wrote to me on October 18, 2001 about the restriction of hazardous materials on the Ambassador Bridge and said, *"The state does not have jurisdiction concerning the transport of hazardous materials across a privately owned bridge, that is the responsibility of the private owner/operator."* The letter went on further to state, *"Jurisdiction over transport of hazardous material across a city street may either be under the jurisdiction of the MSP (Michigan State Police) and/or local enforcement agencies such as the City of Detroit."*

- According to media reports, the Ambassador Bridge, a privately owned and operated international border crossing, informed the Michigan State Police it does not have "the authority to determine what crosses a private piece of property." [Attachment B]
- USDOT legal council states the Hazardous Material Regulations apply to private bridges. [Attachment C]
- The Ambassador Bridge distributes letters allowing certain privileged companies to transport restricted hazardous material across the bridge in contravention of the routing restrictions. [Attachment D] The Michigan State Police state these letters are illegal. [Attachment B]
- For hazardous material restricted routes throughout the US, highway signage is used to inform the commercial vehicle operators of route restrictions. No such signs are in place at the Michigan border crossings. Only one such sign exists on the Ambassador Bridge, seen by trucks after toll collection. [Attachment E]
- In Canada there is no signage on the plaza of the Ambassador Bridge notifying truckers with hazardous materials that the facility is route restricted. On the Canadian side of the border there are no toll booth operators to stop a vehicle from illegally crossing the bridge with restricted hazardous materials.
- In Canadian law there is no hazardous material routing restrictions at the border however in Windsor, Ontario signage has been installed to inform drivers of the US restrictions. [Attachment F]
- From the FMCSA Guide to Developing an Effective Security Plan for Highway Transportation of Hazardous Materials. Part D En Route Components: "Explosives, poisons, and flammables all represent significant potential consequences for weapons conversion in a tunnel scenario. Long-span bridges, such as suspension bridges, are targets for both their iconic and economic value."
- In December 2001, the Ontario Ministry of Transport reported to the media that over 9,000 hazardous material vehicles a year illegally crossed the privately owned bridge. [Attachment G]
- In the March 2006 GAO report, Review of Undeclared Hazmat Entering the United States, according to officials, undeclared hazmat shipments occur for two main reasons: (1) Lack of knowledge: Domestic and foreign shippers may be unfamiliar with hazmat regulations and laws. (2) Economics: Shippers may not declare hazmat to avoid additional costs. This generally occurs because declared hazmat shipments require special placarding, packaging, additional training, carrier surcharges, and insurance.

Following September 11, 2001, it became clear the agenda of those with the intent to do harm to our nation anticipated the use of hazardous material laden vehicles as weapons of destruction. It is not difficult to imagine how those with the intent to do harm to an important trade corridor could exploit the absence of authority and the lack of a consistent hazardous material policy to permanently disable this critical NAFTA transportation link. One cannot assume that our enemies have taken this modus operandi off their agenda. Protection of our international borders requires a consistent enforcement plan based upon transparent rules and regulations.

Canada: International Bridge and Tunnels Act

Until recently the Canadian government as well had no clear authority to regulate matters concerning approvals for the constructing new, or altering existing, international bridges or tunnels; approvals for changes in ownership, operation or control; and issues about maintenance, operations, safety and security.

To resolve this problem, the Canadian government recently enacted into law the **International Bridge and Tunnels Act**. This legislation provides the federal government with legislative authority to ensure effective oversight of the existing 24 international vehicular bridges and tunnels and nine international railway bridges and tunnels, as well as any new international bridges or tunnels built in the future. The Minister, through the governor-in-council, has the power to regulate the safety, security, operation and use of international bridges and tunnels. The Minister will have the authority to issue an emergency directive in response to a potential threat to the safety or security of any international bridge or tunnel. To help protect the safety, security and efficiency of the transportation system, Ministerial approval will be required for transactions that result in changes in ownership or the operation of any international bridge or tunnel.

In the United States there is no similar authority or oversight when it comes to privately owned international border crossings. This is a danger for our national security. Even after September 11, 2001, our company, a transporter of dangerous cargoes across the border, has not been formally interviewed to ask how we finance operations, who beneficially owns our company or what other companies do we control and operate.
As these questions have not been asked of our company, I guarantee you there has not been any vetting of other privately owned border crossings.

This Congress should consider the dire national consequences of not having a clearly defined authority over our international borders.

CONCLUSION

The value of a Short Sea Shipping system in the United States, particularly at the northern border, is integrally linked to the condition and vulnerability of our aging transportation infrastructure. Again referring to the Detroit-Windsor border, about 25% of our nation's trade with Canada, our largest trading partner, crosses a bridge built in 1929. Over $300 million in trade is trucked each day across the Ambassador Bridge. If that facility failed, there is no ready replacement plan; the economy of the entire United States will be harmed.

When a section of the I-495 Beltway around Washington DC closes, traffic snarls and delays abound, but the system continues to operate through the use of secondary roads that absorb the temporary excess traffic demand. At the U.S. and Canada border, this will not happen. If the Ambassador Bridge closes, US bound freight would have to divert either 100 miles to the nearest international bridge crossing in Sarnia, Ontario or 250 miles to Fort Erie, Ontario. Such delays would cripple the automotive industry, its suppliers and our economy overnight.

To mitigate this risk, we must build, without delay, a versatile and flexible multimodal transportation system that includes Short Sea Shipping. The Congress of the United States is being asked today to take a leadership role in this necessary expansion of our transportation network. The following actions are required:

1. Support the reintroduced Great Lakes Short Sea Shipping Act, H.R. 981, to exempt shippers paying the Harbor Maintenance Tax on non-bulk shipments on the Great Lakes and St. Lawrence Seaway System between a port in Canada to a U.S. port. This is the most critical action to be taken for development of Short Sea Shipping in the Great Lakes region.
2. Enforce the Hazardous Material Routing Restriction at the Detroit border and select the Detroit-Windsor Truck Ferry as the prescribed route for high-risk and hazardous materials. The public depends on government to enforce rules and regulations that are put in place to protect people, property and commerce. The continued inconsistent application and enforcement of the NHMRR weakens the overall regulation and emboldens those who wish to harm our nation.
3. End preferential tax treatment of land border crossings. This practice protects incumbent operations, discourages competition and reduces the development of alternative modes of transportation. Be it crossing a lake or an inland river, a Short Sea Shipping vessel should be seen for what it is, a valuable extension of the highway, replacing bridges and tunnels where not practible.
4. Harmonize NAFTA border security, safety and tax policies so there is a consistent and equitable regulatory framework for freight entering this country by either land or marine.
5. Demand from all operators of international border crossings transparency, accountability and compliance with federal security priorities.

With a border transportation system unable to recover from catastrophe, we leave our jugular exposed to the enemies who gather, prepare and plan to destroy our nation. The establishment of a sustainable marine highway system is not only desirable - it must become a national security priority.

Thank you for this opportunity to appear before you today.

ATTACHMENT A: National Hazardous Materials Route Registry - Detroit

The National Hazardous Materials Route Registry

Report Date 2/12/2007

Report Type:	Verbose
States:	Michigan
Categories:	All Categories

STATE: Michigan

Agency:	Michigan DOT	FMCSA:	MI FMCSA Field Office
POC:	Mr. Gregory Rosine, Director	POC:	Motor Carrier State Director
Address:	425 West Ottawa P.O. Box 30050 Lansing, Michigan 48909	Address:	Federal Building, Room 205 315 West Allegan Street Lansing, Michigan 48933
Phone:	(517) 373-1884	Phone:	(517) 377-1866
Fax:	(517)-373-0176		

RESTRICTED ROUTES

Designation Date	Route Description	Restriction
1/1/1929	Ambassador Bridge [Detroit] From Porter St. to Canada [Windsor] [Phone (313)-849-5244]	- 1 - 3 - - - 7 8 - - -----
3/8/1995	Blue Water Bridge [I69] [Port Huron, MI to Sarnia, Ontario. NOTE: In addition to the listed restrictions, Pyrophoric Liquids prohibited. Contact Michigan Dept. of Transportation for specific restrictions. (810)-984-3131]	- 1 - - - 5 - 7 - 9 - -----
1/1/1990	Interstate 696 [County of Oakland] From State Route M-10 to Interstate 75	- 1 - 3 - - - - - - - -----
3/8/1995	International Bridge [I75] [All placarded vehicles require an escort. Contact Operations Supervisor at (906)-635-5255	0 - - - - - - - - - - -----

	before crossing. Sault Ste. Marie, MI to Sault Ste. Marie, Ontario.]	
3/8/1995	Mackinac Bridge [I75] [Mackinac City to St. Ignace. All placarded loads require an escort by the Mackinac Bridge Authority. Phone (906) 643-7600.]	0 - - - - - - - - - - - - - -
1/1/1958	State Route M-10 [Detroit] From Howard St. to Woodward Ave. [Under Cobo Hall (approx 1 mile)]	- 1 - 3 - - - - - - - - - - - -
1/1/1964	State Route M-10 [Detroit] From 8 Mile Rd [South] to Wyoming Rd	- 1 - 3 - - - - - - - - - - - -
10/3/1998	State Route M-59 [Utica] [1.1 mile from either direction of the Mound Rd exit]	- 1 - 3 - - - - - - - - - - - -
1/1/1930	Windsor Tunnel [Detroit] From Jefferson Ave. to Canada [Windsor] [Phone: (313)-567-4422]	- 1 - 3 - - - 7 8 - - - - - - -

Restriction / Designation Key

Restrictions Prohibited for the indicated hazmat	*Designations* Recommended for indicated hazmat
0 - ALL Hazmats 1 - Class 1 - Explosives 2 - Class 2 - Gas 3 - Class 3 - Flammable 4 - Class 4 - Flammable Solid/Combustible 5 - Class 5 - Organic 6 - Class 6 - Poison 7 - Class 7 - Radioactive 8 - Class 8 - Corrosives 9 - Class 9 - Dangerous (Other) i - Poisonous Inhalation Hazard (PIH)	A - *Prescribed Route* ALL NRHM Hazmats B - *Prescribed Route* Class 1 - Explosives P - *Preferred Route* Class 7 - HRCQ Radioactive I - *Prescribed Route* Poisonous Inhalation Hazard (PIH) M - *Prescribed Route* Medical Waste

ATTACHMENT B: Media report

Hazmat Trucks On Bridge Leads To Crackdown
Local 4 Investigation Uncovers Suspect Hauling Practice
Posted: 10:22 p.m. EST January 10, 2002
Updated: 11:18 p.m. EST January 10, 2002

DETROIT-- If trade is America's lifeline, then the Ambassador Bridge is the main artery. Every day more than 32,000 vehicles cross over -- trucks carrying precious cargo and something else. The Defenders have discovered hazardous materials are being carried illegally across. The Ambassador Bridge is restricted by federal regulations, prohibiting corrosives, explosives, radioactives and flammable loads.

Gregg Ward, Detroit /Windsor Ferry: "I think the public takes the assumption the law is enforced. So they assume that they're safely crossing these facilities."

In our three-month investigation, defender cameras catch truckers carrying over illegal loads. On this day, a fuel truck crosses the bridge. A flammable sign warns of dangerous cargo. But no one stops the truck, a clear violation of the law.

[redacted] Windsor Fire Department: "As far as a fuel vehicle, I don't even want to think about it, [redacted] have a real problem." If a situation did occur. Windsor firefighters would be one of several agencies to respond. That's why Assistant [redacted] supports regulations prohibiting hazardous materials crossing the bridge [redacted] "There is no water supply on the bridge. If it actually burst into flame, I'd have a real problem and concern with the actual structure of the bridge."

Defender cameras roll as this truck with flammable signs exits the bridge. Surprised? It happens more often than you think. In fact, a Canadian government report reveals 9,000 truck drivers every year are illegally driving hazardous materials over the Ambassador Bridge.

So how are trucks carrying hazardous materials supposed to cross the river? The ferry. It costs $100 – at times, more than twice the cost of using the bridge, but it's legal. Trucker [redacted] takes the ferry, plays by rules and wishes others would follow. Zelco: " I don't think it's fair having hazmat cross the bridge because it's a cable-suspended bridge and they're diesel fuel. When you're sitting up there who knows what is going to happen?"

How is this happening? Sources tell the Defenders some truck drivers actually take the signs off their trucks and then sneak across the bridge, hoping not to get caught.

But the Defenders discovered the companies who own the bridge actually know and allow certain trucks to cross, even though their loads are illegal.

Company letterhead shows they're from the Detroit International Bridge Company and Canadian Tranist Company, private businesses that own the bridge. The documents are dated as far back as 1996 and as recent as two months ago. In this letter, the bridge company gives one trucking company permission "to cross the bridge even though they (the commodities) are placarded as hazardous." This letter allows the same company to transport empty alcohol tankers, still considered flammable, a violation of the law. This letter allows another company to transport illegal materials across. And so does this document. The memo reads "Do not prohibit access to our facility for this vehicle." Those documents are not legal.

We took the paperwork to the Michigan State Police Motor Carrier Unit. The agency monitors commercial traffic on the bridge. Sgt. Susan Fries, Michigan State Police Motor Carrier Unit: "Even though the bridge is a private structure, Michigan Department of Transportation says that it is a restricted route and those items cannot cross."

We went to the bridge company to get answers. Dan Stamper, the man in charge of the bridge, would not talk to us on camera. By telephone he admits some trucks carrying hazardous material are allowed to cross the bridge. He also admits handing out memos identifying the companies that have been granted permission. Stamper: " We have a number of letters like this that have been issued to customers of the bridge who have explained what they are hauling."

Karen Drew: "I showed those documents to state police and they say those documents are illegal. Those types of trucks carrying those types of commodities should not cross on the bridge."

Stamper: "We don't believe the state has the authority to determine what crosses a private piece of property."

Fries: "They maintain there is an underlying agreement that they don't have to comply with those regulations. We maintain that they do."

Drew: "Now the bridge companies tells me that they will continue to hand out those letters giving truck drivers permission to cross with their illegal loads. Michigan State Police says they were just alerted to this problem. They are going to start to crack down on these illegal drivers. They have already handed out three tickets. One went to a fuel truck who was crossing the bridge with his load of fuel."

U.S. Department
of Transportation

**Research and
Special Programs
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

APR - 5 2001

[redacted]

Ref. No. 01-0058

Bridge Tunnel Patroller
Monitor-Merrimac Memorial Bridge Tunnel
P.O. Box 6570
Portsmouth, Virginia 23703

Dear [redacted]

Thank you for your February 8, 2001 letter to Secretary of Transportation Norman Mineta. Your letter has been referred to this office for response. You ask about state and local routing requirements for the transportation of hazardous materials and specifically about restrictions on the transportation of certain hazardous materials through tunnels.

The Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) set forth requirements for persons who offer hazardous materials for transportation or transport hazardous materials in commerce. The HMR explain how to class and package a hazardous material and how the package must be marked and labeled. The HMR also tell how to complete the shipping papers and emergency response information that must accompany a hazardous material shipment. In addition, the HMR tell whether the vehicle in which a hazardous materials shipment is being transported must be placarded and the specific placards that must be used. Finally, the HMR explain training requirements for persons who transport hazardous materials or prepare hazardous materials for shipment.

Hazardous materials transported in commerce, including on state- or privately-owned bridges and tunnels, must conform to all applicable requirements of the HMR. In addition, regulations issued by the Federal Motor Carrier Safety Administration (FMCSA) at 49 CFR Part 397 provide general routing standards for states and Indian tribes that wish to establish highway routing designations for non-radioactive hazardous materials (NRHM). Generally, these regulations require a state or tribal government to make a public finding that NRHM routing designations enhance public safety in both the area subject to its jurisdiction and other areas that are directly affected by the routing designation. In establishing routing designations, a state or Indian tribe must consider a number of factors, including the population potentially exposed to an NRHM release; the characteristics of the highway; the types and quantities of NRHM expected to be transported on the designated route; emergency response capabilities; and exposure and other risk factors. So long as states and Indian tribes comply with these general standards, they have broad discretion to develop routing designations for NRHM. State officials are better positioned than is the federal government to assess local bridge or tunnel conditions, accident histories, emergency

01-0058

172.701

response capabilities, alternative routes, and exposure and other risk factors in making such decisions. Similarly, we believe state authorities should be responsible for enforcing any bridge or tunnel restrictions and for training their employees to enforce the restrictions. You should discuss any concerns you may have about hazardous materials transported through the Monitor-Merrimac Memorial Bridge Tunnel with your supervisor.

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

[redacted]

Office of Hazardous Materials Standards

ATTACHMENT C: USDOT LETTER

ATTACHMENT D: Ambassador Bridge Letters

AMBASSADOR BRIDGE

DETROIT INTERNATIONAL BRIDGE COMPANY

P. O. BOX 32666 Detroit, Michigan 48232

October 7, 1996

TO: ALL SCALE AND TOLL EMPLOYEES

The bearer of this letter Gorski Bulk Transport Inc., has the permission of the Bridge Company to transport empty alcohol tankers. This letter, upon presentation, covers only this empty alcohol tanker and no others.

Sincerely,
Detroit International Bridge Company
Canadian Transit Company

[redacted]

Superintendent Of Operations

JP/vs

0623

AMBASSADOR BRIDGE

DETROIT INTERNATIONAL BRIDGE COMPANY

P. O. BOX 32666 Detroit, Michigan 48232

NOTICE

TO: ALL TOLL COLLECTORS

FROM: [redacted]

GENERAL MANAGER

DETROIT INTERNATIONAL BRIDGE COMPANY

RE: COMPANY: GORSKI BULK TRANSPORT INC

DATE: 11/06/98

The commodities carried in this trailer have been exempted to cross the bridge even though they are placarded as "hazardous". Do not prohibit access to our facility for this vehicle.

[redacted]

AMBASSADOR BRIDGE

THE CANADIAN TRANSIT COMPANY

780 HURON CHURCH ROAD, SUITE 202 Windsor, Ontario N9C 2K2

NOTICE

DATE: July 30, 1998

TO: All Toll Collectors

FROM: [redacted]
General Manager
The Canadian Transit Company

RE: **Company: TST Overland Express**

The commodities carried in this trailer have been exempted to cross the bridge even though they are placarded as "dangerous". Do not prohibit access to our facility for this vehicle.

[redacted]

NOTICE

DATE: September 09, 1999

TO: All Toll Collectors

FROM: [redacted] General Manager [redacted] The Canadian Transit Company

RE: Company: Morrice Transportation

The commodities carried in this trailer have been exempted to cross the bridge even though they are placarded. Do not prohibit access to our facility for this vehicle.

[redacted]

DETROIT INTERNATIONAL BRIDGE COMPANY

P. O. BOX 32666 Detroit, Michigan 48232

AMBASSADOR BRIDGE

To: Carriers

Re: Hazardous Materials

Detroit International Bridge Company and The Canadian Transit Company owns and operates the Ambassador Bridge and prohibits the hauling of acidic, caustic, flammable, explosive and radio-active material across the Ambassador Bridge.

Scalemen are instructed to check bulk tank trucks, bulk tank trailers as well as regular semi-trailers which appear to be carrying hazardous materials. Carriers must have on file with this Company a notarized affidavit on company stationery, addressed to this Company acknowledging that its tank trucks, tank trailers and/or regular equipment do not and will not haul any cargoes that are <u>acidic</u>, <u>caustic</u>, <u>flammable</u>, <u>explosive</u> or <u>radio-active</u> in nature.

Such affidavit must accompany each crossing unless the carrier is prepared to file a permanent notarized affidavit to cover all of its equipment.

Yours very truly,

DETROIT INTERNATIONAL BRIDGE COMPANY
THE CANADIAN [redacted] COMPANY

[redacted]ntendent of Operations

JP/em

0627

AMBASSADOR BRIDGE

DETROIT INTERNATIONAL BRIDGE COMPANY

P. O. BOX 32666 Detroit, Michigan 48232

To: All DIB & CTC Scale & Toll Employees

Date: November 1, 2001

Re: **General Chemical Corporation**

The bearer of this letter, General Chemical Corp., has permission to transport the commodity **"ALUM"** across our bridge. This is a "mild" corrosive and the truck will be placarded as such. This letter covers only **"ALUM"** and no other corrosive or otherwise prohibited commodity. This transport is scheduled to run indefinitely, however, the carrier must obtain a updated letter after 90 days which will be February 1, 2002

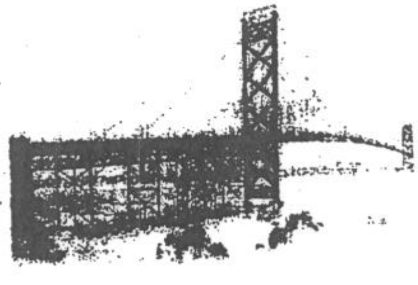
Sincerely,

DETROIT INTERNATIONAL BRIDGE CO.
THE CANADIAN TRANSIT CO.

[redacted]

General Manger

DJ/ah



AMBASSADOR BRIDGE

DETROIT INTERNATIONAL BRIDGE COMPANY

P. O. BOX 32666 Detroit, Michigan 48232

TO: DIBC TOLL COLLECTORS

DATE: December 6, 2005

RE: **GENERAL CHEMICAL CORPORATION**

The bearer of this letter, General Chemical Corporation, has permission to transport the commodity **"ALUM"** across The Ambassador Bridge. This is a "mild" corrosive and the truck will be placarded as such. This letter covers only **"ALUM"** and no other corrosive or otherwise prohibited commodity. These crossings are scheduled to run on a routine nature, seven days per week. However, this letter is good only until March 1, 2006, when an updated letter must be obtained.

Sincerely,

DETROIT INTERNATIONAL BRIDGE COMPANY
THE CANADIAN TRANSIT COMPANY

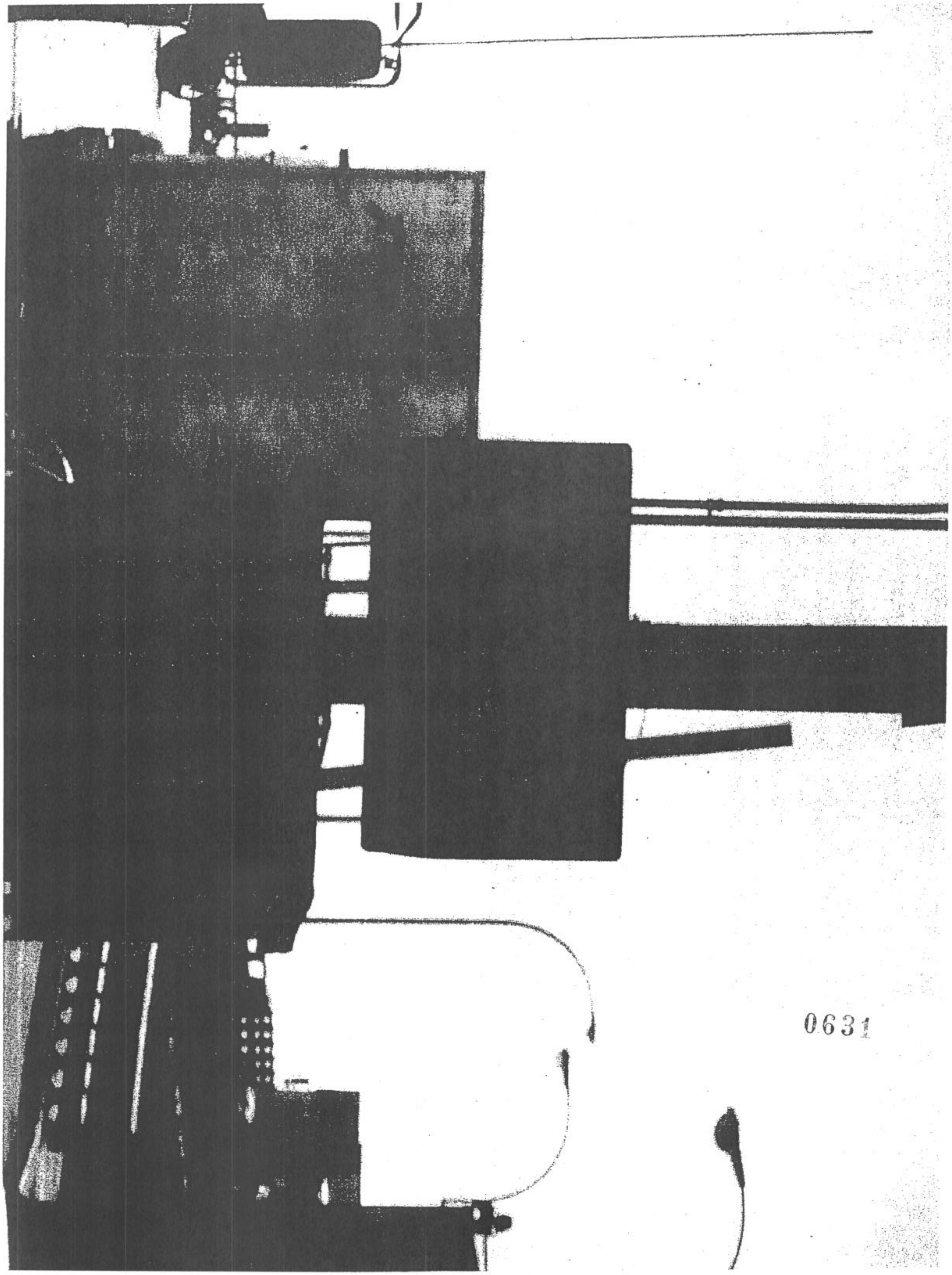
[redacted]

General Manager

DBJ/em

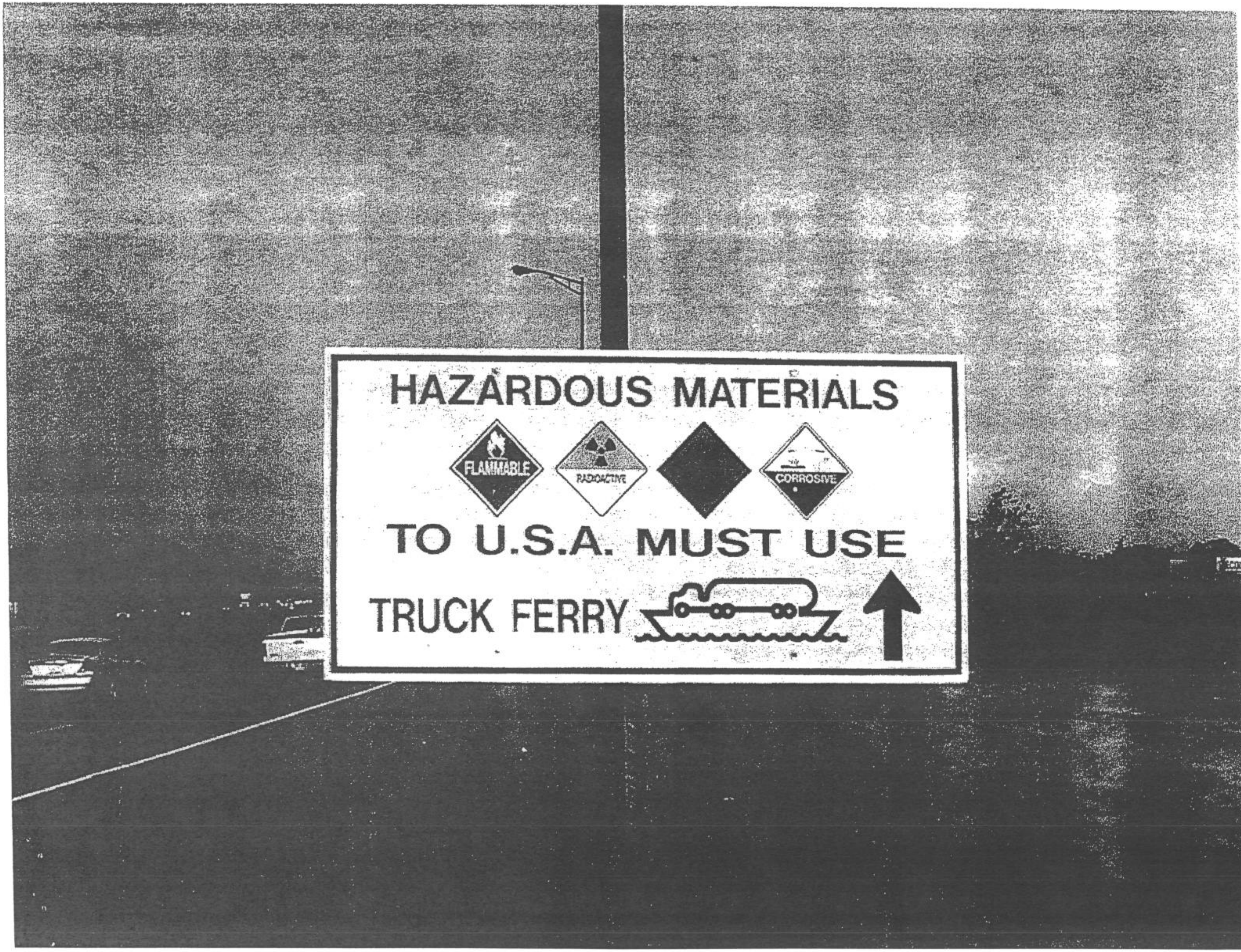
0629

ATTACHMENT E: NHMRR sign at the Ambassador Bridge



0631

ATTACHMENT F: Windsor Sign 1 and 2


HAZARDOUS MATERIALS
FLAMMABLE
RADIOACTIVE
CORROSIVE
TO U.S.A. MUST USE
TRUCK FERRY

0634

ATTACHMENT G: Media reports – Illegal Hazmat Crossings

Unclaimed hazardous materials brought over

December 18, 2001

BY EMILIA ASKARI
FREE PRESS STAFF WRITER

The scene is repeated about 25 times a day on the side streets of Detroit near the foot of the Ambassador Bridge:

A large semi truck pulls over to the curb and stops. The driver hops out of the cab and quickly removes a placard reading "Hazardous Materials." Then the driver steers the rig across the busiest crossing between Canada and the U.S., flaunting a rule that prohibits most hazardous materials from the bridge.

A report by the Ontario Ministry of Transportation recently concluded that about 9,000 truck drivers a year follow this scenario. It is unknown how many pull their hazardous materials placards on the streets of Windsor, before crossing into the United States.

In response to the report, which will be released in its entirety next year, customs officials on both sides of the border are talking about better ways to catch and punish truck drivers who ignore the no-hazardous-materials rule.

The trucks carrying the prohibited hazardous materials represent about one quarter of 1 percent of the traffic on the bridge, Ontario Transportation Ministry Bob Nichols said Monday. The ministry reached its conclusions following a periodic survey of truck drivers on Canadian highways. Some of the drivers carrying hazardous materials indicated to official surveyors that they had entered the country via the Ambassador Bridge, Nichols said.

The materials include things that are explosive, flammable or lethal when breathed in small doses.

Hauling hazardous materials without appropriate placards is a violation of federal law in the U.S. and Canada. Neither U.S. nor Canadian law prohibits hazardous materials from crossing the Ambassador Bridge. But the private company that owns the bridge – the Detroit International Bridge Company -- doesn't allow trucks carrying hazardous materials.

David Jolly, the bridge company's general manager, said Monday that he is reviewing the bridge's hazardous-materials policy with various officials. He declined to comment further.

The company that owns the Detroit-Windsor tunnel also prohibits hazardous materials from crossing through it. The preliminary Ontario Transportation report did not address whether trucks are carrying hazardous materials through the tunnel.

"It makes no sense in this time of heightened security to permit this," said Gregg Ward, who runs a ferry that legally shuttles trucks carrying hazardous materials between the cities.

The drivers have an economic incentive to hide their hazardous materials placards. Ward's ferry costs between $50 and $100, depending on the truck's weight. The bridge costs between $15 and $45.

The Hon. Herb Gray, deputy prime minister of Canada, is seeking a meeting with officials from both sides of the border.

Contact EMILIA ASKARI at 248-586-2606 or askari@freepress.com.

Bridge barricade draws fire; Hazardous shipment exemptions put on shelf

'What they're proposing is radical, it's extreme,' mayor says

By Doug Schmidt Star Staff Reporter

With Michigan state troopers staring them down at the American end, the owners of the Ambassador Bridge have suspended their practice of issuing permits allowing some commercial carriers to truck dangerous goods across the international span.

A consultant has been hired to "look over the situation," says Dave Jolly, general manager of the Detroit International Bridge Company and a report is expected by the end of this month. Meanwhile, all trucks sporting dangerous goods placards have been banished.

"The Michigan State Police are defining it as an illegal route ... the problem is, it's our bridge -- how can a state entity say what can or cannot cross private property?" says Jolly. Company permits were issued primarily to carriers of explosive charges used by the automotive sector for air-bag and seat belt devices.

After the years-old practice was brought to light in recent reports by The Star and other media, Michigan was advised by federal transportation authorities that the U.S. highways leading to the American side of the bridge were identified decades ago as restricted routes forbidding the carrying of a number of categories of dangerous cargo.

'Not legal'

"They maintain the bridge is private and should not be restricted ... that's their position. It's not legal for a load of explosives, flammables, corrosives or radioactive materials to cross that bridge -- that's a violation," says Sgt. Susan Fries of the hazardous materials unit of the Michigan State Police motor carrier division.

Officers from Fries's unit were stationed on the Detroit side of the bridge to help U.S. Customs identify and intercept such shipments. 0637

Carrying restricted dangerous goods on Michigan highways is a federal violation subject to a fine of up to $500 US.

Dangerous goods continue to cross the Ambassador Bridge in commercial trucks that aren't required to carry hazard placards.

"I think it's a very dangerous situation, I really think it's a serious problem going up and down our highways," says David Hawkes, a Richmond Hill firefighter whose five-days-on/five-days-off shifts allow him to work part-time as a commercial trucker.

Most people don't realize, he says, that there are few restrictions on transporting dangerous goods packaged as consumer products for household use.

"Here I was crossing the Ambassador Bridge with 40,000 pounds of highly flammable, combustible barbecue lighter fluid and I didn't even need to be placarded," says Hawkes, who worries the practice could some day put his firefighting colleagues in a dangerous situation.

Private individuals are similarly not bound by dangerous-goods restrictions. On top of that, a recent Ministry of Transportation Ontario study estimated about 9,000 illegal truckloads of hazardous cargo cross the Ambassador Bridge annually.

"It's very wide open now ... you or I can rent a truck, load it up with explosives (and drive on to the bridge) -- it always has been a concern of ours," says Windsor Fire Chief Dave Fields.

Doug Schmidt can be reached at 255-5777, ext. 586.

Back

0638

Gmail by Google BETA

Gregg Ward <ward.gregg@gmail.com>

Inspectors: Security lags when traffic jams

1 message

GREGGWARD@aol.com <GREGGWARD@aol.com> Wed, Mar 29, 2006 at 8:02 AM
To: greggward@truckferry.com

Detroit Free Press
www.freep.com

Home | Back

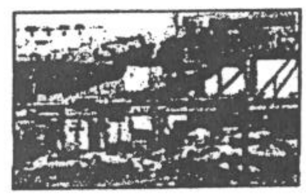
Inspectors: Security lags when traffic jams

SPECIAL REPORT: Bridge operator pushes to keep border travel moving. Government officials deny cutting corners.

BY TAMARA AUDI
FREE PRESS STAFF WRITER

March 29, 2006

On a weekend night earlier this month, 12 big rigs from Detroit were lined up on the Canadian side of the Ambassador Bridge, waiting to be searched by inspectors who were on the lookout for a produce truck thought to be carrying drugs.



Traffic crosses the Ambassador Bridge earlier this month. Amid heightened terror concerns, about 9.4 million vehicles crossed the bridge in 2005, bridge officials said. (KATHLEEN GALLIGAN/Detroit Free Press)

But before the Canadians could scan the trucks, their supervisor received a call from the U.S. company that owns the bridge. The trucks were snarling traffic. And the bridge's owner wanted traffic cleared quickly, an inspector working that night said.

What happened next, according to customs inspectors and security experts, is what routinely happens on the U.S.-Canadian border when security clashes with commerce: Commerce wins.

"We stopped the inspection," a Canadian inspector said, and let the trucks pass.

Despite fears of terrorism and other security concerns at U.S. ports and border crossings since Sept. 11, 2001, U.S. and Canadian inspectors on the Ambassador Bridge and elsewhere say they are routinely told by supervisors to wave vehicles through checkpoints without scrutiny to satisfy commercial interests.

Though government officials in the United States and Canada deny safety is compromised, inspectors say security lapses are a particular problem at the Ambassador Bridge -- the busiest northern border crossing, and one of only two along the U.S.-Canadian border that are privately owned.

In one practice known as lane flushing, inspectors at the bridge -- owned by the Detroit International Bridge Co. -- say supervisors force them to wave through long lines of cars and trucks to ease congestion, without asking even cursory questions of drivers or passengers.

0639

"When the traffic backs up to a certain point, you know the call is going to come" from the bridge company, one bridge inspector told the Free Press. "Then management jumps like lapdogs."

Robert Perez, port director of Detroit for U.S. Customs and Border Protection, an agency of the Department of Homeland Security, denied lane flushing takes place. Perez said his office tries to cooperate with bridge and tunnel operators, and that inspectors might view that cooperation as caving in to commercial interests.

"The people in the community, both in Detroit and Windsor, should feel good about the fact that their border crossings are safer than ever before," Perez said.

The Free Press interviewed more than a dozen inspectors, former inspectors, Homeland Security officials, customs supervisors, politicians and border security experts -- including six inspectors assigned to the Detroit-Windsor border. All but one of the inspectors -- a Canadian union leader -- spoke on condition of anonymity, noting agency restrictions on media interviews and saying they feared job reprisals if named.

The allegations come as U.S. border security has faced its closest scrutiny since the 2001 terrorist attacks.

Congressional opposition recently scuttled a plan to have a Dubai-owned firm manage six U.S. ports. And Tuesday, as Congress debated tougher border security as part of an immigration package, a Senate subcommittee was investigating how undercover agents drove into the United States from Canada and Mexico with nuclear material.

Technology touted

U.S. and Canadian customs officials, and representatives from the bridge company -- owned by trucking magnate Manuel (Matty) Moroun -- insist security is never compromised for commerce and say, in fact, the reverse is true: Better technology, improved facilities and better cooperation between business and government make the border more secure and efficient.

Perez noted that the bridge and Detroit-Windsor Tunnel now feature high-tech surveillance -- invisible to travelers -- such as radiation detectors and electronic prescreening programs. And customs agents in Detroit seized more than 5,000 pounds of drugs last year, an eightfold increase over the previous year, he said.

Dan Stamper, president of the bridge company, said it has spent millions to expand facilities since 9/11 and would never ask inspectors to "give up any of their security initiatives to move traffic faster."

Bridge inspectors concede that, even under the best of circumstances, they could not fully inspect every vehicle entering the United States without crippling trade. Thus, they say, it is not unusual for drivers to pass inspection with only a few questions asked.

What they object to, they say, are orders from supervisors to wave through long lines of cars and trucks with no questioning at all. Sometimes, inspectors say, they have been told to stop inspecting a particular vehicle to open more booths when traffic backs up.

"They call and say, 'You're holding us up too much.' And they always win that argument," said Charles Showalter, national president of one of the two unions representing U.S. Customs and Border Protection officers. He said when inspectors or the union object, Homeland Security officials "call it 'acceptable risk.' It's 'Hurry up, hurry up, hurry up, hurry up.' Nobody wants to slow down commerce."

Bridge inspectors say this can happen once a week or more at the Ambassador Bridge -- one of two privately owned crossings on the U.S.-Canadian border. The other is a bridge in International Falls, Minn. However, they also say that inspectors are also pressured to speed traffic at government-owned crossings that are run by private companies.

The Detroit-Windsor Tunnel, for example, is run by a private company but owned by the City of Detroit on one

0640

side and Windsor on the other. Toll profits are shared with the cities.

Tolls collected at the Ambassador Bridge go to the bridge company, owned by Moroun of Grosse Pointe Shores.

Keeping the wait down

Since 9/11, traffic has declined about 30% at Detroit's border crossings.

To counter memories of long delays in the months after Sept. 11, the Detroit-Windsor Tunnel tries to keep waits under 20 minutes. Both the tunnel and bridge post wait times on their Web sites. During rush hour on an evening this week, bridge travel to and from Canada was under 15 minutes. The tunnel wait was under 6 minutes.

Neal Belitsky, executive vice president of the Detroit & Canada Tunnel Corp., which operates the tunnel, said he considers a 20-minute wait as "the outer limits for acceptability" for the roughly 29,000 vehicles that pass through daily.

"When we see traffic getting to that threshold, we will start calling customs and saying we need more lanes," he said. "That's a standard part of the business and we all do it."

He added there are times when customs denies his request and he backs off.

Danny Yen, spokesman for the Canadian Border Services Agency in Windsor, said, "We've had our challenges" with the bridge company, but "we never compromise security for trade. It's a balance."

Haste makes risk, some say

But inspectors say the rush to speed traffic has spawned practices -- such as lane flushing -- that put security at risk.

"Lane flushing happens all over the place, at every crossing," Showalter said. "The traffic backs up. The supervisor gets a call" from private border businesses. "They run an officer with a canine through the line of cars, and the officers on the primary inspection lanes are told not to ask questions."

About 9.4 million vehicles crossed the Ambassador in 2005, according to bridge officials. Collectively, the bridge, tunnel and a commercial train tunnel account for nearly a quarter of all U.S. trade with Canada, the bulk of it by trucks crossing the bridge. When trade is delayed at the border, Michigan's automobile-reliant economy suffers most, a recent Ontario Chamber of Commerce study shows. Automakers use a "just-in-time" delivery system that depends on parts crossing promptly. A delay of even a few hours can cost millions.

A difficult balance

Perez, the Detroit port director, said changes intended to balance trade and security issues mean that some vehicles don't have to be checked as frequently. The government's so-called trusted traveler programs, for instance, allow prescreened businesses to cross faster and with fewer inspections, though critics say terrorists could exploit such efforts.

Colleen Kelley, president of the National Treasury Employees Union, a union representing 150,000 federal workers, including inspectors, said that pressure to speed trade means "something's got to give." What usually gives, she said, is thorough inspection work.

"The balance of trade and security became a battle that we really lost to trade years ago," said Joseph King, a professor and terrorism expert at John Jay College of Criminal Justice in New York who worked for U.S. Customs for 37 years. "Customs has become an honor system where the industry controls it, and periodically

0641

the government comes in and monitors."

And yet, ask Moroun -- whose company gets a reported $60 million annually in bridge revenue and spent $645,000 on lobbying and consulting over the past nine years -- about inspectors and he says, "They're very independent."

On the other side of the river, Marie-Claire Coupal, a Canadian customs inspector and local union leader, said she doesn't feel very independent lately. Of Moroun, she says, "He calls the shots around here."

The bridge company's Stamper responds that his firm has a duty to keep trade moving. And he notes that a recent study rated the Ambassador's travel times "clearly superior" to six other crossings.

Sept. 11, Stamper said, was a wake-up call for him, too. After the attacks, heightened security led to 14-hour bridge delays. Choking the economy was, after all, a major goal of the terrorists, he said.

So the main threat Stamper sees is not a dirty bomb, or suicide bombers. "Our biggest threat is our own government's reaction to the border."

*Contact **TAMARA AUDI** at 313-222-6582 or audi@freepress.com.*

http://www.freep.com/apps/pbcs.dll/article?AID=2006603290449&template=printart

0642

Bridge OKs risky cargo
Letter of permission given to chemical company

Doug Schmidt
Windsor Star

Wednesday, April 12, 2006

The Ambassador Bridge is telling its toll collectors to wave through trucks carrying hazardous cargo in violation of a U.S. ban, according to a document obtained by The Star.

A copy of a permission letter, signed Dec. 6 by Detroit International Bridge Company general manager Dave Jolly, advises bridge employees that trucks carrying a corrosive material for General Chemical Corp. were free to cross the international link seven days per week.

The letter informs the bridge's toll collectors that "the bearer of this letter ... has permission to transport the commodity 'Alum' across The Ambassador Bridge."

'MILD' CORROSIVE

The letter advises bridge employees that "this is a 'mild' corrosive and the truck will be placarded as such." Jolly's letter states passage is permitted seven days per week until March 1, 2006, "when an updated letter must be obtained."

Bridge spokesman Skip McMahon claimed last week he was unaware of any such shipments.

But a representative of another firm, Harold Marcus Ltd., a Bothwell-based transportation company, said it uses the crossing almost daily to import alum. The representative said the company did so with the bridge's blessing and said other companies are also granted permission to haul hazardous cargo across the bridge.

Windsor West MP Brian Masse is calling on federal Public Safety Minister Stockwell Day to investigate the reports that restricted hazardous materials are being permitted to cross the privately owned span.

"Should an accident occur it will have grave consequences to people, the environment, and trade. It is without doubt the status quo is completely unacceptable," Masse wrote in a letter demanding Ottawa investigate "this urgent matter."

Messages left Monday and Tuesday with spokesmen for the bridge were not returned. Likewise, Day's office did not respond to requests for comment.

Masse said Tuesday he spoke with Day in the House of Commons on Monday and that the minister said he would look into the matter.

The driver of a Harold Marcus tanker truckload of alum delivered Tuesday to Windsor's Lou Romano Water Reclamation Plant wouldn't say how he crossed the border. As part of a $1-million 2006 city contract with the Cambridge-based Kissner Group, such loads are sourced in the U.S.

Kit Woods, the city's environmental services executive director, said last week he would investigate how those loads to two sewage treatment plants are being delivered. The approved area border crossings for hazardous materials are the Windsor-Detroit truck barge or Sarnia's Blue Water Bridge.

"The plant manager here got in touch with the (Kissner) sales rep and reminded him we expect them to comply with all appropriate legislation. They said they understood -- we left it at that," Woods said Tuesday.

General Chemical had the city contract to supply alum in 2005.

Masse said he's heard from truckers who simply remove their hazardous materials placards in order to cross the Ambassador, which is quicker and cheaper than the truck barge or Blue Water Bridge. In the past, the owners of the bridge have argued they can determine what should or shouldn't cross over their private property.

"It's pretty scary stuff. Some trucks can sneak by, and there's nothing Customs can do -- we can't enforce that law," said Marie-Claire Coupal, Windsor branch president for the Customs Excise Union.

Hazardous goods shipments on local roads are the responsibility of the Ontario Ministry of Transportation (MTO), but deciding what's allowed onto the bridge from the Canadian side is left to the bridge's owners.

"Although it is not an offence to transport dangerous goods across the bridge, the bridge authority prohibits access to trucks carrying hazardous material," MTO spokeswoman Emna Dhahak stated in an e-mailed response to questions by The Star.

Masse said it's "complete hypocrisy" for Canada not to have the same safety regulations in place as the American authorities have on their side of the Ambassador. Allowing the bridge company to issue special permission to some carriers of hazardous materials "shows how lax we are ... it's why I'm asking for a full investigation."

An interim report issued last summer in Ottawa by the Senate Security and Defence Committee sounded an ominous warning of how fragile the most important commercial border link is between Canada and the U.S.

"If somebody really wanted to tear into Canada's political and economic future and wound the Americans at the same time, an optimal target might well be the Ambassador Bridge in Windsor," stated the report, entitled Borderline Insecure.

The senators said that disabling that cross-border link between Windsor and Detroit "would have a devastating and long-lasting effect on Canada's economy."

BANNED GOODS

Corrosives, explosives, flammables and radioactive goods are all banned from the Ambassador Bridge under the U.S. federal government's national hazardous materials route registry. Alum, or aluminum sulfate, is a corrosive which can form sulfuric acid when mixed with water.

Michigan state police are generally banned from bridge property but enforce the rules on Detroit access streets.

Ran with fact box "Banned Goods" which has been appended tothe story.

[redacted]

Dear Commander (dpb), United States Coast Guard, May19, 2007

I would like to express my opposition to the proposed building a second span parallel to the current Ambassador bridge by a private company. I have concerns about the national security of such a proposal as well as a private company continuing to operate one of the most important border crossings in North America if not the world. At a minimum, a competitive bidding process should be enacted with public input on the proposed designs. As it stands, the current owners monopolize the crossings in Detroit and Windsor. An independent, bi-national commissioned study concluded with recommendations that should be respected and followed, but differ greatly from the proposed private plan.

Starting in 2002, the joint governments of Ontario, Michigan, Canada, and the United States commissioned this bi-national study to determine the best way to handle the increased traffic flow. Significant tax dollars have been spent ($4.5M) to protect the best interests of all of the citizens of the US and Canada. The administration's suggestion was to construct a separate bridge crossing south and west of the current structure, outside the downtown districts of both Windsor and Detroit.

Public Responses
to
Draft EA
thru July 18, 2007

July 10, 2007

Commander
Ninth Coast Guard District
1240 E. 9th Street, Room 2025
Cleveland, Ohio 44199-2060

Dear Sir:

The Southeast Michigan Council of Governments (SEMCOG) has reviewed the Environmental Assessment prepared for the proposed Enhancement Project at the Ambassador Bridge in Detroit, Michigan.

The proposed Ambassador Bridge Enhancement Project is a regionally significant project. The border crossing is vital piece of the regional transportation system and represents an important international link to Canada. Because it is regionally significant, the proposed project is also being considered for inclusion in the adopted *2030 Regional Transportation Plan for Southeast Michigan* (RTP).

After reviewing the Environmental Assessment, we have the following general comments with additional specific comments after.

1. It is stated several times in the Environmental Assessment that no modification to the Ambassador Bridge Gateway Project on the U.S. side or the Windsor Plaza Expansion Project on the Canadian side are necessary to accommodate the second span. Some confirmation of this conclusion from the Michigan Department of Transportation (MDOT) and Ontario Transport Ministry should be provided in the document.
2. The U.S. Coast Guard is the lead federal agency for the U.S. environmental clearance process. However, there are numerous other federal and state agencies that will affect and be affected by the proposed project. Most notably, there appears to be very little coordination occurring with Homeland Security, Customs and Border Protection, Federal Highway Administration, and MDOT. The argument is made in the Environmental Assessment that the proposed project is necessary for security reasons, but there is no documentation of an analysis of security conditions/requirements or any possible impacts (either positive or negative) on the relative impact of this border crossing.
3. The document states that the selection of a preferred alternative must consider both US and Canadian impacts, yet the Canadian impacts are not quantified in this document. This appears to suggest that the environmental assessment is incomplete and premature in that a preferred alternative is identified in the document.

Specific comments on the Environmental Assessment document are as follows.

- Section 1.3, Proposed Enhancements, page 7 refers to the Ambassador Bridge Enhancement Project as the "Project," while Section 1.4.1 Gateway - DOT and DIBC/CTC, page 8 refers to the Ambassador Bridge Gateway Project as the "Project." This is confusing and should be clarified.
- Section 2.1.3, Construction Plan, page 13, 1st paragraph — Protection of the aquatic environment during construction is discussed. Are there also potential disruptions to shipping/bridge traffic or community impacts during construction?
- Section 2.1.6, Cost and Scheduling, page 13 — A breakdown of costs by phase and timeframe is necessary. It is stated that design has begun and will take 24 months to complete, with construction taking another 36 months. When did design begin and when is construction expected to begin and end? Why has design begun before the Environmental Assessment is finalized?
- Section 2.2, No-Build Alternative
  - Page 15, fourth paragraph — It is stated that traffic backups due to incidents on the bridge will continue to grow. The document should include data that support this statement. Are statistics on vehicle flow, incidents, and the frequency and duration of related congestion available? Was any projection of future traffic volumes and crashes conducted? This information should also be included in the final document.
  - Page 15, fifth paragraph — It is stated that under the No-Build alternative, private funding cannot be leveraged thereby eliminating the opportunity to divert public funds to other projects. Are public funds currently being used in any capacity for the Ambassador Bridge? This should be clarified in the final document.
  - Page 16, second paragraph — It is stated that the No-Build alternative did not rank high among the array of alternatives studied and did not meet the needs of the study. What are these other alternatives? Is there any analysis/ranking of the results for all the alternatives? The final document should clarify the alternatives considered and the ranking of the alternatives that were considered.
- Section 2.3, Corridors under Consideration, page 16, second paragraph — It is stated that the DRIC study is designed to investigate alternatives for additional capacity and there is no need to do that simply to replace existing lanes. Section 1.1.2, Support for the Project, page 3, fourth paragraph states that the Chambers of Commerce in the U.S. and Canada recognize that additional capacity is needed to meet trade demands. This calls into question whether or not the enhancement project is supported by the U.S. and Canada Chambers of Commerce, given that the documents states that this project will not increase capacity.
- Section 2.5, Basis for Choice, page 22 — It is not entirely clear what alternatives were considered using what criteria. The description of the alternative comparisons is inconsistent with the figures, e.g., the text refers to Figure 2-4 while discussing the 6-lane and 3-lane alternatives, but Figure 2-4 actually compares the suspension/cable-

stayed/tunnel alternatives. There is no definition of the ranking criteria or how/when the data were collected and analyzed (e.g., there is no reference to life cycle costs except in Figure 2-3). There is no quantification at all for the No-Build and corridor alternatives. The final document should address these issues.

- Section 2.6, Benefits of Preferred Alternative, page 26, last bullet — The assessment indicates that there will be no increase in traffic volumes associated with the implementation of this proposed project. Was a traffic study conducted? The final report should include documentation of this position.
- Section 3.0, Affected Environment and Expected Impacts, page 35 — A project of this size should not only take steps to protect the environment but also improve the environment where possible.
- Section 3.1.1, Neighborhood Setting, page 36 — Would the project lead to additional condemnations and demolitions within the surrounding neighborhoods? Could the project contribute to loss of character of the neighborhood or trigger a decline in the quality of life of the area? These types of impacts should be addressed in the final document.
- Section 3.1.3, Local and Regional Economy, page 38 — It is stated that there are no negative impacts associated with this proposed project. However, the potential positive impacts are referenced elsewhere but never quantified. The final document should quantify these benefits.
- Section 3.1.5, Environmental Justice Concerns
  - Page 39, Setting — Native Americans are identified as one of the specific racial/ethnic populations covered under Environmental Justice regulations. The final document should reference all of the protected populations, not just Native Americans. It is stated that if a particular group is overly represented in an area, as compared to the rest of the population within the region, then the level of impact is considered to be disproportionate. This is not consistent with current procedures to identify a disproportionate impact. A comparison between the study area and the rest of the region is used to determine if there are significant proportions of EJ communities in the area. A conclusion of disproportionate impacts can only be made once the impacts are quantified.
  - Page 40, Minority Population — There are additional racial/ethnic populations that need to be considered beyond Black and Hispanic.
  - Page 40, Impacts — Why is St. Anne's Church specifically referenced here?
- Section 3.2.1, Land Use, page 40 — There is a lot of discussion of historical land use here. The final document should identify future plans and consistency of the proposed project with those future plans.
- Section 3.2.2, Utilities, page 42 — It is stated that if conflicts are found, utilities will be relocated. The final document should identify how utilities will be relocated and at whose expense.

- Section 3.2.4, Traffic & Circulation, page 42 — It is stated that the two new FAST lanes do not represent additional capacity because they will be reserved for pre-approved trucks. Removing those trucks from the four general-purpose lanes will increase traffic flow (an argument made for the proposed project) and allow more vehicles to traverse the bridge in the same amount of time, increasing its capacity. It is our opinion that the proposed project does increase capacity over the existing crossing. The final report should include the traffic analysis that was used for the above referenced statement to be made.
- Section 3.4, Visual Quality & Aesthetics, Other Considerations, page 49 — There is no reference in this section to the current span being on the National Register of Historic Places. The final document should provide the specific reference so the discussion of the Secretary of the Interior's Standards can be reviewed within the context of the reference.
- Section 3.5, Cultural & Archeological Resources, page 51 — The text should address what would happen if archeological remains are encountered during construction. Are the Phase 1B investigations complete? If so, what are the findings? Why are archeological impacts addressed twice? The final document should answer these questions.
- Section 3.6.5, Natural Landmarks, page 58 — Why is Haven Hill State Natural Area defined as being within the vicinity of the project if it's 45 miles away? This landmark is outside the study area as identified in Figure 3-1.
- Section 3.7.3, Water Quality, page 60 — Stormwater mitigation is discussed here, then followed by a separate stormwater section. Are any RAP permits/coordination required? Section 3.7.3 states the project will not discharge to the Detroit River so no water quality certification is required; but Section 3.7.4 states that there will be an impact to stormwater flow. Section 3.7.4 states that it is anticipated that the stormwater pump station/collection system designed for the project will accommodate runoff (page 63), but Section 3.7.3 states the favorable option is to tie into the existing stormwater/drainage facilities (page 61).
- Section 3.7.4, Stormwater, page 62 — Are there opportunities for onsite detention or retention stormwater ponds that could incorporated into an onsite landscaping plan to reduce impervious surfaces?
- Section 3.8, Aquatic Ecology, page 65 — The fourth paragraph states that the Detroit River has one of the highest diversities of fish and is a major fish corridor; the fifth paragraph states there are no essential fish habitats. The Detroit River is recognized as an ecosystem having one of the highest diversities of wildlife and fish and this apparent conflict should be addressed in the final document. In order to improve the river's shoreline as habitat for fish and wildlife, softshore engineering practices are being implemented at various locations. Opportunities for softshore engineering projects in the vicinity of the project area should be considered. They would be beneficial to the area's residents as well as fish and wildlife.

- Section 3.10, Air Quality, page 74
  - The Environmental assessment should look at the entire project, not just the portion in U.S. territory. It is meaningless to only include the portion of the bridge that is on the U.S. side of the border. Air emissions do not stop at the border.
  - Using the percentage of total Wayne County emissions that the project is expected to generate as the determinant of the air quality significance of a project is not meaningful. No single project is going to contribute a high percentage of total county emissions. More importantly, this has nothing to do with how an area's attainment status is determined. If a project will increase emissions to a level that will cause a new violation at any given monitor in the seven-county nonattainment area, or increase the number or severity of existing violations, it will significantly affect the attainment status of the region. This is because all monitors in a nonattainment area must meet the national standard in order for the region to come into attainment. See Section 176(c)(1) of the U.S. Clean Air Act Amendment of 1990 for more information on what constitutes a significant impact.
  - In order to fully understand the potential environmental impact of the proposed project, the Environmental Assessment should include an analysis of a maximum capacity scenario. This would assume 10 lanes of traffic (both new and current bridges in operation) as well as the maximum number of customs booths provided for in the Ambassador Bridge Gateway Project and the Windsor Plaza Expansion Project. SEMCOG's regional air quality conformity analysis will be conducted using this maximum capacity scenario.
  - The analysis should include the impact of idling emissions due to queuing at the toll plazas. While Mobile6 does not directly generate idling emission factors, the accepted practice is to multiply the grams/mile emission factor generated for a speed of 2.5 mph by 2.5. This yields a grams/hour idling emissions factor that can then be applied to minutes of idling delay. Emissions from truck delay should be computed separately from passenger car delay as the former is likely to be significantly higher.
  - While the predominant wind direction may be from the southwest, the wind does blow from other directions as well. Thus, the potential for the project to impact areas other than those to the northeast should be considered.
  - The Mobile6 inputs for the Environmental Assessment used national default data for a number of parameters. Local data are available for a number of these. Use of these local data would provide more accurate emissions projections.
    - In particular, the distribution of VMT by vehicle class ought to be drawn from bridge traffic count data because the proportion of bridge VMT that is attributable to trucks is significantly higher than the national average. The national average is approximately 10 percent while the average for the Ambassador Bridge is around 30 percent. This difference would have a significant impact on the amount of NOx and particulate emissions.

- SEMCOG also uses localized data for other Mobile6 inputs, including fuel parameters and age distribution of light-duty vehicles. Use of these data in the Environmental Assessment air quality analysis would provide more accurate emissions estimates.

- Section 3.12, Hazardous Waste & Brownfield Sites, page 78 — How many state or federally listed contaminated sites are located within the project area? How many sites could potentially discharge contaminated sediment to the Detroit River or the DWSD sewer system during wet weather events if the soil is disturbed by the construction activities? These determinations should be included in the final document.

- Section 3.13.3, Potential Impacts in Canada from the Enhancement Project
  - Page 82, Air Quality — It is stated there are no unacceptable emissions levels based on current traffic volumes. The analysis should be expanded to include future volumes.
  - Page 84, Land Use — When will the impacts to the land use plan/zoning be assessed? When will impacts to the parks be assessed?
  - Page 84, Traffic — It is stated that the new span should result in reduced delay. The document being developed in Canada should document this statement.

- Section 5.0, Required Authorizations, page 98 — The project needs to be in the 2030 RTP because it is a regionally significant project.

- General Comment — References to appendices need to be corrected.

We want to thank you for the opportunity to review and provide comments on this Environmental Assessment. We look forward to working with the Coast Guard and representatives of the Ambassador Bridge as the region continues to address the needs for additional border crossings as identified in the adopted 2030 RTP. If you have any questions or require additional information, please contact me or Mr. Carmine Palombo, Director, Transportation Programs.

Sincerely,

[redacted]

Executive Director
SEMCOG

PT:je

[redacted]

From: [redacted]
Sent: Wednesday, July 18, 2007 10:13 AM
To: [redacted]
Subject: FW: DIBC Proposed Twin Bridge Project

Attachments: Laurene Baldwin.vcf; DIBC letter to Coast Guard District.doc

Laurene Baldwin.vcf (689 B) DIBC letter to Coast Guard Dis...

-----Original Message-----
Fro[redacted]
Sent: Wednesday, July 18, 2007 9:46 AM
To[redacted]
Subject: DIBC Proposed Twin Bridge Project

Commander[redacted]

Please find attached letter from Greater Corktown Development Corporation pertaining the DIBC Proposed Twin Bridge Project. We can be reached a[redacted] f you require any additional information or by email a [redacted] Thank your for your time.

[redacted]
Administrative Assistant
[redacted]

0559

GREATER CORKTOWN
DEVELOPMENT CORPORATION
[redacted]
Phone: [redacted]

July 16, 2007

[redacted] Commander
Ninth Coast Guard District
1240 East 9th Street
Cleveland, Ohio 44199-2060

Dear [redacted]

My name is [redacted] work for the Greater Corktown Development Corporation as their Executive Director. I live and work in Detroit, Michigan in a neighborhood known as Corktown. Corktown is Detroit's oldest neighborhood. Corktown is named for the Irish who came from Cork Ireland and settled here in the 1830's. My community is located just west of Downtown Detroit and east of the Ambassador Bridge. Corktown is home to 6,000 residents and is adjoining the Mexicantown district which is located next to the Ambassador Bridge entrance to Canada. I have lived in Corktown for 26 years.

The Ambassador Bridge has long been an icon for Corktown. "The Bridge" is visible from every part of Corktown. For over seven decades Corktown has lived with the view, the noise, the diesel fumes/pollution and the traffic, day and night, and every day of every year.

The DBIC has not engaged the community in its effort regarding the proposed new twin bridge, certainly not Corktown. The Bridge Co. has not communicated to our community in a meaningful a way. Their communication has been outside of the community groups. This process for approval even consideration has been removed from our community. A lack of public meetings and a short comment period has put our community in a disadvantaged position. We have not been allowed to fully comment on the problems that we have about this project.

The DIBC and the Trucking industry located in the area, share the same ownership and some personnel. The tactics and methods used by these companies in conducting business display an alarming lack of concern for the impact of their business on the citizens in this area.

I have serious concern that the lack of real information from the DIBC to the public has not fostered any participation by the very people who will have to live with the affects of the twin expansion. Many residents have said they feel hopeless that the Bridge Co. is somehow allowed to do what they wish! The DIBC is also ignoring the wishes of the City of Windsor and the Government of Ontario, Canada. Windsor and the Government of Ontario have stated that they do not want a new bridge built next to the existing Ambassador Bridge. Canada shares our concerns. This arrogance feeds the fear of our citizens. Yet the DIBC continues to pursue their plans as if nothing else matters. How can a company/business, engaged in international port of entry, expand without due process?

We agree that the Coast Guard should have more information in order to make a decision. Studies and reviews for this project have been minimal at best. The DIBC has not been up front with how this project will be funded and the DIBC recently failed at an attempt to access funds from the Michigan Strategic Fund. The Bridge is not a new business and it certainly is not going to move away.

The twin bridge will definitely impact Corktown in a negative way. Corktown has been struggling with the expansion of the truck traffic on the existing bridge. The trucking industry that is located around our area has expanded due to recent trade agreements. Also, a truck driving school has been located in our area, adding even more trucks onto our streets. The increase truck traffic on our streets is a very real threat to our quality of life.

The vacant Michigan Central Railroad Station, located in the Corktown and Mexicantown communities is also owned by the DIBC. The crumbling ruin of the Michigan Central can be seen from the Ambassador Bridge and for many miles around the City of Detroit. The DIBC has not made any attempt to clean up the area around the Station. Yet our communities are building new houses and cleaning up our streets all around the station. Some of our Residents received fines for weeds in the alleys behind their houses, yet the mess at the Michigan Central continues to be an eyesore. The DIBC seems to be above the law. How? Why? The Michigan Central Station has become a symbol of destruction of our City. Yet our communities surrounding the Station are rebuilding.

The DIBC has consistently displayed a high disregard for the citizens in Corktown, Mexicantown, the City of Detroit and Michigan. I realize the DIBC and related trucking industry creates jobs and taxes, but at what expense? There is a real lack of trust operating here. I fear that there may be national security issues with an international port of entry in the hands of a company such as the DIBC. What kind of business decisions are being made that could affect our national security? We will never know because it is a private company.

It is very difficult for me to support anything that the DIBC proposes. The residents of Corktown live in a delicate balance; between quality of life issues for thousands of residents and a major trucking/bridge industry owned by one man; a man who has shown only contempt for our community.

Sincerely,

[redacted]

Executive Director

SEMCOG . . . *Local Governments Advancing Southeast Michigan*

Southeast Michigan Council of Governments • 535 Griswold Street, Suite 300 • Detroit, Michigan 48226-3602 • 313-961-4266 • Fax 313-961-4869
www.semcog.org

July 10, 2007

Commander
Ninth Coast Guard District
1240 E. 9th Street, Room 2025
Cleveland, Ohio 44199-2060

Dear Sir:

The Southeast Michigan Council of Governments (SEMCOG) has reviewed the Environmental Assessment prepared for the proposed Enhancement Project at the Ambassador Bridge in Detroit, Michigan.

The proposed Ambassador Bridge Enhancement Project is a regionally significant project. The border crossing is vital piece of the regional transportation system and represents an important international link to Canada. Because it is regionally significant, the proposed project is also being considered for inclusion in the adopted *2030 Regional Transportation Plan for Southeast Michigan* (RTP).

After reviewing the Environmental Assessment, we have the following general comments with additional specific comments after.

1. It is stated several times in the Environmental Assessment that no modification to the Ambassador Bridge Gateway Project on the U.S. side or the Windsor Plaza Expansion Project on the Canadian side are necessary to accommodate the second span. Some confirmation of this conclusion from the Michigan Department of Transportation (MDOT) and Ontario Transport Ministry should be provided in the document.
2. The U.S. Coast Guard is the lead federal agency for the U.S. environmental clearance process. However, there are numerous other federal and state agencies that will affect and be affected by the proposed project. Most notably, there appears to be very little coordination occurring with Homeland Security, Customs and Border Protection, Federal Highway Administration, and MDOT. The argument is made in the Environmental Assessment that the proposed project is necessary for security reasons, but there is no documentation of an analysis of security conditions/requirements or any possible impacts (either positive or negative) on the relative impact of this border crossing.
3. The document states that the selection of a preferred alternative must consider both US and Canadian impacts, yet the Canadian impacts are not quantified in this document. This appears to suggest that the environmental assessment is incomplete and premature in that a preferred alternative is identified in the document.

0562

Specific comments on the Environmental Assessment document are as follows.

- Section 1.3, Proposed Enhancements, page 7 refers to the Ambassador Bridge Enhancement Project as the "Project," while Section 1.4.1 Gateway - DOT and DIBC/CTC, page 8 refers to the Ambassador Bridge Gateway Project as the "Project." This is confusing and should be clarified.
- Section 2.1.3, Construction Plan, page 13, 1st paragraph — Protection of the aquatic environment during construction is discussed. Are there also potential disruptions to shipping/bridge traffic or community impacts during construction?
- Section 2.1.6, Cost and Scheduling, page 13 — A breakdown of costs by phase and timeframe is necessary. It is stated that design has begun and will take 24 months to complete, with construction taking another 36 months. When did design begin and when is construction expected to begin and end? Why has design begun before the Environmental Assessment is finalized?
- Section 2.2, No-Build Alternative
  - Page 15, fourth paragraph — It is stated that traffic backups due to incidents on the bridge will continue to grow. The document should include data that support this statement. Are statistics on vehicle flow, incidents, and the frequency and duration of related congestion available? Was any projection of future traffic volumes and crashes conducted? This information should also be included in the final document.
  - Page 15, fifth paragraph — It is stated that under the No-Build alternative, private funding cannot be leveraged thereby eliminating the opportunity to divert public funds to other projects. Are public funds currently being used in any capacity for the Ambassador Bridge? This should be clarified in the final document.
  - Page 16, second paragraph — It is stated that the No-Build alternative did not rank high among the array of alternatives studied and did not meet the needs of the study. What are these other alternatives? Is there any analysis/ranking of the results for all the alternatives? The final document should clarify the alternatives considered and the ranking of the alternatives that were considered.
- Section 2.3, Corridors under Consideration, page 16, second paragraph — It is stated that the DRIC study is designed to investigate alternatives for additional capacity and there is no need to do that simply to replace existing lanes. Section 1.1.2, Support for the Project, page 3, fourth paragraph states that the Chambers of Commerce in the U.S. and Canada recognize that additional capacity is needed to meet trade demands. This calls into question whether or not the enhancement project is supported by the U.S. and Canada Chambers of Commerce, given that the documents states that this project will not increase capacity.
- Section 2.5, Basis for Choice, page 22 — It is not entirely clear what alternatives were considered using what criteria. The description of the alternative comparisons is inconsistent with the figures, e.g., the text refers to Figure 2-4 while discussing the 6-lane and 3-lane alternatives, but Figure 2-4 actually compares the suspension/cable-

stayed/tunnel alternatives. There is no definition of the ranking criteria or how/when the data were collected and analyzed (e.g., there is no reference to life cycle costs except in Figure 2-3). There is no quantification at all for the No-Build and corridor alternatives. The final document should address these issues.

- Section 2.6, Benefits of Preferred Alternative, page 26, last bullet — The assessment indicates that there will be no increase in traffic volumes associated with the implementation of this proposed project. Was a traffic study conducted? The final report should include documentation of this position.
- Section 3.0, Affected Environment and Expected Impacts, page 35 — A project of this size should not only take steps to protect the environment but also improve the environment where possible.
- Section 3.1.1, Neighborhood Setting, page 36 — Would the project lead to additional condemnations and demolitions within the surrounding neighborhoods? Could the project contribute to loss of character of the neighborhood or trigger a decline in the quality of life of the area? These types of impacts should be addressed in the final document.
- Section 3.1.3, Local and Regional Economy, page 38 — It is stated that there are no negative impacts associated with this proposed project. However, the potential positive impacts are referenced elsewhere but never quantified. The final document should quantify these benefits.
- Section 3.1.5, Environmental Justice Concerns
  - Page 39, Setting — Native Americans are identified as one of the specific racial/ethnic populations covered under Environmental Justice regulations. The final document should reference all of the protected populations, not just Native Americans. It is stated that if a particular group is overly represented in an area, as compared to the rest of the population within the region, then the level of impact is considered to be disproportionate. This is not consistent with current procedures to identify a disproportionate impact. A comparison between the study area and the rest of the region is used to determine if there are significant proportions of EJ communities in the area. A conclusion of disproportionate impacts can only be made once the impacts are quantified.
  - Page 40, Minority Population — There are additional racial/ethnic populations that need to be considered beyond Black and Hispanic.
  - Page 40, Impacts — Why is St. Anne's Church specifically referenced here?
- Section 3.2.1, Land Use, page 40 — There is a lot of discussion of historical land use here. The final document should identify future plans and consistency of the proposed project with those future plans.
- Section 3.2.2, Utilities, page 42 — It is stated that if conflicts are found, utilities will be relocated. The final document should identify how utilities will be relocated and at whose expense.

- Section 3.2.4, Traffic & Circulation, page 42 — It is stated that the two new FAST lanes do not represent additional capacity because they will be reserved for pre-approved trucks. Removing those trucks from the four general-purpose lanes will increase traffic flow (an argument made for the proposed project) and allow more vehicles to traverse the bridge in the same amount of time, increasing its capacity. It is our opinion that the proposed project does increase capacity over the existing crossing. The final report should include the traffic analysis that was used for the above referenced statement to be made.
- Section 3.4, Visual Quality & Aesthetics, Other Considerations, page 49 — There is no reference in this section to the current span being on the National Register of Historic Places. The final document should provide the specific reference so the discussion of the Secretary of the Interior's Standards can be reviewed within the context of the reference.
- Section 3.5, Cultural & Archeological Resources, page 51 — The text should address what would happen if archeological remains are encountered during construction. Are the Phase 1B investigations complete? If so, what are the findings? Why are archeological impacts addressed twice? The final document should answer these questions.
- Section 3.6.5, Natural Landmarks, page 58 — Why is Haven Hill State Natural Area defined as being within the vicinity of the project if it's 45 miles away? This landmark is outside the study area as identified in Figure 3-1.
- Section 3.7.3, Water Quality, page 60 — Stormwater mitigation is discussed here, then followed by a separate stormwater section. Are any RAP permits/coordination required? Section 3.7.3 states the project will not discharge to the Detroit River so no water quality certification is required; but Section 3.7.4 states that there will be an impact to stormwater flow. Section 3.7.4 states that it is anticipated that the stormwater pump station/collection system designed for the project will accommodate runoff (page 63), but Section 3.7.3 states the favorable option is to tie into the existing stormwater/drainage facilities (page 61).
- Section 3.7.4, Stormwater, page 62 — Are there opportunities for onsite detention or retention stormwater ponds that could incorporated into an onsite landscaping plan to reduce impervious surfaces?
- Section 3.8, Aquatic Ecology, page 65 — The fourth paragraph states that the Detroit River has one of the highest diversities of fish and is a major fish corridor; the fifth paragraph states there are no essential fish habitats. The Detroit River is recognized as an ecosystem having one of the highest diversities of wildlife and fish and this apparent conflict should be addressed in the final document. In order to improve the river's shoreline as habitat for fish and wildlife, softshore engineering practices are being implemented at various locations. Opportunities for softshore engineering projects in the vicinity of the project area should be considered. They would be beneficial to the area's residents as well as fish and wildlife.

- Section 3.10, Air Quality, page 74
  - The Environmental assessment should look at the entire project, not just the portion in U.S. territory. It is meaningless to only include the portion of the bridge that is on the U.S. side of the border. Air emissions do not stop at the border.
  - Using the percentage of total Wayne County emissions that the project is expected to generate as the determinant of the air quality significance of a project is not meaningful. No single project is going to contribute a high percentage of total county emissions. More importantly, this has nothing to do with how an area's attainment status is determined. If a project will increase emissions to a level that will cause a new violation at any given monitor in the seven-county nonattainment area, or increase the number or severity of existing violations, it will significantly affect the attainment status of the region. This is because all monitors in a nonattainment area must meet the national standard in order for the region to come into attainment. See Section 176(c)(1) of the U.S. Clean Air Act Amendment of 1990 for more information on what constitutes a significant impact.
  - In order to fully understand the potential environmental impact of the proposed project, the Environmental Assessment should include an analysis of a maximum capacity scenario. This would assume 10 lanes of traffic (both new and current bridges in operation) as well as the maximum number of customs booths provided for in the Ambassador Bridge Gateway Project and the Windsor Plaza Expansion Project. SEMCOG's regional air quality conformity analysis will be conducted using this maximum capacity scenario.
  - The analysis should include the impact of idling emissions due to queuing at the toll plazas. While Mobile6 does not directly generate idling emission factors, the accepted practice is to multiply the grams/mile emission factor generated for a speed of 2.5 mph by 2.5. This yields a grams/hour idling emissions factor that can then be applied to minutes of idling delay. Emissions from truck delay should be computed separately from passenger car delay as the former is likely to be significantly higher.
  - While the predominant wind direction may be from the southwest, the wind does blow from other directions as well. Thus, the potential for the project to impact areas other than those to the northeast should be considered.
  - The Mobile6 inputs for the Environmental Assessment used national default data for a number of parameters. Local data are available for a number of these. Use of these local data would provide more accurate emissions projections.
    - In particular, the distribution of VMT by vehicle class ought to be drawn from bridge traffic count data because the proportion of bridge VMT that is attributable to trucks is significantly higher than the national average. The national average is approximately 10 percent while the average for the Ambassador Bridge is around 30 percent. This difference would have a significant impact on the amount of NOx and particulate emissions.

  - SEMCOG also uses localized data for other Mobile6 inputs, including fuel parameters and age distribution of light-duty vehicles. Use of these data in the Environmental Assessment air quality analysis would provide more accurate emissions estimates.

- Section 3.12, Hazardous Waste & Brownfield Sites, page 78 — How many state or federally listed contaminated sites are located within the project area? How many sites could potentially discharge contaminated sediment to the Detroit River or the DWSD sewer system during wet weather events if the soil is disturbed by the construction activities? These determinations should be included in the final document.

- Section 3.13.3, Potential Impacts in Canada from the Enhancement Project
  - Page 82, Air Quality — It is stated there are no unacceptable emissions levels based on current traffic volumes. The analysis should be expanded to include future volumes.
  - Page 84, Land Use — When will the impacts to the land use plan/zoning be assessed? When will impacts to the parks be assessed?
  - Page 84, Traffic — It is stated that the new span should result in reduced delay. The document being developed in Canada should document this statement.

- Section 5.0, Required Authorizations, page 98 — The project needs to be in the 2030 RTP because it is a regionally significant project.

- General Comment — References to appendices need to be corrected.

We want to thank you for the opportunity to review and provide comments on this Environmental Assessment. We look forward to working with the Coast Guard and representatives of the Ambassador Bridge as the region continues to address the needs for additional border crossings as identified in the adopted 2030 RTP. If you have any questions or require additional information, please contact me or Mr. Carmine Palombo, Director, Transportation Programs.

Sincerely,

Executive Director
SEMCOG

PT:je

RAYMOND E. BASHAM
8TH DISTRICT
P.O. BOX 30036
LANSING, MICHIGAN 48909-7536
PHONE: (517) 373-7800
FAX: (517) 373-9310
senrbasham@senate.michigan.gov

THE SENATE
STATE OF MICHIGAN

SENATE STANDING COMMITTEES:
NATURAL RESOURCES AND ENVIRONMENTAL AFFAIRS, MINORITY VICE CHAIR
TRANSPORTATION, MINORITY VICE CHAIR
LOCAL, URBAN AND STATE AFFAIRS
SENIOR CITIZENS AND VETERANS AFFAIRS

May 15, 2007

Admiral John E. Crowley, Jr.
Ninth Coast Guard District
1240 East 9th Street – Room 2023
Cleveland, OH 44199-2060

Dear Commander Crowley:

I am writing to express my serious concerns about the Detroit International Bridge Company's proposed twin spanning of the Ambassador Bridge. Knowing of U.S. Coast Guard's obligation to consider both the environmental and socioeconomic impact of this project, I respectfully request the denial of the Company's pending application for permit.

As you should know well, there is significant opposition to this new span, which would continue as a privately-owned international crossing. Complaints about the company's all too common disregard for bridge's impact on neighboring communities, for compliance with local regulations, and for the protection of the public's interest would likely worsen under such a proposal. Furthermore, by twinning the existing Ambassador Bridge this new crossing fails to address homeland security issues and possibly only makes them a greater concern.

According to the information I have received the U.S. Coast Guard is expected to issue a decision on the permit sometime this summer. As part of the permit process, a Coast Guard sponsored public hearing was previously held. Unfortunately the public notice given for the hearing was questionable as was the manner in which it was conducted. I would, therefore, argue that at the very least, an additional, more appropriately publicized hearing should be scheduled.

Thank you in advance for your consideration. I look forward to your response.

Sincerely,

Ray Basham

RAYMOND E. BASHAM
State Senator
8th District

RECEIVED
MAY
DCS

0568

Recycled Paper

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpb)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6085
FAX: (216) 902-6088

16590
B-054/rwb

JUL 0 5 2007

The Honorable Raymond E. Basham
Michigan Senate
8th District
P.O. Box 30036
Lansing, Michigan 48909-7536

Dear Mr. Basham:

I am writing in response to your letter of May 15, 2007 concerning the Detroit International Bridge Company's proposal to construct a second bridge adjacent to the existing Ambassador Bridge, Detroit, Michigan. I sincerely appreciate your concern and the comments you have provided concerning the proposed project.

The Coast Guard is the lead federal agency for issuance of the federal bridge permit and the permit process is published in 33 CFR 114-115. As you have mentioned, the Coast Guard will not issue a permit unless the proposed project meets the navigational, safety and waterway management requirements in the regulations and all of the environmental, historic and socio-economic impacts have been addressed in compliance with the National Environmental Policy Act (NEPA).

Public comment and input to the permitting and NEPA process is very important to the Coast Guard. Our initial notice to the public and cooperating agencies was released as Public Notice 09-03-06 on July 28, 2006 and the accompanying comment period ended on August 30, 2006. That notice provided the location and plan and elevation views of the proposed bridge and the initial determination that the proposed project would be a Categorical Exclusion under the provisions of NEPA. However, due to the issues and concerns brought to our attention during the comment period, the Coast Guard subsequently initiated a more expansive Environmental Assessment (EA) in order to address those concerns and meet our NEPA obligations.

On May 10, 2007 the Coast Guard gave notice of the availability of the draft EA through issuance of Public Notice 09-03-07. The original comment period was scheduled to close on June 1, 2007. At the request of concerned parties, we extended that comment period until July 17, 2007.

On May 24, 2007, a public meeting was held at the Amelia Earhart School in Detroit in order to receive public comments on the draft EA and to provide an opportunity for the public to provide comments to the applicant relative to the preferred design and color of the proposed bridge. This meeting in May was announced by the Coast Guard through a press release to the Detroit media and through publication in our *Ninth Coast Guard District Local Notice to Mariners.* In addition, both meetings were listed on the Ambassador Bridge internet web page at www.AmbassadorBridge.com. The meeting was attended by approximately 30 local residents.

This meeting was in addition to a public meeting hosted by the applicant, the Detroit International Bridge Company, at the same location on March 1, 2007.

We have no established time frame for the permitting decision. After completion of the NEPA process and upon receipt of all of the public input, there will be an extensive study and review performed by my bridge staff personnel and a permitting recommendation will be made. Although the Coast Guard bridge permit application is processed by my staff here in Cleveland, permits for proposed international bridge crossings are issued by our bridge administration office at Coast Guard Headquarters in Washington, D.C. However, the applicant is required to satisfy all of the local and state permitting requirements before we can forward our permitting recommendations to Headquarters for consideration.

We expect the security needs for the additional span to be met by the existing local, state and federal agencies who share this responsibility. The proposed location of the additional span right adjacent to the existing bridge is expected to minimize the need for additional resources.

If you have any remaining questions, please contact Mr. Robert Bloom of my staff at (216) 902-6085.

Sincerely,

JOHN E. CROWLEY, JR.
Rear Admiral, U.S. Coast Guard
Commander, Ninth Coast Guard District

0570

12th House District
Southwest Detroit

H-153 CAPITOL
P.O. BOX 30014
LANSING, MI 48909-7514

(517) 373-0823
1-877-STEVE-12
FAX: (517) 373-5993
stevetobocman@house.mi.gov

STEVE TOBOCMAN

MICHIGAN HOUSE OF REPRESENTATIVES
MAJORITY FLOOR LEADER

Rcvd (dpb)
10 May 2007

May 8, 2007

[redacted] Bridge Program Manager
U.S. Coast Guard
Office of Commander (dpw 3)
Ninth Coast Guard District
1240 E. Ninth Street
Cleveland, OH 44199-2060

Dear [redacted]

As the State Representative for the 12th District located in Southwest Detroit, I am writing to request a 90 day extension on the comment period on the Draft Environmental Assessment (EA) for the Ambassador Bridge Enhancement Project proposed by the Detroit International Bridge Company. An extension of the comment period on the proposed Ambassador Bridge Enhancement Project is certainly with precedent. Following the U.S. Coast Guard notice for public comment on the preliminary determination that the proposed project qualified for a categorical exclusion last summer, an extension of the comment period was requested and granted. As you are well aware, the proposed project continues to cause confusion and significant controversy in the 12th District where there are two competing border crossing projects. Finally, each of the permits processed thus far for the proposed project have required public notice and comment; and each associated comment period has been extended to accommodate and encourage full discussion and debate on such a critical project – not only to the 12th District – but to the relationship with one of our strongest trading partners. A thirty-day comment period is simply not sufficient to accommodate a thorough and proper review of the Draft EA.

Please do not hesitate to contact me if you have any questions or would like to discuss this matter.

Sincerely,

Steve Tobocman
House Majority Floor Leader
State Representative, 12th District – Detroit

cc: Senator Carl Levin
Senator Debbie Stabenow
Congressman John Dingell

0571

Striffler, Scot

From: [redacted]
Sent: Wednesday, July 18, 2007 6:03 AM
To: [redacted]
Subject: FW: Opposition to Proposed Bridge

-----Original Message-----
From[redacted]
Sent: Tuesday, July 17, 2007 10:41 AM
To: [redacted]
Subject: Opposition to Proposed Bridge

Mr. [redacted]

I am writing to register my opposition to the proposed new bridge over the Detroit River.

I am a home owner in Hubbard Farms and have invested a lot in the revitalization of the neighborhood. I am dismayed to see that Detroit International Bridge Company has been less that forthwright with public about the real impact of this proposed project on the area. It appears that those of us who would be most affected by this project have been given short shrift by those who are planning it. We have been given no reason to think that this project would be good for our community.
Therefore, I have come to the conclusion that I must oppose it.

Sincerely,

[redacted]

0572

[redacted]

From: [redacted]
Sent: Wednesday, July 18, 2007 5:32 AM
To: [redacted]
Subject: FW: Comments on Ambassador Bridge EA

Attachments: USCGcmtsdibcenvirnass..doc

USCGcmtsdibcenvir
nass..doc (63...

-----Original Message-----
From: [redacted]
Sent: Tuesday, July 17, 2007 5:03 PM
To: [redacted]
Cc: Steve Tobocman
Subject: Comments on Ambassador Bridge EA

Attached are Representative Steve Tobocman's comments on the Ambassador Bridge EA.

Thank you,

[redacted]

0573

July 17, 2007

[redacted] Commander
U.S. Coast Guard
Ninth Coast Guard District
1240 E. Ninth Street
Cleveland, Ohio 44199-2060

Subject: Ambassador Bridge Enhancement Project Environmental Assessment

Dea[redacted]

I am writing to provide comments on the Draft Environmental Assessment (Draft EA) submitted by the Detroit International Bridge Company (DIBC) for the proposed Ambassador Bridge Enhancement Project. Since 2003, I have represented the 95,000 residents of the 12th State House District, which hosts the Ambassador Bridge, in the Michigan House of Representatives. I have attached my previous submissions to the U.S. Coast Guard (USCG) and the Michigan Department of Environmental Quality regarding the proposed Ambassador Bridge Enhancement Project.

I. The U.S.Coast Guard Should Postpone the Draft EA and Await the Completion of the DRIC Study

I have repeatedly stated my strong objection to government action, at any level, that would promote an international border crossing outside of the binational Detroit River International Crossing (DRIC) Study. Governmental actions, including the USCG's processing of the DIBC's permit application for the Ambassador Bridge Enhancement Project, that would promote one of the eliminated alternatives of the DRIC Study represents exceptionally dysfunctional public policy-making. Approving a project lacking the support of the binational parties involved in the DRIC Study undermines the U.S. relationship with Canada, its largest trading partner. I continue to have a difficult time responding to questions from my constituents regarding why a public agency, particularly a DRIC Study partner, would consider promoting a border crossing alternative that was eliminated almost two years ago though the DRIC Study process.

The DRIC Study is in the process of completing an Environmental Impact Statement (EIS) for alternatives designed to expand border crossing capacity at the Detroit Windsor corridor. The USCG is a partner in the DRIC Study and should be thoroughly engaged and familiar with the ongoing process, relevant data, and the various alternatives studied. As previously stated, the Ambassador Bridge Enhancement Project represents an alternative already studied, evaluated, and eliminated through the DRIC Study. What is the public policy rationale for consideration of any border crossing alternative through a less rigorous analysis than an Environmental Impact Statement (EIS) when the binational process is engaged in a full EIS for the same project? **The USCG should require a full EIS for the Ambassador Bridge Enhancement Project.**

DIBC claims that the proposed project will not increase capacity and, therefore, is distinct from the goals of the DRIC Study, are patently false. If this were accurate, why would the DIBC characterize the DRIC Study as a competitor? The Ambassador Bridge Enhancement Project includes the construction of six bridge lanes an increase of two additional lanes compared to the existing Ambassador Bridge. Describing the proposed project as a maintenance project is illogical given the construction of these additional lanes which, according to the Draft EA, will be used as dedicated throughways for low-risk trucks.

In fact, the support letters submitted as Attachment A include at least three letters that support the project based solely upon its ability to increase capacity. The July 26, 2006 letter from the U.S. Chamber of Commerce opens with "I am writing to express our strong support for investment in additional infrastructure capacity to meet the growing demand so trade across the U.S. Canadian border in the Detroit region." A September 9, 2006 letter from the Michigan Chamber of Commerce similarly states "the Michigan Chamber strongly supports efforts to increase needed capacity, including private sector initiatives such as proposed by the Detroit International Bridge Company for an additional span at the Ambassador Bridge." Finally, the Michigan Teamsters Joint Council 43 write in a June 19, 2006 letter: "Additional capacity will ensure that Detroit Windsor is the border crossing of choice." Expanding transportation infrastructure, such as building additional crossing lanes here, has empirically created increased traffic growth.

II. The USCG Should Reject the Draft EA on Homeland Security Grounds

Security issues must play a predominant role in expanding international border crossing capacity. The U.S. Department of Homeland Security (DHS) and the U.S. Customs and Border Protection (USCBP) are among the federal agencies partnering with the DRIC Study. The Draft EA lacks any discussion of security clearances beyond an unsubstantiated allegation that the proposed project is in the national interest and security of the U.S. and Canada. Moreover, there is no commentary from the DHS or the USCBP. There also should be substantive commentary from the General Services Administration (GSA), the landlord for USCBP, given that they recently completed a Master Plan for the expansion of the Ambassador Bridge primary cargo inspection facility. Several expansion options contingent on expanded capacity at the Detroit Windsor border are considered viable by the GSA and are depicted in the Master Plan. **The USCG must solicit comments from the GSA, DHS, USCBP, and other critical federal agencies before it can properly analyze the Draft Environmental Assessment.**

Creating redundancy is one of the primary homeland security objectives of expanding international border crossing capacity at the Detroit Windsor border. Any discussion of redundancy must focus on the entire system, specifically including all three components of border crossing infrastructure: bridge structure; bridge plaza; and roadway connections. *One* of the reasons that a twinning of the Ambassador Bridge was eliminated from further consideration by the DRIC Study is that it did not perform well on redundancy criteria in the U.S. or in Canada. DRIC analyzed 37 crossings and rated each system for its effectiveness on route, plaza, and crossing. Redundancy was one variable amongst several used in the rating criteria. The Ambassador Bridge ranked second on the U.S. side, but the spread between the highest ranked crossing and the Ambassador Bridge was significant – 24.52 and 18.92 respectively. It is imperative that the USCG coordinate its review of the Draft EA with the DHS's analysis of the proposed project.

While the Draft EA correctly notes that redundancy in the regional transportation system is "much needed" (page 5), its claims of "structural" redundancy (pages 15 and 21) miss the mark. Redundancy within the regional transportation system can only occur when all three levels of the system are addressed and the DRIC Study correctly points out that a separate route for trucks to cross the central industrial corridor between Detroit and Windsor does that. The Ambassador Bridge Enhancement Project is only relevant to the Ambassador Bridge structure, not its plazas or freeway connections. Nor is it redundant in the system's overall context. That is why it was rejected by the DRIC Study. In the wake of the September 11, 2001 terrorist attacks, these homeland security concerns should not be ignored as they are in the Draft EA.

A related homeland security concern is the routing and transport of hazardous materials across international boundaries. The USCG should include a thorough analysis of the existing regulations and laws governing hazardous materials transport and any changes required by the DHS. There have been various claims and allegations regarding the regulation and enforcement of hazardous material transport across the Ambassador Bridge including media exposes alleging that the DIBC has violated hazardous materials transport regulations. Additionally, law enforcement and other relevant government agencies should be consulted including the Michigan State Police, Detroit Police Department, and the Detroit Fire Department.

III. The Draft EA Raises Serious U.S. Environmental Law Issues, including Segmentation

The proposed Ambassador Bridge Enhancement Project is described within the initial USCG permit application, as well as the subsequent Draft EA, as involving the construction of a six-lane, cable-stayed bridge just west of the existing Ambassador Bridge. The description states that there are no additional plaza, roadway, or interstate freeway connections required. Throughout the Draft EA, however, the DIBC claims project benefits that come instead from actions being undertaken as part of the MDOT Gateway Project. **In response to the USCG's July 2006 request for public comment on this project, I, along with multiple parties, identified that the Ambassador Bridge Enhancement Project misrepresents the full scope of the proposed changes and, as such, segments the project. Segmentation of a project is a violation of the National Environmental Policy Act.**

Additional segmentation appears to be underway with regards to DIBC's plaza expansion plans. The DIBC has gone on record stating that they plan to expand the U.S. side of the Ambassador Bridge plaza south of Fort Street and have requested that the MDOT evaluate the impacts of relocating Fort Street. In fact, several of the support letters provided in Attachment A of the Draft EA, use language nearly identical to the April 28, 2006 letter from the Detroit Hispanic Development Corporation noting their support for "(DIBC) plans to move the truck inspection plaza south of Fort Street." The DIBC also has proposed an international plaza that would eventually accommodate joint U.S. and Canadian customs and inspection activities. This proposed expansion is detailed in DIBC documents ("A Model Border Crossing for the 21st Century," November 2001; "Ambassador Bridge Today and Future") and was depicted in advertisements in the Detroit daily newspapers and Crain's Detroit Business. Another letter, dated April 19, 2006, and signed by ten individuals, provides twice as much commentary on the proposed "International Center" (sic), as the Enhancement Project. This letter provides equal commentary on the Gateway Project.

Therefore, the project and its impacts, as described in the Draft EA, are significantly deficient. In a summary of air quality impacts, Weston Solutions even states that "it should be noted that the proposed project does not include any changes to the existing U.S. inspection plaza." Based on the information presented above, their estimates would be incomplete. The USCG should require that the DIBC fully disclose, describe, and record the impacts of the expansion plans for the bridge, plaza, and roadway system.

IV. USGC Should Reject Draft Environmental Assessment and Require a Full Environmental Impact Statement (EIS)

All of the environmental impacts of the Enhancement Project, including air, noise and vibrational impacts, should be evaluated under federal Environmental Justice standards. In addition to the fact that the Draft EA notes that 60 percent of the surrounding community is Hispanic and significant numbers are black, the area has significant poverty rates. Trying to deny these facts by stating that Detroit has higher minority and low-income numbers than the immediate neighborhood is no defense to not following the Environmental Justice regulations prescribed by Executive Order 12898 issued on February 11, 1994. If indeed this project inflicts significant environmental impacts on these protected populations, it should be rejected
Pollution Concerns – These should be evaluated as Environmental Justice concerns

Air Quality

The Draft EA should include an air quality analysis of transboundary impacts. Based on a conference call with the USCG (conference call with Robert Bloom, June 4, 2007), it is my understanding that transboundary impacts are typically included in the analysis of the Draft EA for an international border crossing. Page 76 of the Draft EA states that "the emissions from the Proposed Project represent an insignificant source of air emissions in the area." This is a meaningless and inappropriate standard for determining air quality impacts and subsequent mitigation initiatives. If every project that accounted for only a thousandth of Wayne County's air pollution were exempt from regulation, air quality controls and standards would be rendered entirely meaningless.

Despite a recognition that air quality impacts will occur during both the construction and operation of the proposed project, no mitigation activities are described beyond a statement that pollution controls will be employed during the construction of the proposed project. The Draft EA does not include an analysis of the air quality impacts of operationalizing a new six lane bridge, along with the existing four lane bridge, and U.S. and Canadian plaza operations. The

USCG should require such an analysis as there are repeated descriptions within the Draft EA of this potential scenario.

Any legitimate analysis of air quality impacts also must account for the increase in truck traffic the project will generate. While the Draft EA asserts that the project will not increase traffic volumes, such a contention does not pass a reasonableness standard. Why would the DIBC spend money for six lanes instead of four if it were not handling more traffic? At least the project's supporters believe it will attract more traffic. Nearly half of the letters of support in Appendix A say as much. Finally, the DRIC traffic projections used in the analysis support more traffic.

The Southeast Council of Governments (SEMCOG) comments on the Draft EA raise several important issues related to the methodology used to assess air quality impacts particularly the need to use local available data to ensure a higher level of accuracy in emissions projections.

Noise

The Draft EA only includes an analysis of noise impacts on the areas east and immediately south of the proposed project. All areas surrounding the proposed project should be evaluated for noise impacts including the neighborhoods to the west. The Draft EA should be rejected for its negative noise impacts on this minority community. First, it is not clear how the analysis picked the area to study. It is true that there are a "few residences mixed with vacant land, and one church" immediately *adjacent* to the Ambassador Bridge plaza as described on Page ii of Appendix L. Yet, to state that there are no schools near the project area suggests that the project area is defined as two blocks at most, since Webster Elementary School is located two blocks west of the north end of the Ambassador Bridge Plaza. Noise impacts from tens of thousands of vehicles and trucks, particularly when elevated on a bridge, travel farther than the so-called "project area" and the Noise Analysis Study should be rejected out of hand.

In essence, the Draft EA suggests that, because traffic noise is already excessive and exceeds the NAC, nothing needs to be done to mitigate noise concerns. Similar to the air quality analysis that seeks project exemption from federal standards because Wayne County is out of attainment, the noise analysis seeks exemption because of the undesirable present conditions. In the present context, the exact project being contemplated *is carrying the vehicles that are producing the noise!* **The USCG must demand that reasonable analysis and mitigation be undertaken to address noise concerns that will result from the proposed project.**

The Draft EA needs to utilize a larger scope of noise sites. No sites were picked to the west, north, northwest or north east of the Ambassador Bridge Plaza or the new span. In fact, a reasonable person would conclude that the Draft EA selected only the least populous areas to study for noise, exactly the areas where USCG should be least, not most, concerned.

The noise data sets are from a small sample of time periods and conditions. Despite the reports analysis that measurements were taken "during morning and/or afternoon rush-hour," Appendix A shows the complete opposite of this characterization with all measurement times falling between 12:02 p.m. and 2:54 p.m. Indeed a new analysis with morning and/or afternoon rush hour should be ordered, as well as a more robust data set that includes other days of the week and other weather conditions, rather than just a day with 80 percent humidity. This analysis is particularly critical when the report notes conditions exceed the NAC at numerous sites.

Historic and Visual Impacts

The ultimate use of the existing Ambassador Bridge, should the Enhancement Project go forward, is anything but clear. The Draft EA includes a scenario under which the existing structure is removed from service, repaired, and used for pedestrian and bicycling purposes. Another scenario is uses the existing Ambassador Bridge for backup traffic relief. It is imperative that a final conclusion on the ultimate use of the Ambassador Bridge is reached, then studied and reported on in an environmental assessment. There are dramatically different impacts depending on whether the Ambassador Bridge remains in service, is removed from service, or is demolished. **The USCG should require a final determination on the future of the existing Ambassador Bridge within the context of the construction of the Enhancement Project. Such a determination must include appropriate budgets and timelines.**

The Draft EA indicates that the State Historic Preservation Office (SHPO) has determined that there are adverse effects on the historical integrity and views of the Ambassador Bridge from the proposed Enhancement Project (March 2007 SHPO letter to DIBC). This would be especially significant if DIBC were to dismantle the existing span or leave it in disrepair. A surface reading of the Draft EA supports that DIBC would have every financial incentive to not repair the existing span, especially if the new span contains additional lanes of traffic and DIBC is to be believed that the project will not increase usage. One only needs to look at DIBC's unkept nearby Michigan Central Depot to realize that the physical and aesthetic deterioration of the existing span are real possibilities. The impacts of the views of the existing span in Riverside identified below must be given due consideration by SHPO's letter.

Riverside Park

The Draft EA recognizes potential adverse impacts from the proposed project to Riverside Park including potential long-term visual impacts and shading of park land. The Draft EA understates the historic value of this impact. The view of the Ambassador Bridge from Riverside Park is breathtaking and a true cultural asset to the city of Detroit. The picture used is from the farthest corner of Riverside Park and grossly understates its appeal.

The West Riverfront revitalization plan will provide, for the first time in decades, direct public access to the riverfront as it transitions and limits industrial uses to residential, commercial, and recreational. Moreover, the West Riverfront plan connects the neighborhoods of Southwest Detroit to the east riverfront. The USCG should require evaluation of the Enhancement Project on the West Riverfront plan.

V. Draft EA Is Flawed

The DIBC has repeatedly stated that there is no need for expanded international crossing capacity and has widely criticized the DRIC Study traffic growth estimates. Yet, the DIBC has not included any traffic forecasts, current or future, to rationalize the proposed project or to back up the claim that traffic is decreasing rather than increasing. If additional traffic is not expected at the Detroit Windsor border, USCG should question why the DIBC would build a larger bridge structure, and how future toll revenues will cover the construction costs of the new bridge, as well as the rehabilitation of the existing span. It is extremely puzzling that the DIBC used the DRIC Study traffic estimates to describe the air quality impacts of Ambassador Bridge Enhancement Project.

The Draft EA contains substantial inaccuracies and/or confusing claims. First, the Draft EA claims that no public money will be used, that the construction costs are $500 million, that no additional property will be required, and that no one will be relocated. All of these claims are contradicted in fact or elsewhere in the Draft EA.

The DIBC has repeatedly claimed that the Ambassador Bridge Enhancement Project costs would be completely privately financed. In fact, the DIBC has argued that this should elevate the ranking of their proposal when compared to DRIC Study alternatives because federal and state transportation resources could be used for other critical projects. However, in February 2007, the DIBC submitted an application for the use of $1 billion in Private Activity Bond financing for their portion of the MDOT Gateway Project and the Ambassador Bridge Enhancement Project.

The application stated that total project costs for constructing the Ambassador Bridge Enhancement Project are approximately $800 million and that no additional land was required in the U.S. or Canada. The Draft Environmental Assessment states that the total project costs are $500 million. **Given that a federal action is required and that the use of federal funds and/or federal tax benefits may be requested for the proposed project, the USCG should require a specific line-time budget delineating total project costs.**

Second, the document contradicts itself with regard to the project's land needs and ownership status. Page 9 of the Draft EA states "the DIBC/CTC owns *most of* the property required for the construction of the Ambassador Bridge Enhancement Project and are currently in the process of acquiring the necessary remaining property rights for the project." Inexplicably, however, on page 22 of the Draft EA the following appears: "the only relocations required in Canada are those renters occupying short term temporary housing near the University of Windsor." **The Private Activity Bond application stated that all land required for the project had been acquired. The application was silent on the need for relocation. The USCG should identify the remaining land needed for the proposed project and whether relocation, other than residential, is required.**

Southwest Detroit hosts the most extensive array of transportation land uses in the state. Four Class one railroads, acres of intermodal and rail facilities (including the largest intermodal yard in the region), an international rail tunnel, three interstate freeways, and the Ambassador Bridge are located in Southwest Detroit. The community, and particularly the neighborhood adjacent to the Ambassador Bridge, has experienced significant residential and commercial regeneration, and increased population. There is little discussion of secondary and cumulative impacts of the proposed project. The Draft EA should include such an analysis and consider the cumulative impacts of other proposed projects such as the development plans of the Detroit Wayne County Port Authority, the Detroit Intermodal Freight Terminal, Systematic Recycling, and the possible expansion of Marathon Petroleum Refinery.

A full EIS would provide the kind of analysis that is critically needed for this important project. Our nation's most valuable international border crossing deserves such consideration. Our homeland security deserves such consideration. Southwest Detroit's growing residential and business communities, environment, and historic character deserve such consideration.

Thank you for the opportunity to comment on the DIBC's proposed Ambassador Bridge Enhancement Project. As always, I am available for additional discussion on this critical matter.

Sincerely,

Steve Tobocman
House Majority Floor Leader
12th District, Detroit

cc: Senator Carl Levin
Senator Debbie Stabenow
Representative Carolyn Cheeks-Kilpatrick

July 17, 2007
[redacted]

Commander, Ninth Coast Guard District (dpb)
1240 East 9th Street – Room 2025
Cleveland, OH 44199-2060
VIA FAX 216-902-6088

Re: Comments on the New Ambassador Bridge Draft Environmental Assessment

Dear [redacted]

I am writing to strongly oppose the application of the Detroit International Bridge Company ("DIBC") to the Coast Guard for the construction of a second span of the Ambassador Bridge. I write this letter as a resident of Hubbard Farms in Southwest Detroit. Our neighborhood is located in the shadow of the existing Ambassador Bridge.

The construction of a second Ambassador Bridge would have adverse effects on a part of Detroit that is recognized as a neighborhood undergoing revitalization. Southwest Detroit is one of the few areas of the city that is experiencing a rise in population. Nonprofit organizations and private entrepreneurs have invested hundreds of millions of dollars to build or substantially renovate hundreds of homes and apartments, create and expand businesses. There are many examples but one of the strongest is to walk in the Hubbard Richard neighborhood near St. Anne's Church. There Bagley Housing Association, a nonprofit organization, has been working over the last ten years to rebuild the neighborhood. Over 140 new single-family homes and townhomes have been built because of their efforts. Bagley Housing has also contributed to the development of a new senior housing complex, the renovation of a historic church building into a charter school, and the opening of an art gallery.

Commercial development has followed the boom in housing. Mexicantown and its restaurants have expanded, with the business owners citing the housing construction as an impetus for their new businesses or expansions. Two new commercial buildings with a total of 45,000 square feet were just completed by the Mexicantown Community Development Corporation. One building will house a State of Michigan Welcome Center and the other will lease space to a mix of local retail businesses. Other gems in Hubbard Richard include the Matrix Theater and Honeybee Market, a long-standing family owned business that expanded its small grocery store into an important 15,000 square foot supermarket. A new tortilla factory was recently built and several banks have opened branches nearby. Clearly Southwest Detroit is a thriving community for its residents to live, work and play, and a community that has wonderful resources for the city and Metro Detroit region.

It should be noted that the revitalization of Southwest Detroit has been recognized by the City, County, State, foundations and Federal Government in a number of important efforts. The City of Detroit has consistently awarded grants through federal programs to support the development activity. The Mayor's Office of Commercial Revitalization has approved two commercial areas for inclusion in its RE$TORE Detroit initiative. The State of Michigan has approved two Cool Cities sites in the Southwest Detroit area. The State has also designated a considerable amount of resources through the Michigan State Housing Development Authority (MSHDA) to support neighborhood improvement strategies. For example, MSHDA's program to administer federal low income housing tax credits have provided funding for the substantial renovation of over ten buildings into more than 200 apartments and 17,500 square feet of commercial space through the work of Southwest Solutions Nonprofit Housing Corporation. Two foundations (Skillman and the Local Initiatives Support Corporation) have designated Southwest Detroit as one of a small number of communities in Detroit through which they will target their efforts at supporting neighborhood revitalization.

The Federal Government should be a partner that supports the economic revitalization of the City of Detroit with strong support for the redevelopment of the city's neighborhoods. A second Ambassador Bridge would be the antithesis of neighborhood development and would be the wrong choice to solve what are clearly important issues affecting trade at the border.

Unfortunately, the Ambassador Bridge is privately owned and as a result the DIBC has not had a level of accountability that almost all other international border crossings have in the U.S. (I say almost because I believe there is only one other international crossing that is not publicly controlled). The DIBC has many times not supported the revitalization of the community as I described earlier; in fact their actions ran contrary to these efforts. They have purchased property and razed homes and businesses, leaving vacant land sitting for many years. They have proposed construction large trucking facilities right in the middle of residential neighborhoods.

In addition to those concerns, the DIBC has often supplied misinformation to the media and the public. It has simultaneously argued for the need of a 2nd span while presenting the opposite argument to other audiences. It has presented grandiose plans for redevelopment of properties it owns in order to gain trust and public support, and not completed much if any of the proposals. Another example is the DIBC claiming that the state will save money in its tight budget because no public funding would go towards the construction of a 2nd span, and then the DIBC submitting an application to the Michigan Strategic Fund for $1 billion of Private Activity Bonds. In addition, DIBC's owner, Matty Maroun, has continued to own the Michigan Central Depot while willfully allowing it to become derelict and possibly beyond repair. In short, the DIBC has shown absolutely no concern for the surrounding community and has been a terrible corporate citizen.

Support for a second Ambassador Bridge is logically inconsistent with the work of the bi-national Detroit River International Crossing ("DRIC") Study which has invested significant public dollars and resources in determining, through an open and transparent process, the optimal location for increased international crossing capacity. Increasing capacity at the Ambassador Bridge was analyzed by the DRIC Study and determined not optimal based upon several variables including community impact and inability to meet redundancy objectives. An affirmative action by the MSF Board on the PAB application will harm Michigan's credibility in the DRIC process and relations with Canada.

I am extremely disturbed that the only environmental concerns identified in regards to the construction of a second span of the Ambassador Bridge would be the aesthetic impact on the current bridge identified by the Michigan State Historic Preservation Office. The operations of the DIBC have resulted in an inordinate amount of truck traffic along the local streets of Southwest Detroit. How can an increase in the number of trucks in this neighborhood not negatively contribute to the already poor air quality in the area? Was the impact considered in light of the myriad other current and proposed other industrial and transportation-related uses in Southwest Detroit, such as the many freeways, steel plants, cement silos, the Detroit Intermodal Freight Terminal, and others? The level of air quality is one of the worst in the State and the location of the Ambassador Bridge plays a role in that. There would also be serious noise and safety concerns brought about by this proposal. The results of the Environmental Assessment are dubious at best.

Additionally, the Coast Guard's handling of public meetings to solicit input on the project has been abysmal. The "Public Workshop" on March 1, 2007 was not advertised to the community. I live within half a mile of the Bridge and had no knowledge of the meeting until a neighborhood resident noticed the posting on the DIBC's website a few days before the meeting. This meeting should not count as part of the public input process since the public wasn't even aware of it until the last minute. The Coast Guard's lack of outreach should be an embarrassment to the organization. A "Public Workshop" held in April was slightly better advertised, and I attended a portion of the meeting. However, at the very beginning of the meeting, a representative of the Coast Guard spoke and completely stifled public comment on the project except for design-related issues of a new bridge. Therefore, the community has had absolutely no opportunity to comment on other issues and, therefore, this process has essentially been a charade leading to approval for the DIBC to build 2nd span of the Ambassador Bridge. Until a true community meeting is held, the seriousness of the impacts of this process dictate that the process to-date should not even be considered valid.

Lastly, there are a number of other outstanding concerns related to the overall project. The DIBC has made no mention of the current bridge being in need for repairs before this application. How is it that suddenly it needs to build a second span in order to shut down the Ambassador Bridge for these studies? Even if true, the Gateway Project, while allegedly designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the DIBC has well-documented plans to significantly expand its plaza far beyond what was anticipated in the Gateway study and even beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications, including adding primary inspection booths and

0584

the reconfiguration of Fort Street. And is there really a need for a new span at all? The July 14, 2007 edition of The Detroit News discussed the drop in passenger trips to Canada due to a number of factors and the decline in truck traffic is well-documented, even by the DIBC itself.

It is not just our neighborhood that opposes a second Ambassador Bridge. Government at all levels in Canada is opposed to a second span. The opposition of Canada, the undoing of strong neighborhood redevelopment progress, respecting the DRIC process, the lack of a comprehensive review of environmental impacts, weak community notification by the Coast Guard and poorly operated community meetings are all solid reasons that justify a rejection of any approvals required by the Coast Guard for the construction of a second Ambassador Bridge by the Detroit International Bridge Company.

Sincerely,

[redacted]

Cc: Gateway Communities Development Collaborative
Governor Jennifer Granholm
Senator Carl Levin
Senator Debbie Stabenow
Representative John Conyers, Jr.
Representative Carolyn Cheeks-Kilpatrick
State Representative Steve Tobocman
State Senator Hanson Clarke
[redacted] ederal Highway Administration
[redacted] Michi[redacted]t of Transportation
Detroit City Council President [redacted]
[redacted] City of Detroit Planning Commission
[redacted] City of Detroit Department of Environmental Affairs

0585

From the Fax of:

[redacted]

[redacted]

Date 7-17-07

To: Command[redacted]   Fax No. 216-902-6088

Number of Page (s) 5 (including cover sheet) - If you do not receive all pages, please contact our office immediately.

Comments I am submitting comments in connection with the application of the Detroit International Bridge Company to build a second Ambassador Bridge between Detroit and Windsor

0586

July 16, 2007

Mr. [redacted]
Commander, Ninth Coast Guard District(dpb)
1240 East 9th St.
Cleveland, OH 44199-2060

Dea[redacted]

We are writing to comment on the Detroit International Bridge Company's proposal to build a bridge across the Detroit River. The Southwest Detroit Business Association is a nonprofit community development corporation, 50 years old in 2007, in the business of building community----combating community deterioration and removing blight with a comprehensive approach to community based economic development.

First and foremost, we believe that any international border crossing impacts vehicular traffic and truck traffic, and the safety and well being of communities on both sides of the border. Because of the public purposes involved in the ownership and operation of an international border crossing, we believe that any new crossing must be publicly controlled.

Secondly, the span as proposed by the DIBC is immediately west of the current Ambassador Bridge. Our understanding from our counterparts in Windsor, Ontario, Canada, is that there is no place for the proposed bridge to land on the Canadian side of the border. They have examined other possible alternatives, and what is acceptable is 2-3 miles west of the proposed DIBC site. Half a bridge is no solution.

The Mexicantown Mercado and state of Michigan Welcome Center are designed and intended to welcome visitors and travelers to the U.S., the state of Michigan, the metro Detroit area, and the Hubbard Richard neighborhood. Expanded truck queuing, customs inspection, and 24/7 operations cause increased noise, traffic congestion, diminished air quality, and odors, and do not enhance the new and renovated housing, the new and renovated retail and the Mexicantown restaurant district's plans for the future. Transportation development must be balanced with residential and commercial development. No study has been done to measure the impact of increased use of the customs plaza.

Government is accountable to the public. The private sector is not. The private sector is obligated to maximize profit for its investors. Minimal review has been done(there is an appalling lack of information to date, and the information that is available now is not the same as the information available initially, i.e., a twinned span vs. a replacement span; how will the new span be financed) and minimal review will be the rule because there is simply not the same obligation to the public in the private sector.

We are curious as to the fate of the existing bridge. No concrete information is available. It is a national historic landmark, and little has been said regarding its future.

We would suggest that the Detroit River International Crossing, engaging governments on both sides of the border, engaging the Department of Homeland Security, engaging the communities that are most impacted by a bridge development, is a far better process to determine how and where a new border crossing should be built. It is by far a better alternative to a private business initiative, given the impact to the people who live, work, play, shop and invest in southwest Detroit.

Sincerely,

[redacted]
President

[redacted]

From: [redacted]
Sent: Tuesday, July 17, 2007 9:12 AM
To: [redacted]
Subject: FW: Comments on new bridge Draft EIS

Attachments: uscg ltr.doc

uscg ltr.doc (31 KB)

-----Original Message-----
From [redacted]
Sent: Tuesday, July 17, 2007 9:03 AM
To: Bloom, Robert
Subject: Comments on new bridge Draft EIS

Comment from the Southwest Detroit Business Association, Inc. Original in U.S. Mail.

[redacted]

President

Southwest Detroit Business Association

7752 W. Vernor Hwy.

Detroit, Michigan 48209

(313) 842-0986

(fax) 842-6350

0589

[redacted]

July 15, 2007

[redacted]
Commander, Ninth Coast Guard District (dpb)
1240 East 9th Street – Room 2025
Cleveland, OH 44199-2060

Re: Comments on the New Ambassador Bridge Draft Environmental Assessment

Dea[redacted]

As a life long Detroiter and a decade long resident of Hubbard Farms, I feel that it is necessary to express my concerns and am hoping that you will listen to reason, when it comes to burdening Southwest Detroit with another headache. I do not want another bridge in my backyard.

I am concerned about the environmental consequences of building a second span of the Ambassador Bridge. The Southwestern portion of the City of Detroit is an area that has seen considerable residential and commercial revitalization and is the only part of the city experiencing population growth. There has been significant private and public investment in new housing and commercial developments, renovations of vacant buildings, and individuals rehabbing their homes. Much of this investment would be jeopardized by the construction and operation of a 2nd span of the Ambassador Bridge.

I am extremely disturbed that the only environmental concerns identified in regards to the construction of a second span of the Ambassador Bridge would be the aesthetic impact on the current bridge identified by the Michigan State Historic Preservation Office. There would also be serious noise and safety concerns brought about by this proposal. As a runner and frequent user of our local park, I am already disturbed by the noise and pollution in our neighborhood and do not see how doubling the "cause" reduces the "effect"; in other words, by adding another bridge, certainly, the noise and pollution must be increased also. I have invested a great deal of time and money in my property here and plan to live here for a long time. I hope that as decisions are made, the authorities making them would consider people like myself.

Sincerely,

[redacted]

0590

13 July 2007

Commander, Ninth Coast Guard District
1240 East 9th St
Cleveland, OH 44199-2060

Re: Draft Environmental Assessment for a twin span to the Ambassador Bridge

Dea[redacted]

I am a resident of Hubbard Farms community, a designated historic district within the borders of West Grand Boulevard, West Lafayette, Clark St and West Vernor. I have made great investments in the community by renovating two homes of unique architectural style. We were drawn to this area because of the stable and growing urban community and the proximity to the Detroit River and the Ambassador Bridge. I am opposed to the construction of a twin span for the following reasons.

First, I agree with the State Office of Historic Preservation that a modern, larger twin span will have adverse visual impact to the Ambassador Bridge. I am also concerned with The Detroit International Bridge Company's future plans for the Ambassador Bridge based on current conditions of other property owned b[redacted] of DIBC (i.e. the neglect of The Michigan Central Rail Station).

The neighborhood currently struggles with truck traffic, pollution and noise. Increasing the trucking capacity with a new large span will only add to this existing problem. I have great concerns regarding the feasibility of the new bridge using the existing custom plazas efficiently and am worried about The DIBC's future plans for the area and the possibility of increasing the footprint of the trucking plazas. This will only have great negative impact on the community. The lack of transparency in DIBC's plans is worrisome.

This community is a shining example of both rehabilitation and growth with a dense and diverse population, many active non-profit and development associations, and strong commercial districts—all of which will be adversely affected by increases in trucking.

Sincerely,

[redacted]

0591

[redacted]

July 15, 2007

[redacted]
Commander, Ninth Coast Guard District (dpb)
1240 East 9th Street – Room 2025
Cleveland, OH 44199-2060

Re: Comments on the New Ambassador Bridge Draft Environmental Assessment

Dear M[redacted]

As a resident in the Hubbard Farms neighborhood adjacent to the Ambassador Bridge, I am writing to express my deep concerns about the Environmental Assessment process conducted by the Coast Guard on the Detroit International Bridge Company's (DIBC) proposal to build a second span.

I am concerned about the environmental consequences of building a second span of the Ambassador Bridge. The southwestern portion of the City of Detroit is an area that has seen considerable residential and commercial revitalization and is the only part of the city experiencing population growth. There has been significant private and public investment in new housing and commercial developments, renovations of vacant buildings, and individuals rehabbing their homes. Examples of this development include the nearly 100 Homes at Ste. Anne's built by Bagley Housing, the nearly 200 renovated apartment units by Southwest Housing Solutions, and the 43,000 square foot Mexicantown International Welcome Center & Mercado recently completed by Mexicantown CDC, among many other current and proposed development projects. Yet this community has continued to bear the burden of the region's transportation and industrial infrastructure without any community benefits. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will surely only grow if the bridge's capacity was to be expanded. Much of this investment would be jeopardized by the construction and operation of a 2nd span of the Ambassador Bridge.

Many of these projects have been constructed in spite of the DIBC's active opposition to them. This has been demonstrated many times as the DIBC has purchased lots in the development areas of these nonprofits and as it has acquired private residences that have disappeared soon thereafter, sometimes in the middle of the night. And it has persistently failed to build three (three!) new homes for senior citizens it promised the community at least five years ago.

In addition to those concerns, the DIBC has often supplied misinformation to the media and the public. It has simultaneously argued for the need of a 2nd span while presenting the opposite argument to other audiences. It has presented grandiose plans for redevelopment of properties it owns in order to gain trust and public support, and not completed much if any of the proposals. Another example is the DIBC claiming that the state will save money in its tight budget because no public funding would go towards the construction of a 2nd span, and then the DIBC submitting an application to the Michigan Strategic Fund for $1 billion of Private Activity Bonds. In addition, DIBC's owner, Matty Maroun, has continued to own the Michigan Central Depot while willfully allowing it to become derelict and possibly beyond repair. In short, the DIBC has shown absolutely no concern for the surrounding community and has been a terrible corporate citizen.

I am extremely disturbed that the only environmental concerns identified in regards to the construction of a second span of the Ambassador Bridge would be the aesthetic impact on the current bridge identified by the Michigan State Historic Preservation Office. How can an increase in the number of trucks in this neighborhood not negatively contribute to the already poor air quality in the area? Was the impact considered in light of the myriad other current and proposed other industrial and transportation-related uses in Southwest Detroit, such as the many freeways, steel plants, cement silos, the Detroit Intermodal Freight Terminal, and others? There would also be serious noise and safety concerns brought about by this proposal. The results of the Environmental Assessment are dubious at best.

Additionally, the Coast Guard's handling of public meetings to solicit input on the project has been abysmal. The "Public Workshop" on March 1, 2007 was not advertised to the community. I live within ¼ mile of the Bridge and had no knowledge of the meeting until a neighborhood resident noticed the posting on the DIBC's website a few days before the meeting. This meeting should not count as part of the public input process since the public wasn't even aware of it until the last minute. The Coast Guard's lack of outreach should be an embarrassment to the organization. A "Public Workshop" held in April was better advertised, and I attended a portion of the meeting. However, at the very beginning of the meeting, a representative of the Coast Guard spoke and completely stifled public comment on the project except for design-related issues of a new bridge. Therefore, the community has had absolutely no opportunity to comment on other issues and, therefore, this process has essentially been a charade leading to approval for the DIBC to build 2nd span of the Ambassador Bridge. Until a true community meeting is held, the seriousness of the impacts of this process dictate that the process to-date should not even be considered valid.

Lastly, there are a number of other outstanding concerns related to the overall project. The DIBC has made no mention of the current bridge being in need for repairs before this application. How is it that suddenly it needs to build a second span in order to shut down the Ambassador Bridge for these studies? Even if true, the Gateway Project, while allegedly designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the DIBC has well-documented plans to significantly expand its plaza far beyond what was anticipated in the Gateway study and even beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications, including adding primary inspection booths and the reconfiguration of Fort Street. And is there really a need for a new span at all? The July 14, 2007 edition of The Detroit News discussed the drop in passenger trips to Canada due to a number of factors and the decline in truck traffic is well-documented, even by the DIBC itself. It seems to me that the Coast Guard is fronting the efforts of the DIBC to continue its monopolistic hold on border traffic between the US and Canada.

Sincerely,

cc: Gateway Communities Development Collaborative
State Representative Steven Tobocman
Federal Highway Administration
Michigan Department of Transportation
City of Detroit Historic Designation Advisory Board
Senator Carl Levin
Senator Debbie Stabenow
Representative John Conyers, Jr.
Michigan State Historic Preservation Office
Detroit City Council
City of Detroit City Planning Commission
City of Detroit Planning and Development Department

June 27, 2007

Commander
Ninth Coast Guard District
1240 E. 9th Street - Room 2025
Cleveland, Ohio 44199-2060

RE: Proposed Second Span of Ambassador Bridge

Dear Commander:

The purpose of this letter is to express opposition to the plans of the Detroit International Bridge Company to build a second twin-span directly west of the Ambassador Bridge.

I am writing as a resident of Hubbard Farms Historical District which is located directly west of the present Ambassador Bridge--an area seriously negatively impacted by health concerns caused by air pollution and lead contamination, economic hardships caused by rapid deterioration of home foundations that crack under the weight of the 9,000 to11,000 industrial trucks that barrel through the neighborhood every day in order to cross the Ambassador Bridge since NAFTA and the opening of the Detroit Intermodal Freight Terminal. Great decisions, great costs to citizens!

Please understand that city and state planners and commissions, along with nonprofit organizations have dumped hundreds of millions of dollars into this area in the past twenty years and because of that southwest Detroit continues to thrive and even grow despite the economic challenges facing Detroit and Michigan.

Isn't it a travesty to have residents now face the very real possibility of obliteration in order to satisfy the plans of one man, [redacted] and his Detroit International Bridge Company. If anyone has learned anything about where we are at now, the State of Michigan Department of Transportation's Detroit International River Crossing study, at least acknowledges there needs to be an expansive buffer area between industrial traffic and residential areas. This study will be ongoing through 2008. Of the fourteen proposed sites for a second bridge, the one closest to the existing bridge was eliminated early on, for the obvious reasons stated above, and especially due to the reality of terrorist attacks in a post 9/11 world.

The neighborhood is more tolerant of a publicly-owned rather than a privately-owned bridge, especially in light of international and national security. In your position, do you know of a weaker "link" in our nation's northern border security than that of the Ambassador Bridge? There is much concern and consternation among area residents that neighbor the bridge, and one wonders why the laws of imminent domain don't seem to apply when they should now more than ever before!

So, in response to your call for input from the community regarding the aesthetics of the new bridge next to a historic landmark such as the Ambassador Bridge, I have to say as I shake my head, who is their right mind would put another bridge up next to an existing one anyway?

How can the Bridge Company move forward when the Canadian side opposes the plan, and the State of Michigan is in the midst of negotiations via the MDOT study?

Therefore, I cannot fathom any reason for this question being brought to your attention at this time.

Sincerely,

[redacted]

June 24, 2007

Commander (dpb)
Ninth Coast Guard District
1240 E 9th St – Room 2025
Cleveland OH 44199-2060

RE: Proposed Ambassador Bridge Enhancement Project
Environmental Assessment

Dear Commander:

I live practically in the shadows of the Ambassador Bridge, in southwest Detroit, Michigan, at 359 W Grand Blvd. I am strongly opposed to the building of a second bridge span next to the existing Ambassador Bridge.

First, I do not believe such an important international trade and security crossing should be in private hands, as it is now. I believe the current owner has refused previous attempts by government to have any oversight regarding the Bridge's safety and/or security, which is unacceptable in the world we live in today. The government should have total control over this crossing.

Second, a second span will most definitely increase the amount of car and truck traffic, noise, pollution, and general congestion in this neighborhood and on the highways here, which I strongly oppose.

Third, the DRIC study has found that the better location for the new crossing should be downriver, in the Delray, Michigan area, as the distance over the river is shorter, and the socioeconomic impact on both sides of the river would be more tolerable than at the current Ambassador sight.

I support the DRIC process. Do not destroy the southwest Detroit and the Windsor, Ontario, Canada communities!

Sincerely,

[redacted]

0597

Donovan's Pub
3003 West Vernor
Detroit, MI 48216
(313) 964-2267

June 13, 2007

[redacted]
Chief Bridge Branch
United States Coast Guard
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060

Dea[redacted]

I find the myriad of roadblocks continually put in front of the Ambassador Bridge to be a serious infringement on the rights of residents, private business owners, employees and customers not necessarily represented by "community groups"

We have been in business for approximately twenty years and in all of that time, I have heard nothing but in-fighting and petty jealousies espoused by these community groups. The planned walkway across I-75 for example, has been discussed ad nauseam for twenty plus years that I know of. Please do not make the Ambassador Bridge Enhancement Project another example of Southwest Detroit's lack of cohesiveness.

The "Bridge" has been a fantastic neighbor of ours. I personally am totally in favor of their planned improvements. I am neither jealous nor envious of the accomplishments of [redacted] I applaud his determination and steadfastness in the face of opposition from the self-anointed "few".

If only the gloves would come off, then just maybe, the twenty years already consumed by in-fighting could be replaced by advancement beneficial to the citizens of Southwest Detroit.

I truly believe the proponents of this project far outnumber those in opposition.

Talk to the people on the street, in the bars, restaurants, bakeries, and stores. It will be an enlightening experience, I assure you.

Sincerely,

[redacted]

Corporate Officer

cc: Steve Tobocman, State Representative
United States Senator Carl Levin
Gateway Collaborative

0598

Detroit River Wyandot's
6662 Thornberry Crescent
Windsor Ontario
N8T 2X2

June 10, 2007

[redacted]
External Affairs
U.S. Coast Guard
1240 E. 9th Street
Suite 2073
Cleveland, OH 44199

Dear [redacted]

We are the Detroit River Wyandots (DRW) and descendents of the former band of Anderdon. We are a tribal organization in Windsor Ontario. The board of Directors and our members of the DRW are formed of Wyandot Indian descendents.

We are opposed to building a bridge that will cause any destruction of the sacred ground surrounding the historical area in Sandwich Ontario.

We would like to be kept informed of any development that may affect our native sites and offer any support possible to stop the building of a bridge that will cause great destruction of this very sacred site. These grounds mean so much to so many different people, especially to the Wyandot Indians of Anderdon, Ontario.

Sincerely

[redacted] Director DRW
25885 Sierra Dr
Novi, Michigan 48374-2335

[redacted]
Fax [redacted]

c.c. [redacted]
DRW Project Director
[redacted]

0599

[redacted]

June 7, 2007

Commander (dpb)
Ninth Coast Guard District
1240 E. 9th St., Room 2025
Cleveland, OH 44199

Dear Commander,

The crush of traffic caused by the location of the Ambassador Bridge is unhealthy for truck drivers, residents of Windsor and residents of this part of Detroit. Shipping the enormous tonnage of freight through urban areas--where none of it remains--is outrageous and irrational. I recognize that a sensible solution is not obvious, but a second span ~~on~~ next to the existing bridge is the worst alternative I can imagine.

I attended the Public Workshop on May 24, 2007 where cheerleaders for the bridge addition asked for our opinions about esthetic matters. Substantive issues were never addressed.

For 33 years I have lived in homes on tree-lined streets two or three blocks from the bridge. The environmental impact of the bridge has caused some deterioration of the neighborhood; another span o~~n~~f ~~the~~ bridge would sound the death knell for our pleasant part of the city. I urge that the proposal for a second span be denied.

Your decision on this issue will affect our lives crucially.

Sincerely,

[redacted]

Commander (dpb)
Ninth Coast Guard District
1240 E. 9th Street – Room 2025
Cleveland, OH 44199 2060

May 24, 2007

Dear Commander:

I am a resident of the Hubbard Farms Community in Detroit and strongly oppose the construction of a twin span of the Ambassador Bridge. This neighborhood has to contend with enough noise, congestion, and pollution from the bridge truck traffic the way it is. Also, I see a second span as a security risk.

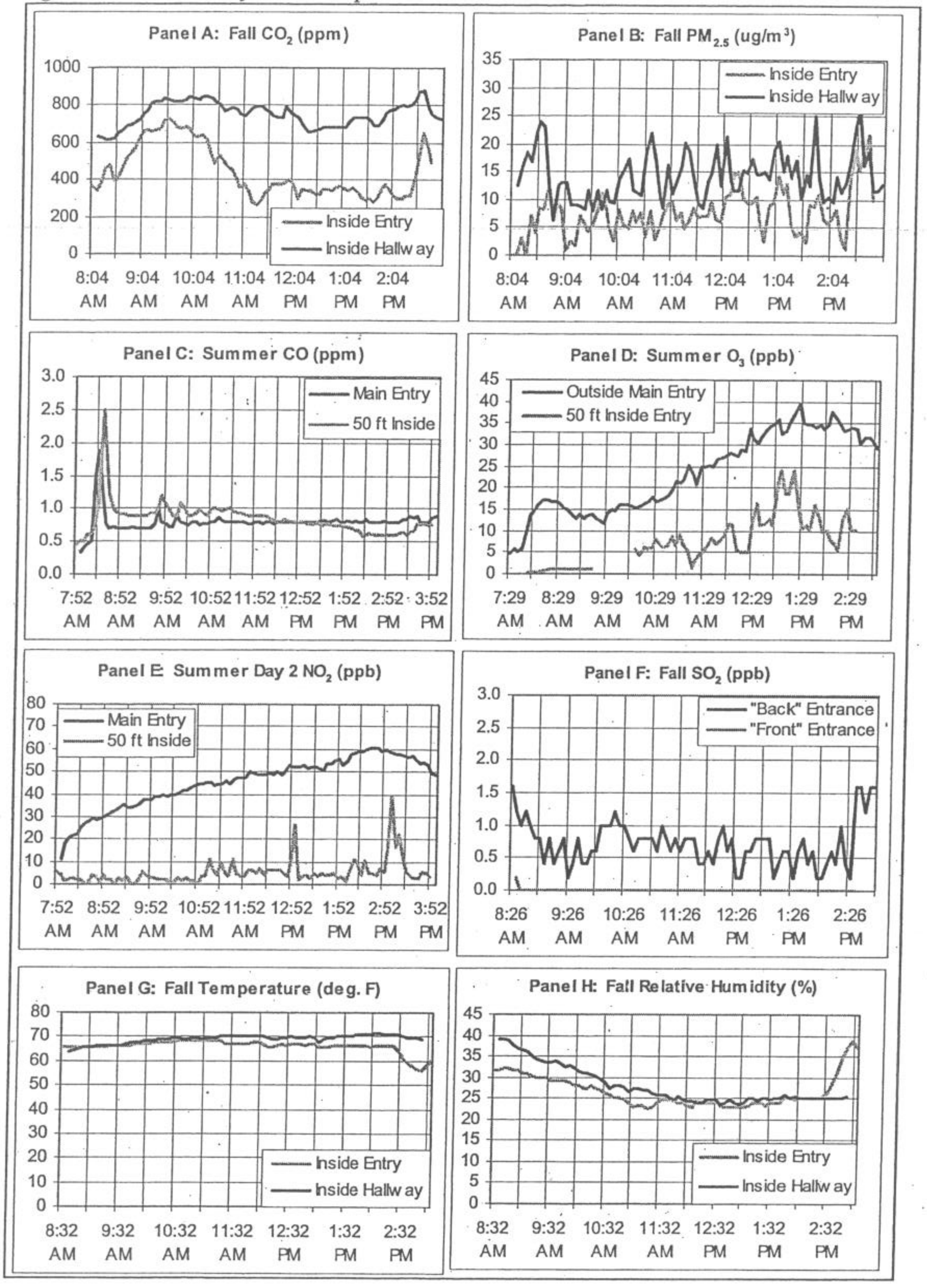
I am in favor of the alternate, government-planned/studied proposed plan for a new bridge in the Delray area, however. That community wants it there due to the possible spin-off business that could result. This is the plan that the DIBC wishes to kill, and it is widely felt that the sole reason is that they wish to maintain their monopoly. I can't believe that the US Department of Homeland Security would have a hand in this—and especially with the security concerns of having two bridges side-by-side.

Well, you asked for my input, and now you have it.

Sincerely,

[redacted]

Figure 2. ACCESS System Composite Data



0500

- **Carbonyls**

Of the suite of fifteen carbonyls monitored during this project, three target compounds for this pilot project – acetaldehyde, formaldehyde, and acetone – were found most consistently and in the highest concentrations. Other peer-reviewed EPA monitoring and modeling studies for hazardous air pollutants have shown these pollutants to be present in high concentrations in ambient air. Thus, the detection of these same compounds in our pilot study lends credibility to our concern over indoor exposure. Also, acetaldehyde and formaldehyde were target compounds for this project due to our focus on fossil fuel combustion, particularly from motor vehicles.

The summary data in Tables 2 - 4 indicate that concentrations of acetaldehyde, formaldehyde and acetone outside schools, 50 feet inside main entrances, and in rooms inside the schools appear to increase as one moves toward the interior of school buildings. Note that where the sample was below the analytical limit of detection, one-half the minimum detection limit was substituted in the calculations for these samples (a total of 13 samples during the entire project). These tables also illustrate that for the most part, concentrations during summer were higher than in fall both inside and outside. This could be due to atmospheric conditions on monitoring days, or to summertime atmospheric conditions that tend to result in greater formation, transport, and residency of these compounds in ambient air, or due to additional, unconsidered variables. Higher ambient concentrations may then have directly influenced indoor concentrations in the schools that were monitored. Additionally, indoor human activity and emission sources such as carpeting may play a critical role in increasing detected concentrations for compounds like formaldehyde.

Table 2. Acetaldehyde Statistics in $\mu g/m^3$ (all samples, separated by sampling location)

	Median Value		75th Percentile		Minimum/Maximum	
	Summer	Fall	Summer	Fall	Summer	Fall
Outside	0.19	0.27	0.37	0.36	0.04/0.90	0.14/0.47
Entry	0.30	0.36	0.49	0.44	0.04/0.69	0.04/0.69
Inside	0.45	0.46	0.63	0.61	0.04/1.16	0.04/1.11

Table 3. Formaldehyde Statistics in $\mu g/m^3$ (all samples, separated by sampling location)

	Median Value		75th Percentile		Mininum/Maximum	
	Summer	Fall	Summer	Fall	Summer	Fall
Outside	0.13	0.21	0.41	0.36	0.03/4.51	0.05/0.51
Entry	1.27	0.60	1.60	0.81	0.36/2.92	0.23/1.51
Inside	1.75	0.91	2.15	1.23	0.03/5.60	0.03/2.71

Table 4. Acetone Statistics in $\mu g/m^3$ (all samples, separated by sampling location)

	Median Value		75th Percentile		Minimum/Maximum	
	Summer	Fall	Summer	Fall	Summer	Fall
Outside	0.55	0.47	0.86	0.72	0.07/2.24	0.26/0.87
Entry	1.25	1.05	1.60	1.85	0.50/78.58	0.65/4.24
Inside	1.45	1.43	2.19	2.16	0.07/39.24	0.21/4.24

Figures 3, 4 and 5 show the ratio by percentage of indoor to outdoor carbonyl concentrations measured at schools over two days of monitoring in the summer and two days in the fall. Note that each percentage figure is a ratio of an indoor to an outdoor concentration. A percentage infiltration above 100% indicates that a higher concentration of the compound was measured indoors. At each school, NESCAUM monitored for carbonyl compounds in two to five indoor locations. As a result between two and five ratios per school per day could be generated (a total of 36 – 90 ratios). Where the samples were below the analytical limit of detection, indoor to outdoor ratios were not calculated or plotted in Figures 3 - 5.

During the summer a total of 52 indoor samples were collected. The total number of monitoring sample site ratios calculated for acetaldehyde, formaldehyde and acetone during the summer was 31, 34, and 36 respectively. This reduction in sample population was due to 5 monitoring days during the summer when no outdoor sample was taken to derive a ratio (loss of 15 potential ratios), and due to no detectable concentration reported for 1 acetone, 3 acetaldehyde, 6 formaldehyde indoor samples.

During the fall, 70 indoor samples were taken at the schools. A total of 59, 60, and 61 ratios were calculated for acetaldehyde, formaldehyde, and acetone respectively. The fall reduction in indoor to outdoor ratios was due to one day with no outdoor measurement at a single school and due to non-detected indoor concentrations of acetaldehyde (2 samples) and formaldehyde (1 sample) during the fall monitoring study.

These Figures suggest a number of interesting relationships. First, indoor to outdoor concentration percentages generally exceed 100% for all three pollutants (acetaldehyde ratios sometimes are at or below 100%); hence, indoor levels of these pollutants were greater than outdoor concentrations at most schools on most of the days that we monitored. Second, ratios varied considerably depending on the day when monitoring took place. For example, in Figures 3 - 5, in the summer at School A on day 1, carbonyl ratios ranged from over 200% to over 1200%, while on day 2, all three carbonyl ratios clustered between just under 100% and 200%. Finally, ratios for the three carbonyls were different. Acetaldehyde percentages were generally between 50 and 300% in summer and 50 and 375% in fall. Acetone ratios ranged between 0 and 300% in summer and 0 and 800% in fall. Ratios for formaldehyde in both summer and fall were more varied than the other two carbonyls and ranged from near 0 to approximately 800% and in some cases, over 2000%.

The higher inside concentrations of carbonyls indicated in Tables 2 - 4 and Figures 3 - 5 may suggest that carbonyls accumulate over the course of the day when air exchange is minimal. Alternatively, they may indicate the presence of critically important indoor sources of these carbonyls, which would supplement the concentration of infiltrating outdoor carbonyls. A more complete assessment is needed to account for building residency, air exchange rates, and interior emission sources in order to determine the actual contribution of ambient pollution to indoor concentrations. In addition, further ambient emissions characterization and monitoring is necessary to adequately evaluate these observations. Typical indoor building materials such as carpeting, modular panel walls, indoor combustion sources, and some cleaning products have been identified as important indoor sources, particularly for carbonyls like formaldehyde. In this case, carpeting does not appear to be a distinguishing factor among schools.[27]

Figure 3. Acetaldehyde Summer and Fall Inside/Outside Concentrations by Percentage[28]
(line indicates the median value of all 31 and 59 values on the summer and fall charts, respectively)

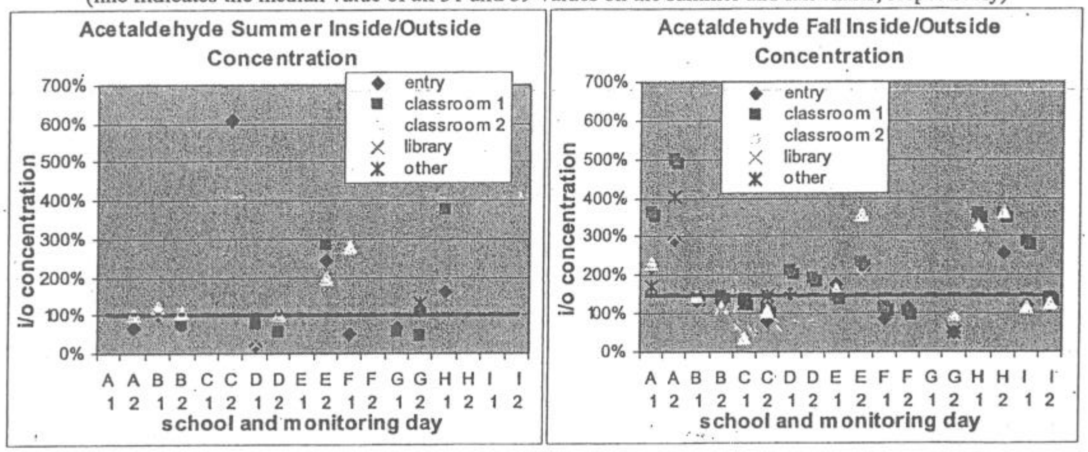
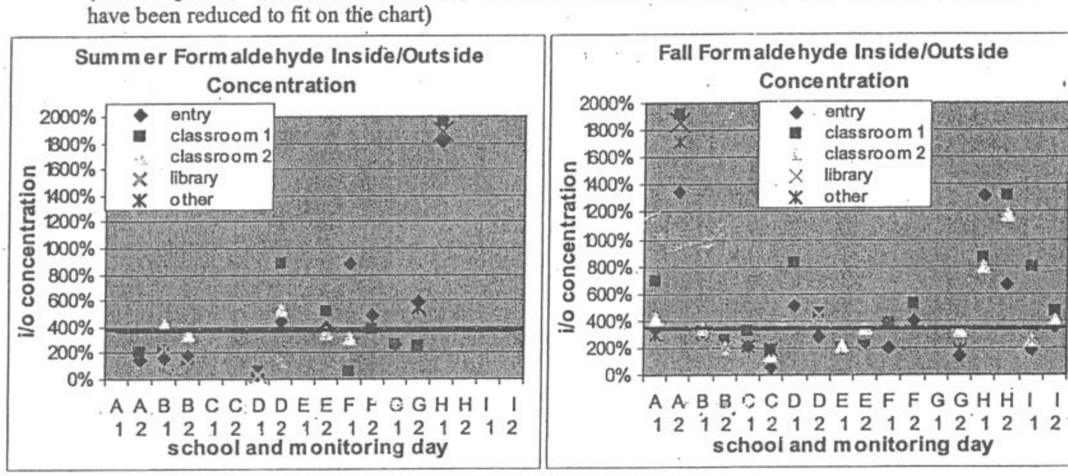
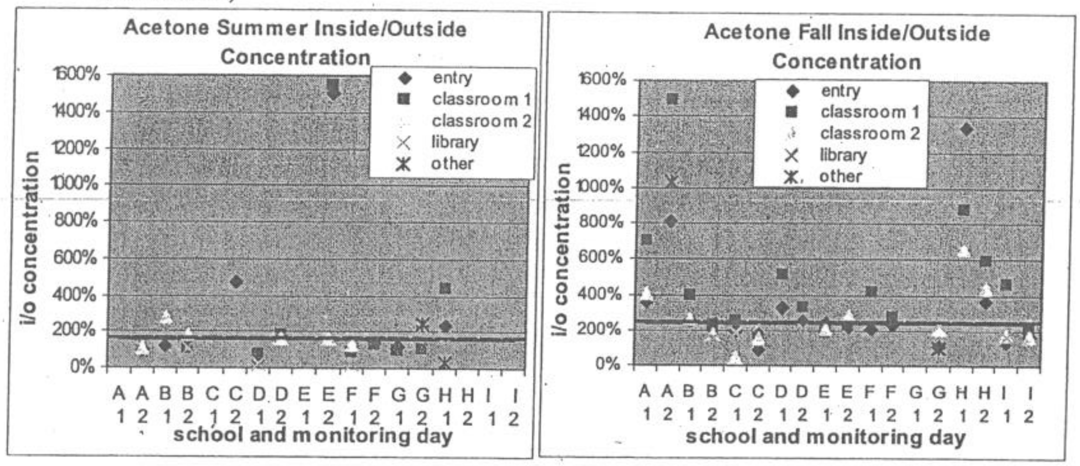


Figure 4. Formaldehyde Summer and Fall Inside/Outside Concentrations by Percentage
(line indicates the median value of all 34 and 60 values on the summer and fall charts, respectively)
(red data points – classroom 1 and library values for Summer School H Day 1 and Fall School A Day 2 – have been reduced to fit on the chart)



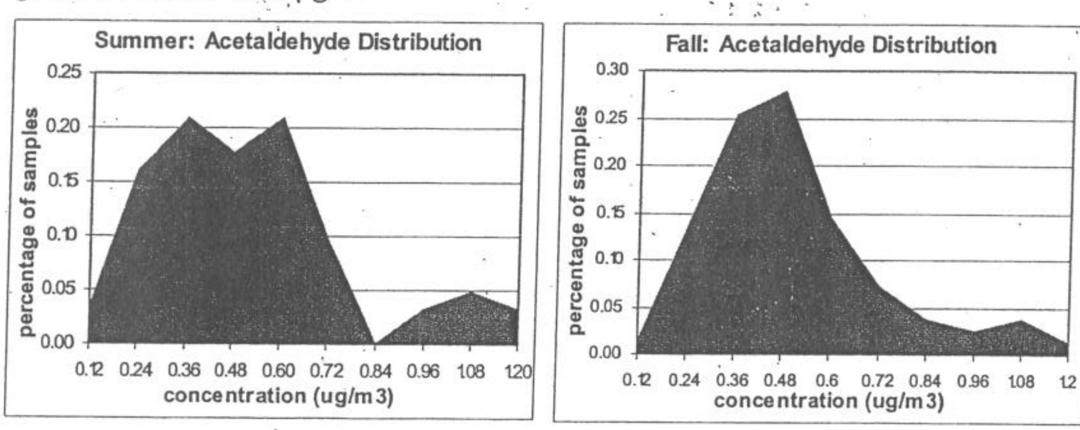
[27] Please see Appendix H for further analyses of subsets of carbonyl samples.
[28] For example, a ratio above 100% demonstrates a higher concentration inside, and a ratio below 100% demonstrates a higher concentration outside.

Figure 5. Acetone Summer and Fall Inside/Outside Concentrations by Percentage
(line indicates the median value of all 36 and 61 values on the summer and fall charts, respectively)
(red data points – entry and classroom 1 values for Summer School E Day 2 – have been reduced to fit on the chart)

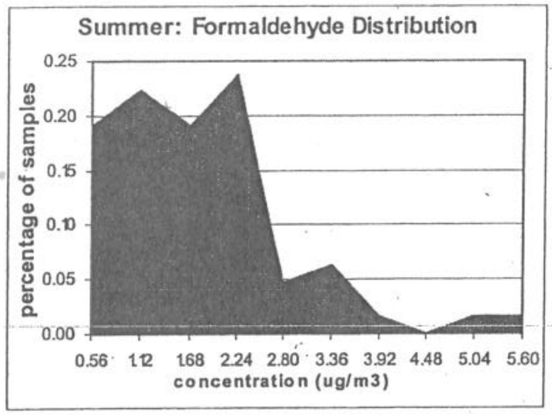


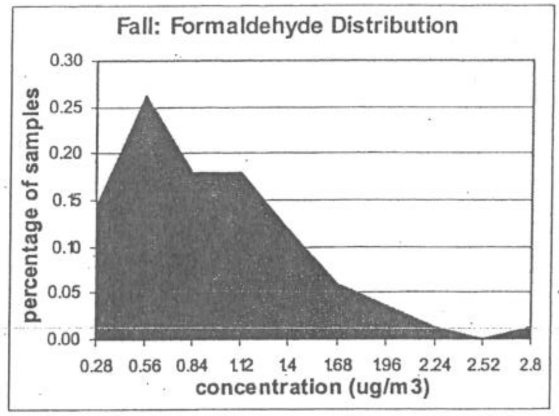
The graphs in Figure 6 below illustrate the distribution of acetaldehyde, formaldehyde and acetone for all carbonyl samples collected. The graphs indicate that carbonyl concentrations inside the school environment do not follow a normal distribution. In fact, a few of the pollutants appear to follow a somewhat biphasic distribution in the summer (where some results cluster around a lower range of concentrations while other results cluster around a higher range of concentrations). The inconsistency and abnormality of the distribution indicate that a number of factors must be considered to appropriately explain the concentrations of pollutants. In future studies it will be important to more carefully track weather conditions, monitoring location within the school building, traffic volume near the school, industrial emissions, and the presence of indoor pollutants that influence concentrations, in order to better interpret the data. However, given the pilot nature of this study, the limited sample size, the number of potential variables, and the range of monitoring conditions, these data are useful to illustrate the wide variability and range of findings across the various locations within a school or between schools participating in the study.

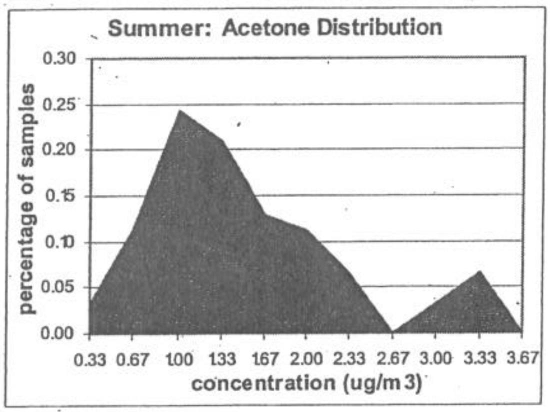
Figure 6. Distribution of All Carbonyl Samples, by the percentage of samples with a given concentration in $\mu g/m^3$

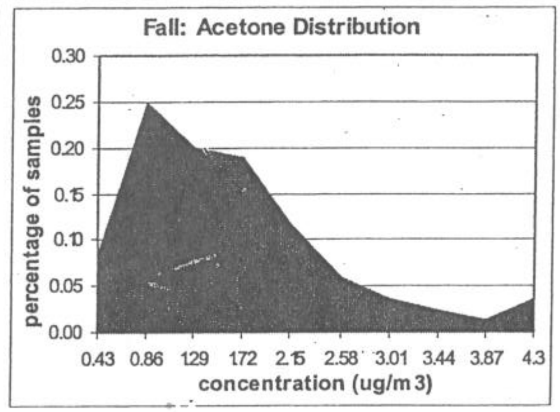


0504









The problem of pumps faulting during sample collection occurred with 30% of our summer samples and 20% of samples during the fall. In some instances, the pumps stopped working when the field monitoring team was not present to note the fault. This pump error (typically due to excessive pressure across the sampling media) results in an uncertain total sample volume. In each of these cases, the time the fault was noted and the potential shortest and longest run time was recorded. We assumed longest possible sample duration, which is the laboratories routine practice, and in each we had adequate sample volume for a positive detection (therefore not less than the limit of analytical detection). Assuming our actual sample duration was between the shortest and longest possible sample period, the ambient concentration could have been greater than that reported by the laboratory. We conducted an analysis to determine the range of potential error in the concentration for these faulted samples, as shown in Appendix I. The potential errors of the faulted samples range from 4 to 56%, with a median value of 21%.

- **Volatile Organic Compounds**

Of the suite of 27 volatile organic compounds monitored during this project, the data presented below show findings for four of the most pervasive and/or potent volatile organic compounds (VOCs): benzene, methyl ethyl ketone (MEK), acetone (also classified and reported as a carbonyl[29]) and toluene. These data represent a limited sample size (a maximum of four days at each school), however, so pollutant levels do not necessarily represent typical conditions at each site.

VOC data are plotted to address the applicability of the methods to explore our central and secondary hypotheses: 1) ambient air pollution concentrations penetrate indoor environments and 2) urban areas or areas near heavy roadway traffic have higher ambient and indoor concentrations of the pollutants.

Figures 7 and 8 examine the ratio of indoor to outdoor pollutants and do not indicate any conclusive relationship. Figures 9 – 13 suggest the range of relative VOC concentrations across the region varying with the level of urbanization and proximity to motor vehicle traffic at each school.

Figure 7 shows the ratio of indoor to outdoor VOC concentrations, as a percentage, measured at schools on both days of monitoring in the summer. In Figure 7, we excluded data from 3 out of 9 schools because the samples were analyzed using a different method and were not comparable. The fall data is shown in Figure 8 using data from four schools. The remainder of the data was excluded in this study because it came from grab samples collected with the Summa canisters rather than eight-hour integrated samples collected during the summer. Additionally, where a data point is missing, VOCs were not detected in either the indoor or outdoor sample, so a ratio could not be calculated.

[29] Acetone is reported as a carbonyl and a volatile organic compound because it is detected under both the sampling and analytical methods employed for this project. However, the accuracy and sensitivity in detection for this compound will differ between these methods, therefore, the results are not directly comparable.

Figure 7. Summer VOCs Inside/Outside (i/o) Concentration Presented as Percentage
(line on graph indicates median value)

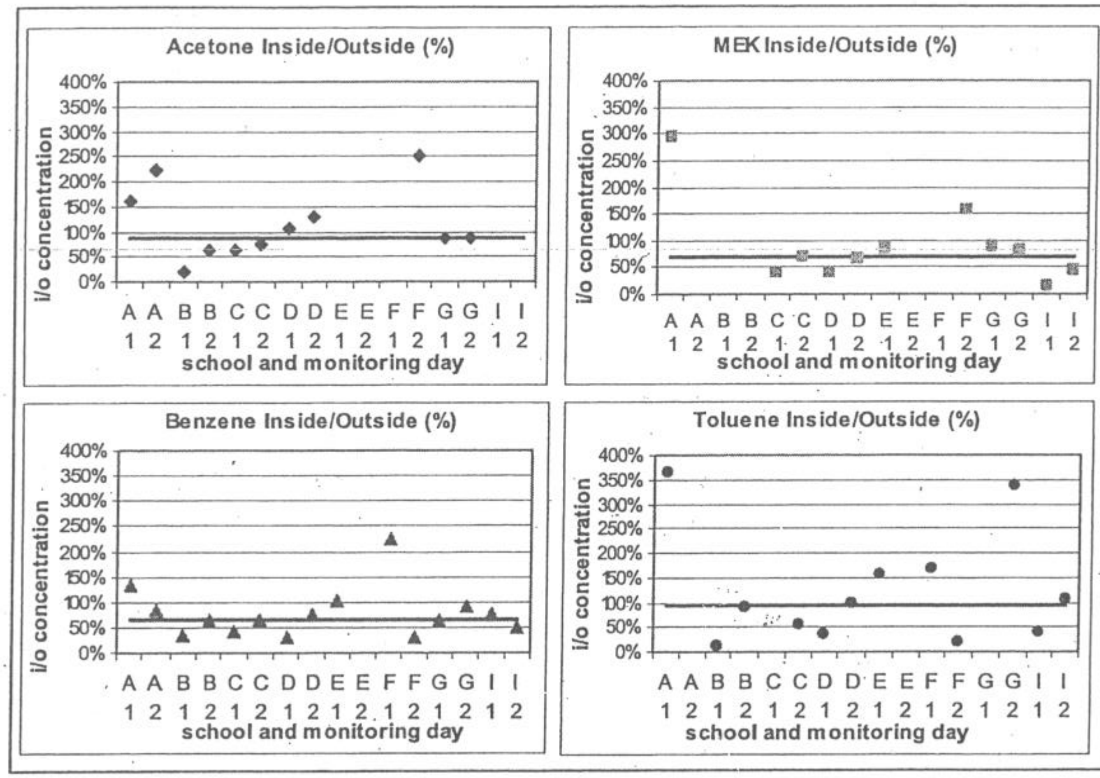
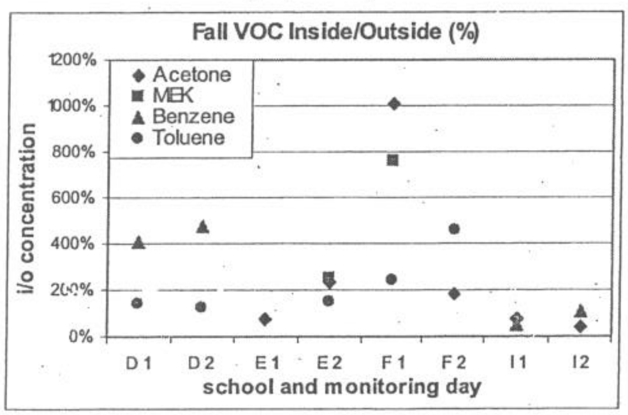


Figure 8. Fall VOCs Inside/Outside (i/o) Concentrations Presented as Percentages



In an attempt to better understand the variability in indoor to outdoor ratios in our sample population, we calculated the average and median percentage infiltration for all nine schools.[30] During the summer months of this study the median indoor concentrations of acetone, benzene, methyl ethyl ketone, and toluene ranged from approximately 60 to 90 % of the outdoor concentrations, respectively. Fall monitoring data for the much smaller integrated sample population (n= 8) suggest a median indoor concentration of these same

[30] This represents a sample size of eighteen samples.

0507

pollutants ranging from approximately 130% to 500% of outdoor concentrations, respectively. Creating these types of comparisons with our pilot project data is illustrative, supports the investigation of our central and secondary hypotheses, and assists us when reviewing our methodology. The sample size is very small, which limits any rigorous statistical analyses of the data at this time.

However, as described previously in this report, these observations are consistent with those made by other researchers previously and underscore the importance of season and of the potential contribution of indoor emissions sources and activities when attempting to evaluate infiltration. Future analyses will aim to more carefully characterize indoor sources and activities in an effort to more appropriately evaluate whether important mobile source pollutants (i.e. benzene and toluene) will infiltrate indoor microenvironments in a manner that approaches 100% to establish a "baseline" of exposure.

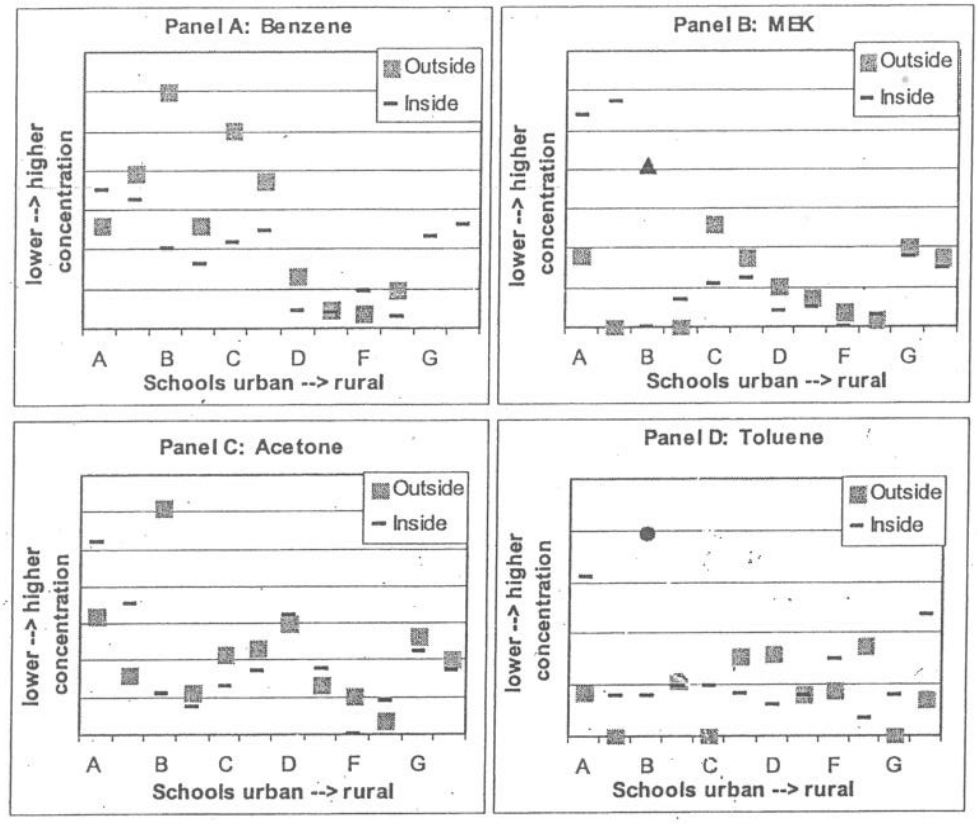
Figure 9 examines the influence of urbanization levels on concentrations of VOCs. Figure 9 is a scatter plot of relative inside and outside summer concentrations for the four compounds discussed above, with schools arranged from urban to rural (A to I, as described in Table 1) from left to right along the x-axis.[31] The diagram suggests a general trend of decreasing pollutant concentrations from urban to rural areas. This is most apparent for acetone and benzene, but also occurs to some degree with MEK and toluene.

A high degree of variation is evident, and may be explained by meteorological effects, varying either with the seasons or with individual days picked for sampling. In addition, benzene, toluene, acetone and MEK are emitted from numerous sources, including cleaning products. These emissions may be higher in the intense summer cleaning period at schools. Further testing is needed in order to determine the exact nature of these potential impacts.

Another interesting observation is the higher concentration of benzene at school G relative to the other rural schools, D and F. This may be because School G, the most rural school presented in this figure, is located near a road with very heavy traffic volume, and benzene is largely a fuel-related constituent.

[31] Schools E, H and I were not included in these graphs. Data for School H was not available at the time of publication of this report, and the data for Schools E and I were not comparable to the other six schools due to alternate analytical techniques.

Figure 9. Scatter Plots of Relative Inside and Outside Concentrations of VOCs by School
* Triangle in Panel B represents School B Outside concentration divided by 10
* Circle in Panel D represents School B Outside concentration divided by 100, to incorporate these data points on the same graph



Figures 10 through 13 present relative data correlating ambient and indoor concentrations with population density and traffic volume. Figures 10 and 11 illustrate that concentrations of benzene and toluene, which are primarily generated by motor vehicle fuel combustion or evaporation, are relatively higher in areas located in close proximity (< 500 meters) to roadways with higher traffic volume. Note, however, that the relationships between traffic volume and these two pollutants were stronger for inside measurements than for outside measurements.

Relative concentrations for schools B and C in Figure 10A suggest the importance of urban environments as additional considerations to traffic volume.[32] Essentially, these schools are located in the most urbanized environment of our sample population; as a result, we hypothesize that the general ambient "background" concentration for some of the traffic-related pollutants are higher than other less urban locations. These schools were the sites of the highest measured benzene concentrations even though they are located near only moderately trafficked roads. This apparent confounding observation, is

[32] Schools are ranked from most to least urban, with School A being the most urban and School G the least.

probably because traffic volume in the surrounding area (>500 meters from the school) contributed to an elevated benzene baseline for these schools.

In Figures 12 and 13, associations with population density and ambient or indoor concentrations are less clear. Acetone and methyl ethyl ketone are pollutants typically associated with industrial sources or personal product use rather than fuel combustion or evaporation. Accordingly, we graphed relative concentrations of these pollutants in comparison with the broader criterion of population density. No close association is seen in these graphs, likely due to the many potential emission sources of these pollutants and the variability between sampling sites in this study. In Figure 12, levels of MEK measured outside correlate more closely with population density than those measured inside. This same relationship does not hold true for acetone measurements in Figures 13A and B.[33]

Our ability to interpret these data more thoroughly was limited by laboratory error,[34] and a lack of a comprehensive outdoor or indoor emissions inventory during pilot monitoring. Although they represent a limited sample size, these data provide interesting insights for future study design, particularly with respect to sample site selection.

Figure 14 shows the distribution of all VOC measurements collected during summer monitoring. These graphs also suggest the variability and multiphasic nature of the data. As with the carbonyl distributions shown in Figure 6 above, biphasic or multiphasic distributions imply that a number of factors may explain concentrations of pollutants rather than one overriding factor. Thus in a future study it will be important to carefully track weather conditions, location within the school building, traffic volume near the school, industrial emissions, and the presence of indoor pollutants that influence the concentrations in order to interpret the data more comprehensively. A more complete emissions characterization and monitoring program will be necessary to better understand the biphasic nature of the pollutant concentrations. However, given the pilot nature of this study, the limited sample size, the number of potential variables, and the range of monitoring conditions, these data are useful to illustrate the range of findings across the region.

For two pollutants, benzene and formaldehyde, many of the levels found in the pilot study are above the cancer risk thresholds set by the U.S. Environmental Protection Agency. This finding is consistent with recent regional and national studies that have found that **all** locations in the country exceed the conservative thresholds for these pollutants. At this time there is a vigorous public debate regarding scientifically justifiable use of health risk assessment practices for air pollution policy at the regional and national level. The observation that all locations are recording concentrations above the risk thresholds underscores the need for federal consideration of policy changes. It is

---

[33] The strength of the association of each set of inside and outside data with population density and traffic volume was evaluated statistically; results are shown in the table in Appendix H. Note: the power of these statistical analyses is limited by the small sample size.

[34] The laboratory error produced samples that are relative to each other, but they cannot be analyzed as definitive concentrations.

anticipated that improved public education and public policy will be forthcoming to address the real or potential health risk associated with environmental exposure to widespread pollutants such as benzene and formaldehyde. For further information on how the U.S. EPA establishes these thresholds or ongoing regional and national assessments, see Appendix B.

Figure 10. Benzene Relative to Traffic Data

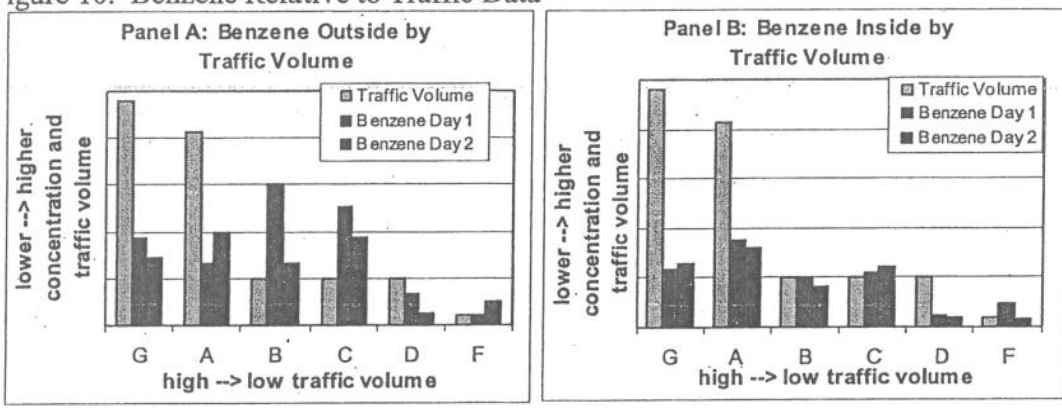
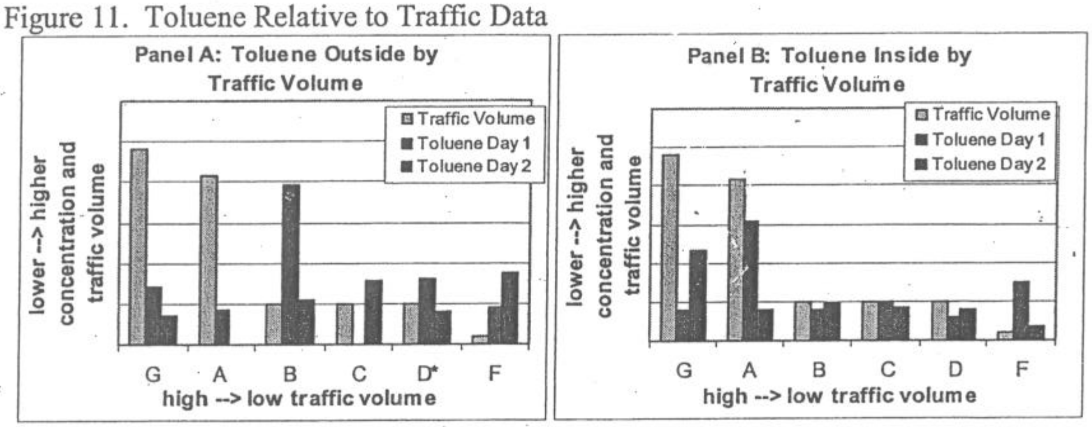
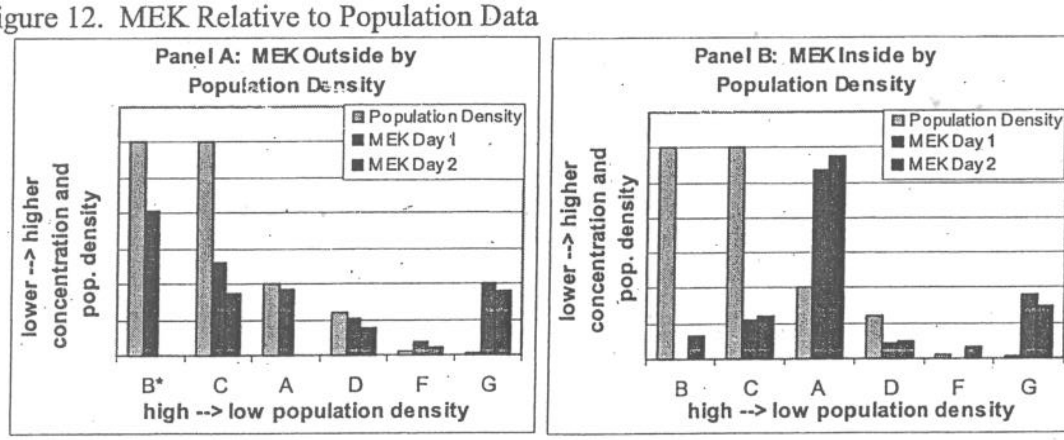


Figure 11. Toluene Relative to Traffic Data



*School D Day 1, concentration divided by 20

Figure 12. MEK Relative to Population Data



*School B Day 1, concentration divided by 10

0511

Figure 13. Acetone Relative to Population Data

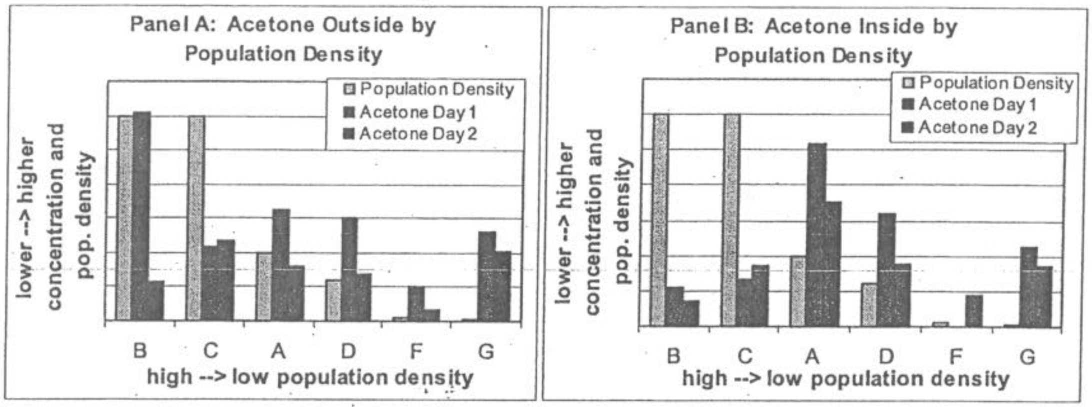
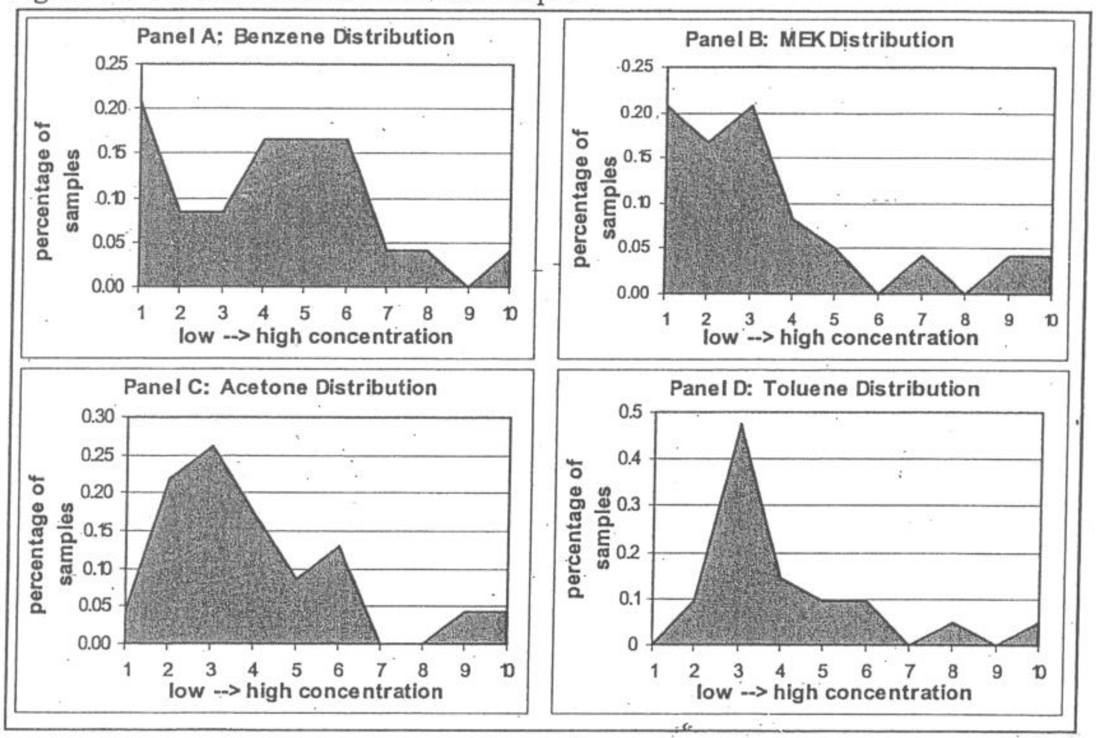


Figure 14. VOC Relative Distribution Graphs



0512

REFERENCES:

Caldwell JC, Woodruff TJ, Morello-Frosche R, Axelrad DA. Application of Health Information to Hazardous Air Pollutants Modeled in EPA's Cumulative Exposure Project. Toxicology and Industrial Health, 1998; 14, No. 3: 429-454.

Friedman MS, Powell KE, Hutwagner L, Graham LM, Teague WG. Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. Journal of the American Medical Association, February 2001.

Gilli G, Scursatone E, and Bono R. Geographical Distribution of Benzene in Air in Northwestern Italy and Personal Exposure. Environmental Health Perspectives, 1996; 104, Supp 6.

Kinney, P, Aggarwal M, Northridge ME, Janssen NAH, Shepard P. Airborne Concentrations of PM2.5 and Diesel Exhaust Particles on Harlem Sidewalks: A Community-Based Pilot Study. Environmental Health Perspectives, March 2000.

Lewis CW. Sources of Air Pollutants Indoors: VOC and Fine Particulate Matter. Journal of Exposure Analysis and Environmental Epidemiology, 1991: 1, No. 1.

Lewis CW, Zweidinger RB. Apportionment of Residential Indoor Aerosol, VOC and Aldehyde Species to Indoor and Outdoor Sources, and their Source Strengths. Atmospheric Environment. 1992; 26A, No. 12.

NESCAUM. NESCAUM Peer Review, US EPA's DRAFT Estimation of Motor Vehicle Toxic Emissions and Exposure in Selected Urban Areas. October 1999a. http://www.nescaum.org/committees/MSPeerReview/MSPeer.shtml

NESCAUM. Northeast States' Management of Toxic Air Pollution and an Overview of the United States Environmental Protection Agency's Cumulative Exposure Project and its Predictions. 1999b.
http://www.nescaum.org/committees/CEPmay99/regnlsumm2.html

Pearson RL, Wachtel H, Ebi KL. Distance-weighted traffic density in proximity to a home is a risk factor for leukemia and other childhood cancers. Journal of the Air & Waste Management Association. February, 2000.

Samet JM, Zeger SL, Dominici F, Curriero F, Coursac I, Dockery DW, Schwartz J, Zanobetti A. The National Morbidity, Mortality and Air Pollution Study. Research Reoprts 93, 94. Health Effects Institute. 2000.

Woodruff TJ, Axelrad DA, Caldwell J, Morello-Frosch R, Rosenbaum A. Public Health Implications of 1990 Air Toxics Concentrations across the United States. Environmental Health Perspectives. 1998; 106, No. 5.

Yu, O, Sheppard L, Lumley T, Koenig JQ, Shapiro GG. Effects of Ambient Air Pollution on Symptoms of Asthma in Seattle-Area Children Enrolled in the CAMP Study. Environmental Health Perspectives, December, 2000.

APPENDIX A: Health Effects of Criteria Pollutants

The federally regulated criteria pollutants are carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, particulate matter and lead. Lead is not included in this appendix because it is beyond the scope of this report. Additionally, this section addresses carbon dioxide, which is an indicator of indoor air quality but not a criteria pollutant.

Carbon Monoxide (CO)

Sources:
CO is a product of fossil fuel combustion, predominantly generated by vehicle emissions. Additional sources include other modes of transportation, as well as wood-burning stoves, incinerators, and industrial sources. The presence of CO in a school indicates the infiltration of vehicle emissions or other outdoor sources, or an inefficient heating system.
Standards and Health Effects:
The EPA's National Ambient Air Quality Standard (NAAQS) for CO is 9 ppm for an eight-hour average and 35 ppm for a one-hour period. Low levels of exposure to CO are thought to contribute to heart disease by reducing the amount of oxygen delivered to the body's organs and tissues. At extremely high concentrations (which are not expected to be found in schools), CO can be lethal.

Nitrogen Dioxide (NO_2)

Sources:
NO_2 is a brownish, highly reactive gas produced when fossil fuels are burned at high temperatures. Sources include transportation vehicles such as diesel buses and trucks, power generating facilities and industrial boilers. Cooking can also be a particularly large contributor in schools.
Standards and Health Effects:
The outdoor annual standard for NO_2 is 50 ppb; there is no indoor standard. NO_2 exposure irritates the lungs, and can aggravate bronchitis and lower resistance to respiratory infections.

Ozone (O_3)

Sources:
O_3 is a highly reactive gas that is the major component of smog. It is not directly emitted into the outside air, but instead is formed through chemical reactions between nitrogen oxides and volatile organic compounds. These two precursors are primarily emitted by transportation and industrial sources. Inside, photocopiers and other office equipment can produce ozone.
Standards and Health Effects:
Ozone can damage the lungs and reduce their function when it is inhaled because of its reactivity. At relatively low levels exposure for several hours can significantly reduce lung function and induce inflammation in healthy people during exercise. The EPA's NAAQS is 120 ppb for a maximum hourly exposure to ozone, and 80 ppb for 8 hours.

Benzene	71-43-2	71	.	0.12
Benzotrichloride	98-07-7	.	0.7	0.00028
Benzyl chloride	100-44-7	12	5.2	0.02
Beryllium compounds		0.0048	.	0.00042
Biphenyl		.	.	.
Bis(2-ethylhexyl)phthalate	117-81-7	71	.	0.25
Bis(chloromethyl)ether	542-88-1	.	.	0.000016
Bromoform	75-25-2	.	.	0.91
1,3-butadiene	106-99-0	8	.	0.0036
Cadmium compounds		3.5	*	0.00056
Calcium cyanamide		.	.	.
Captan	133-06-2	.	.	1
Carbaryl		.	.	.
Carbon disulfide	75-15-0	700	.	.
Carbon tetrachloride	56-23-5	2.4	.	0.067
Carbonyl sulfide		.	.	.
Catechol		.	.	.
Chloramben		.	.	.
Chlordane	57-74-9	0.018	.	0.0027
Chloroacetic acid	79-11-8	.	1.8	.
Chlorobenzene	108-90-7	70	.	.
Chloroform	67-66-3	35	.	0.043
Chloromethyl methyl ether	107-30-2	.	1.8	0.0014
Chloroprene	126-99-8	1	.	**
Chromium Compounds	18540-29-9	0.002	0.05	0.000083
Cobalt and Compounds	7440-48-4	*	.	.
Cresol		180	.	**
Cumene	98-82-8	.	.	.
Cyanide compounds		*	*	*
D(2,4)		.	.	.
Dibutylphthalate		.	.	.
Dichlorobenzidene(3,3')	91-94-1	.	.	0.0078
Dichloroethyl ether	111-44-4	.	.	0.003
1,3-dichloropropene	542-75-6	20	.	0.027
Dichlorvos	62-73-7	0.5	.	0.012
Diethanolamine		.	.	.
Diethyl sulfate	64-67-5	.	.	**
Dimethoxybenzidine(3,3')	119-90-4	.	.	0.0067
Dimethyl formamide	68-12-2	30	.	**
Dimethyl hydrazine(1,1)	57-14-7	0.022	.	0.0004
Dimethyl phthalate		.	.	.
Dimethyl sulfate	131-11-3	.	5	**
dinitro-o-cresol(4,6)	534-52-1	.	0.5	.
Dinitrophenol(2,4)		.	.	.
Dinitrotoluene(2,4)	121-14-2	7	.	0.0091
dioxane(1,4)	123-91-1	400	.	0.32
Epichlorohydrin	106-89-8	1	.	0.83
Epoxybutane(1,2)	106-88-7	20	.	.
Ethyl acrylate	140-88-5	48	.	0.073
Ethyl carbamate	51-79-6	.	.	0.036
Ethyl benzene	100-41-4	1,000	.	**

extremely difficult to predict the effect of multiple pollutant exposures in human populations, but research continues to assist federal, state, and local agencies in developing appropriate regulatory programs to address air pollution concerns.

Table 5 below displays the health effect benchmark concentrations for many of the federally regulated HAPs (Caldwell, 1998). A benchmark concentration represents the atmospheric concentration of a pollutant above which there may be potential public health concerns. Benchmark values essentially serve as "yardsticks" to assess potential threats to public health posed by HAPs. These values represent the current state of scientific understanding about the health effects of pollutants of concern. The benchmarks are a compilation of values used by EPA, the International Agency for Research on Cancer, the National Toxicology Program, the California Environmental Protection Agency, and the Agency for Toxic Substances and Disease Registry when recommending regulatory limits or public health advisory limits. The concentrations shown in the table below are generally similar to the health-based regulatory standards developed by health agencies in the Northeast states.

Benchmarks for short-term exposure are included in the table for comparative purposes. These benchmarks were calculated by dividing the Level of Concern (LOC) values developed for EPA's Superfund program by a safety factor of 1000. The LOC is indicative of levels of airborne concentrations of chemicals for which no serious irreversible health effects are expected to occur after exposure of thirty minutes to the pollutant.

The benchmarks shown here are meant to serve as general indicators of air quality presenting potential risk to public health. It is important to recognize that these values cannot necessarily be used to predict the likelihood of a particular cancer or non-cancer effect.

Table 5. Benchmark Concentrations for Hazardous Air Pollutants (HAPs)

Benchmark values published in Caldwell et al. Toxicology and Industrial Health, Vol 14, No.3, 1998, pp 429-454.				
		Published Benchmark Concentrations (µg/m^3)		
ChemName	CAS Number	ChronicToxicity	Acute Toxicity	Carcinogenicity
Acetaldehyde	75-07-0	9	.	0.45
Acetamide	60-35-5	.	.	0.05
Acetonitrile	75-05-8	50	.	.
Acetophenone		.	.	.
Acrolein	107-02-8	0.02	1.2	**
Acrylamide	79-06-1	0.7	.	0.00077
Acrylic acid	79-10-7	1	.	.
Acrylonitrile	107-13-1	2	.	0.015
Allyl chloride	107-05-1	1	.	0.17
Aniline	62-53-3	1	.	0.63
Anisidine	90-04-0	.	.	0.025
Antimony compounds		*	*	*
Arsenic compounds		0.5	.	0.00023

0517

Ethyl chloride	75-00-3	10,000	.	**
Ethylene dibromide	106-93-4	0.2	.	0.0045
Ethylene dichloride	107-06-2	95	.	0.038
Ethylene glycol	107-21-1	.	.	.
Ethylene oxide	75-21-8	600	540	0.043
Ethylene thiourea	96-45-7	3	.	0.032
Ethylidenedichloride	75-34-3	.	.	0.63
Formaldehyde	50-00-0	3.6	.	0.077
Glycol ethers		*	.	.
Heptachlor	76-44-8	.	.	0.00077
Hexachlorobenzene	118-74-1	2.8	.	0.0022
Hexachlorobutadiene	87-63-3	90	.	0.045
Hexachlorocyclopentadiene	77-47-4	0.07	0.02	.
Hexachloroethane	67-72-1	80	.	0.25
Hexane	110-54-3	200	.	.
Hydrazine	302-01-2	0.24	.	0.0002
Hydrochloric acid	7647-01-0	20	.	.
Hydrofluoric acid	7664-39-3	5.9	1.6	.
Hydroquinone	123-31-9	.	.	.
Lead compounds		1.5	*	0.013
Lindane	58-89-9	1	.	0.0026
Maleic anhydride	108-31-6	2.4	.	.
Manganese compounds		0.05	*	.
Methyl ethyl ketone	78-93-3	1000	.	.
Mercury compounds		*	.	*
Methanol	67-56-1	620	.	.
Methoxychlor		.	.	.
Methyl bromide	74-83-9	5	.	.
Methyl chloride	74-87-3	.	.	0.56
Methyl chloroform	71-55-6	320	.	.
Methyl hydrazine	60-34-4	.	0.94	0.0032
Methyl iodide	74-88-4	10	.	**
Methyl isobutyl ketone	108-10-1	.	.	.
Methyl isocyanate	624-83-9	0.36	4.7	.
Methyl methacrylate	80-62-6	980	.	.
Methyl tert-butyl ether	1634-04-4	3000	.	6
4,4-Methylene bis(2-chloroaniline)	101-14-4	.	.	0.011
Methylene chloride	75-09-2	3000	.	2.1
Methylene diphenyl diisocyanate	101-68-8	0.02	.	.
Methylenedianiline(4,4')	101-77-9	1.9	.	0.0022
N,N-diethyl/dimethylaniline		.	.	.
Naphthalene	91-20-3	14	.	.
Nickel and Compounds	7440-02-0	0.24	*	0.0042
Nitrobenzene	98-95-3	1.7	.	.
nitrophenol(4)		.	.	.
nitropropane(2)	79-46-9	20	.	**
o-toluidine	95-53-4	.	.	0.18
p-dichlorobenzene	106-46-7	800	.	0.15
p-phenylenediamine		.	.	.
Parathion	56-38-2	.	2	**
PCDD/PCDFs (used TCDD)	(1746-01-6)	0.0000035	.	0.00000003

0518

Pentachloronitrobenzene	82-68-8	.	.	0.014
Pentachlorophenol	87-86-5	0.2	.	0.033
Phenol	108-95-2	45	.	.
Phosgene	75-44-5	0.3	0.8	.
Phthalic anhydride	85-44-9	120	.	.
Polychlorinated biphenyls	1336-36-3	1.2	.	0.002
Polycyclic organic matter		*	.	.
Propionaldehyde		.	.	.
Propoxur	114-26-1	.	.	0.91
Propylene dichloride	78-87-5	4	.	0.053
Propylene oxide	75-56-9	30	.	0.27
1,2-propyleneimine	75-55-8	.	.	0.00015
Quinoline	91-22-5	.	.	0.00029
Quinone		.	.	.
Selenium compounds		0.5	*	.
Styrene	100-42-5	1000	.	**
Styrene oxide	96-09-3	6	.	0.022
1,1,2,2-tetrachloroethane	79-34-5	.	.	0.017
Tetrachloroethylene	127-18-4	35	.	1.7
Toluene	108-88-3	400	.	.
Toluene diamine(2,4)	95-80-7	.	.	0.0011
2,4-toluene diisocyanate	584-84-9	0.07	7	0.091
Trichlorobenzene(1,2,4)	120-82-1	200	.	.
1,1,2-trichloroethane	79-00-5	400	.	0.063
Trichloroethylene	79-01-6	640	.	0.59
Trichlorophenol(2,4,6)	88-06-2	.	.	0.32
Trifluralin	1582-09-8	.	.	0.45
Trimethylpentane(2,2,4)		.	.	.
Vinyl acetate	108-05-4	200	.	**
Vinyl bromide	59-36-02	3	.	0.031
Vinyl chloride	75-01-4	26	.	0.012
Vinylidene chloride	75-35-4	32	.	0.02
Xylenes (mixed)	1330-20-7	300	.	.
* *Benchmark identified; however, given uncertainties in benchmark derivation, a comparison is not advised.*				
** *Tier III benchmark available*				

APPENDIX C: Helpful Suggestions to Manage Indoor Air Quality

These suggestions are based on the EPA's Tools For Schools program.[36] Indoor air quality is primarily a function of the effectiveness of ventilation systems and of controls over sources of and exposure to pollutants and bioaerosols. These suggestions are ways to manage indoor air quality. They are intended to help improve indoor air quality in the school, not to fix all possible problems.

- Keep dust and dirt under control in the building
- Use walk-off mats at all entrances, both inside and out
- Be aware of the locations of air intakes and keep the areas surrounding them free of standing water and other sources of pollution (such as dumpsters, fumes from maintenance, and smoking)
- Use cleaning products that do not contain harmful chemicals[37]
- Only use ventilated areas for chemical storage
- When it is necessary to use a harmful chemical, use the smallest amount possible and use it in a well-ventilated area or under a hood
- Move bus loading and unloading areas away from air intakes and try to minimize the amount of time that doors to schools are open when buses are present
- Minimize the amount of time that buses spend idling near schools
- When deliveries are made to schools, do not allow trucks to idle while being unloaded
- Do not allow parents who pick up their children to idle near the school
- Place printers, copiers, and fax machines in well-ventilated areas
- Ensure that all combustion appliances have clean, working hoods over them
- Inspect and clean ventilation systems regularly (indoors and outside)
- Prevent the blocking of vents
- Fix leaks in floors, roofs and pipes as soon as possible, then remove and replace damaged tiles
- Make sure that the ground around foundations slopes away from buildings, to prevent standing water from accumulating around foundations
- Keep all roof drains and gutters clear so that water can drain away from buildings

[36] For further information and references regarding this program see Appendix E.
[37] See Appendix E for more information.

APPENDIX D: Detailed Information on Sampling Equipment and Methods

- **Part I: ACCESS EMS**

The ACCESS Environmental Monitoring system is a single, portable monitoring device comprised of a number of sensors that detect a set of pollutants and register basic meteorology (temperature, barometric pressure, etc.) Carbon monoxide, nitrogen dioxide, ozone, and sulfur dioxide sensors are measured with electrochemical sensors. The particulate sensor uses optical technology. The carbon dioxide sensor is based on infrared technology. The details of these sensors are described below. The temperature sensor is a Type K thermocouple and the relative humidity sensor uses capacitative technology.

All sensors relay data to a specialized computer known as a datalogger, which queries the sensors for current readings every six seconds. The data is averaged over each minute and stored with a date and time stamp for eventual upload to a computer for analysis. For further analysis, data in this study was averaged at five-minute intervals.

An electrochemical sensor uses a chemical reaction between the target gas and a chemical gel in the sensor to detect concentrations of the target gas in the air. When the reaction occurs, it generates a tiny electrical current that is proportional to the concentration. The current is then amplified electronically to a readable level. These sensors can react to other gases, potentially causing the reported value to increase or decrease; this is known as cross-sensitivity. The ACCESS system utilizes the most selective and accurate sensors available. Cross-sensitivity can somewhat affect sensor accuracy. However, each sensor's accuracy is primarily determined by the frequency of calibration and the span gas used to calibrate the sensor. The bottled gas standards used to calibrate the sensor are generally ±10% of the span value. Repeatability is ± 2 % of span.

Because these sensors are measuring small levels of pollutants in the air, it is critical that they be zeroed before use. This helps to maintain the highest degree of accuracy. No sensor in the system has a perfectly linear response curve. As a result, when the gas sensor is calibrated, it is done over the region of greatest interest to the users. In the cases of O_3, NO_2 and SO_2 this is typically between 0 and 300 ppb. When the sensor is calibrated, the slope and offset of the response curve is determined and stored in the datalogger.

The O_3 sensor on the system has a range of 0-1000 ppb. Its minimum detectable limit is 20 ppb. The expected accuracy of the O_3 sensor is ±20 ppb. The resolution of the sensor is 1 ppb. It is cross-sensitive to other oxidants such as Cl_2, Br_2, ClO_2 and F_2, and will respond to these gases with a false positive reading. For example, 50 ppb of chlorine will typically cause a reading of 25 ppb ozone. The NO_2 sensor has a range of 0-1000 ppb. Its minimum detectable limit is 10 ppb and the expected accuracy is ±20 ppb. It is cross-sensitive to other nitrogen oxides such as NO and NO_2. The SO_2 sensor has a range of 0-1000 ppb. Its minimum detectable limit is 10 ppb and the expected accuracy is ±20 ppb. It is cross-sensitive to other sulfur compounds and NO_2. The CO sensor has a range of 0-

100ppm. Its minimum detectable limit is 1 ppm and the expected accuracy is ±2ppm. It does not have any common cross-sensitivities.

The CO_2 sensor is based on infrared technology. It uses a double cell sensor to provide additional signal stability. This sensor has a range of 0-5000ppm. Its minimum detectable limit is 1 ppm and the expected accuracy is ±20 ppb. It does not have any common cross-sensitivities.

On the ACCESS system, particulates are measured through a nephelometor that is built directly into the system. The nephelometer, an AQ-10, is a passive real-time aerosol monitor that utilizes optical light scattering to continuously sense a population of particles as they transverse the sensing chamber. This nephelometric technique is based on the principles of near forward light scattering, at a 45- to 90-degree angle of electromagnetic radiation in the near infrared. The radiation scattered by airborne particles is detected by means of a silicon photocell and particle concentration is directly proportional to its signal output. Signal processing is performed by lock-in synchronous electronic circuitry that enhances performance by canceling detector noise and drift. All electronic circuitry is housed in a RFI protective case. Power is provided by the ACCESS system. A transformer supplies the main sensor board with 8VDC power. Constructed in lightweight aluminum case, the AQ-10 is able to withstand harsh environments. The absence of moving parts and complete semiconductor design make the AQ-10 largely unaffected by shock, vibration, temperature and humidity.

Calibration of the particulate unit is performed using a representative test dust. When aerosolized to factory calibration standards, the mean mass diameter (mmd) equals 10 microns ±0.5 microns and a log normal size distribution. The calibration aerosol has a 50% cutpoint at a 10 microns particle aerodynamic diameter, which has applications for both EPA and OSHA particulate air monitoring. The 10 micro-m cutpoint is consistent with the ACGIH Particulate Size-Selective Criteria for Thoracic Particulate Mass (TPH). ACGIH defines TPM as those particles that are likely to be deposited anywhere within the lung airways (tracheobronchial) or gas exchange (alveolar/respirable) region. The 10 microns cutpoint is also consistent with the EPA PM_{10} reference method for ambient particulate air monitoring. The sensor can also be calibrated to the EPA standard of 2.5 microns. For our pilot study, we used the 2.5 micron calibration.

	Type of sensor	Range	Minimum Detectable Limit	Expected Accuracy	Cross-Sensitivities
CO	Electrochemical	0-100 ppm	1 ppm	± 2 ppm	No
NO_2	Electrochemical	0-1000 ppb	10 ppb	± 20 ppb	Yes (NO, NO_2)
SO_2	Electrochemical	0-1000 ppb	10 ppb	± 20 ppb	Yes (SO_X, NO_2)
O_3	Electrochemical	0-1000 ppb	10 ppb	± 20 ppb	Yes (Cl, Br_2, ClO_2, F_2)
CO_2	Infrared	0-5000 ppm	1 ppm	± 20 ppb	No
$PM_{2.5}$	Nephelometer	0-2000 μg/m³	10 μg/m³	± 40 μg/m³	No

0522

- **Part II: GILIAN PERSONAL SAMPLING PUMPS**

These pumps are designed to measure a four- to eight-hour sample throughout the day for a variety of compounds. They can be calibrated to draw air at different flow rates through a cartridge that reacts with the air being sampled. The cartridge contains different types of media that react and bind to a variety of compounds. Before sampling, each pump in this study was calibrated to 200 ±20 cc/min so that it would draw through a certain amount of air to create the sample. The Gilian pumps pull air through a filter at a specified rate, gathering particles that react with the filter media, but no air sample is collected. The airflow rate and duration of sampling must be used to calculate the amount of substance present in the air. A dinitrophenyl hydrazine (DNPH) media was used in the cartridges to test specifically for carbonyls. In most cases, ozone scrubbers were used because ozone can interfere with the bond between certain carbonyls and the DNPH media. The sampling media must be kept cool (in the freezer or on ice) before sampling and afterwards as they are shipped to the lab, so that the fragile bonds between the carbonyls and the DNPH are retained. In the laboratory they are analyzed using high-performance liquid chromatography, the details of which are described below.

Throughout the process of monitoring the nine schools, two different types of absorbent tubes (both with DNPH media) were used. The first type used was the sep-pak cartridge. The sep-pak cartridge contains DNPH media and an ozone scrubber was attached. These pumps were calibrated to 200±20 cc/min, and had the problem of becoming saturated, particularly in high humidity conditions. Once saturated, it was difficult for the Gilian pumps to pull through a constant flow rate, causing the pumps to fault before the designated four- or eight- hour sampling period was completed.

This faulting problem led us to try a different type of DNPH cartridge, the SKC tube, in the last few schools we tested. The SKC tubes have the DNPH media and an ozone scrubber together inside a glass tube. The SKC media is not as tightly packed, so the cartridges did not get saturated as easily as the sep-pak cartridges. This was favorable because the samples could be of longer duration and the times recorded were more accurate because the pumps did not fault. These tubes were also able to run at a faster rate (500-700 cc/min), which captured a larger sample, but was also much louder, making it hard to use in a classroom or other quiet areas of a school.

- **Part III: EVACUATED SUMMA CANISTERS**

Summa canisters were used to sample volatile organic compounds over an eight-hour period. These one-liter canisters have been evacuated and fitted with an airflow orifice that controls the rate of airflow into the canister. The orifices were calibrated to draw approximately 15 cc/min, and the airflow would automatically stop after drawing in one liter, which was expected to take seven to eight hours. The canisters could also be sealed prior to collecting a full sample, and by recording a starting and ending pressure the amount of air collected could be determined. When the sample was collected it had to be closed and shipped off to a laboratory to be evacuated and analyzed for the presence of volatile organic compounds. In a few cases during the second phase of testing, during which the orifices were not available, the summa canisters were cracked and a five- to seven-minute sample was obtained. This will be an estimate of the eight-hour sample, but results may be skewed high or low depending on conditions at that time of day.

- **Part IV: INSTANTANEOUS GRAB SAMPLING**

Grab sampling was performed for CO_2 (and CO) with the Dräger CMS (Chip Monitoring System), a digitized handheld monitor that provides an instantaneous, replicable result. The system works with computerized chips which each contain ten capillaries. The tip of one capillary is broken, it draws in air, and a reading is reported. The pumps are calibrated to draw in a constant mass of air, which automatically adjusts to changes in atmospheric pressure. Each capillary contains a chemical reagent that undergoes a color reaction when the reagent contacts the particular gas being monitored. The extent of the color reaction is measured by a photo-optical system that then returns a digital reading with a repeatable accuracy often at ± 5-15%.

APPENDIX E: Additional Resources for Air Quality Assessment

Indoor air quality problems can be caused by a variety of factors. This project evaluates a specific set of factors that affect indoor air quality, but does not address all of them. The goal of the study was to evaluate the effect of outdoor air pollution on the indoor environment. A thorough assessment of indoor air quality in a building would include inspection and evaluation of many factors that were not evaluated in the study. For example, an inspection of the ventilation system and testing for biological sources (molds and mildews) would be included in a comprehensive evaluation of indoor air quality. The resources listed below can help interested readers to learn more about how to evaluate and improve indoor air quality.

The *Indoor Air Quality (IAQ) Tools for Schools* Kit

The Environmental Protection Agency (EPA) has designed the *Indoor Air Quality Tools for Schools* kit. This kit is intended to be used by existing staff in schools, and allows schools to construct and implement plans of action to improve their indoor air quality. It includes fact sheets, checklists to help identify problems, an Indoor Air Quality Problem Solving Wheel, and a guide to the use of the system. For more information see the web sites below.

- http://www.epa.gov/iaq/schools/
- http://www.epa.gov/iaq/schools/tools4s2.html

Indoor Air Quality Information Clearinghouse (IAQ INFO)

EPA created the IAQ INFO to provide a central source of information regarding indoor air quality. It is an excellent resource for EPA publications on all aspects of indoor air quality, from testing to current standards and guidelines. EPA will also refer interested parties to other organizations that may have useful information.

IAQ INFO can be reached toll-free at 1-800-438-4318, from Monday through Friday from 9:00 AM to 5:00 PM EST. During non-business hours voice mail is available. Inquires may also be made via e-mail to the address iaqinfo@aol.com or by fax at 1-(703)-356-5386.

- http://www.epa.gov/iaq/iaqxline.html

- Indoor Air Quality Information Clearinghouse
  IAQ INFO
  P.O. Box 37133
  Washington D.C. 20013-7133
  Direct line: (703) 356-4020

0525

Moisture Control is the Key to Mold Control [EPA Document Number (EPA 402-K-01-001 March 2001]

This EPA publication provides a good overview of the impact that mold can have on indoor air quality. It also includes a section detailing methods of mold control. It is available online at http://www.epa.gov/iaq/molds/toc.html or can be ordered through the Indoor Air Quality Information Clearinghouse.

Occupational Safety and Health Administration (OSHA)

The OSHA website has many links that lead to excellent resources about indoor air quality. http://www.osha-slc.gov/SLTC/indoorairquality/index.html

Consumer Product Safety Commission

The CPSC website has a search engine that allows users to search for information about products that can affect indoor air quality (cleaners, paint strippers, etc.)

- http://www.cpsc.gov
- Mailing Address:
  U.S. Consumer Product Safety Commission
  Washington, D.C. 20207-0001
- Telephone: 1-(301) 504-0990
- Fax: 1-(301) 504-0124 and 1-(301) 504-0025
- E-mail: info@cpsc.gov

American Lung Association

This website has a large amount of information and links about indoor air quality.

- http://www.lungusa.org
- Mailing Address:
  The American Lung Association
  1740 Broadway
  NY, NY 10019
- Phone: 1-(212)-315-8700

These Agencies also have information on indoor air quality:

National Institute for Occupational Safety and Health

- http://www.cdc.gov/niosh/homepage.html
- Phone: 1-800-35-NIOSH (1-800-356-4674)
- Fax: 1-(513)-533-8573

US Department of Energy

- http://www.energy.gov/
- Mailing Address:

U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

- Phone: 1-800-dial-DOE
- Fax: 1-(202)-586-4403

APPENDIX F: NESCAUM Walkthrough Checklist

Name of School: Location:

Before executing this checklist it is useful to obtain a map of the school and its layout, as well as a small-scale map of the area immediately surrounding the school. If you are unable to obtain these items, draw a map of the building to show problem areas.

Type of Roof: Flat ____ Peaked ____ Combination ___

If the roof is a combination, describe where on the building each type of roofing is used.

Date of original construction:

If the building has had additions, describe the location of the original portion of the building and the location of the additions.

Date(s) of construction of addition(s):

Type(s) of ventilation system(s):

If the building has more then one type of ventilation system, describe which part of the building each system ventilates.

What is the neighborhood like around the school?

Rural ____ Suburban ____ Urban ____

How far away from the road is the school? (If more then one side of the school is adjacent to the road, measure the distance on all sides)

What types of roads are the adjacent roads?

Are the outdoor air intakes obscured? If so, note the locations on a map of the school building.

Where are the outdoor intakes located? If possible, include a diagram of the ventilation system with the intake locations marked.

Are the outdoor air intakes located near any immediate pollution sources? If so, record the locations of the sources in relation to the school building.

Is the roof in good repair? If not, note the damaged locations.

Are there any potential sources of pollution near the building? If yes, note their locations and the type of activity.

Does water drain away from building? If no, note the location of problem areas where water collects.

Are sprinklers in use near the building? If yes, note the location of intake vents that get wet.

Are the outdoor air intakes working? (Use chemical smoke or a small piece of tissue paper to determine if air is moving into the intake vents)

Are there clean walk-off mats at all entrances to the building?

Are there any sign of leaks, mold or mildew growth inside building? If so, please use the following checklists for individual rooms and to document the location and size of the stain.

Room #:
Mold smell: 1 2 3 4 5
Number of wet or stained ceiling tiles:
Please describe:

Carpeting: Yes_____ No_____ Area carpet_____

Fabric walls, fabric chairs: Yes_____ No_____

Evidence of moisture:

Evidence of visible mold:

Ventilation system:

Other comments:

Are there any signs of water damage (e.g, discolored ceiling tiles, or floors)? Use the checklist for individual rooms above to document the location and size of the damaged area.

Have windows that could be important to the airflow system been sealed shut?

Are temperature and humidity levels acceptable?

Is the building generally clean and dust under control?

Have transfer grills between rooms and halls or other rooms been sealed off or blocked?

Does each room have a source of outside air (mechanical or window)?

Have large objects (e.g., blackboards, room partitions) been placed in a position to block airflow in a room?

Have wall vents been covered or blocked by objects (e.g., bookshelves, displays)?

Are the exhaust fans pulling air out of the building?

Do the exhaust fans have enough capacity to cover the area they are designed to exhaust?

Does each bathroom have a working exhaust fan?

Do all drains have traps?

Do trash and chemical storage areas have working exhaust fans?

Are there flumes or exhaust hoods over combustion appliances?

Is there visible soot, leaks, or disconnected flumes or exhaust hoods?

If the building was built before 1980, is there any peeling or flaking paint?

Does the building have chemistry labs? If so, list the chemicals used in the lab.

Does the building have an art room? If so, list the chemicals used in the art area.

Where are the copier machines (or other machines like a fax) located in the building?

Time	Location	Count

Where is the equipment for outdoor maintenance kept? Does it idle near the building?

How is the building heated?

What types of boards are used in the building?

Does the cafeteria cook lunch or defrost prepackaged lunches?

0531

APPENDIX G: Traffic Volume Calculations

Traffic Data was calculated using Annual Average Daily Traffic (AADT) counts from the Department of Transportation of each state in which schools were located. The AADT was calculated by counting the number of cars that pass a particular spot for an entire year, and dividing that number by the number of days in that year. Thus, the AADT value is representative of "a typical day" of traffic for that year. In most cases, the AADT was available for streets bordering schools, and for some of the larger nearby streets as well. The most recent year of data that was available was 2000. In some locations, data was only available from previous years, starting in 1996. Traffic counts of busy streets and major intersections are often calculated every year, but smaller streets are not measured as often.

The traffic counts, shown in Table 1 on page 13, are calculated using the most information available from the most recent years for the area surrounding the school. The area was cut off to a 500m radius, and an approximation was made of the amount of traffic, which is in that area based on the streets for which there was information. For instance, when schools are located near a large intersection, there are typically 4 traffic counts associated with that intersection, one from each direction. Adding these together would overestimate the number of vehicles. Instead, the two points on the same street were averaged to give an estimate of the number of vehicles on that street. Then the traffic counts on the two streets were added to produce a total volume around the intersection. When information was available on a number of streets near the school, the numbers were simply added. However, if there were multiple traffic count numbers on the same street in different locations that were both close to the school, the two were averaged. For schools close to the highway, the total number of cars that passed by was added to the total of smaller streets.

These calculations are imperfect for many reasons, including the fact that the number represents a "typical" 24-hour day. NESCAUM monitoring was representative of four days at each school, which most likely were not "typical" days. The monitoring days also were at most eight hours long, but 24-hour days are used here as a consistent baseline with which to compare the nine schools to each other. When there were other events going on near the school, such as a brush fire or construction, these were noted but not factored into the traffic calculation. Additionally, the difference between the emissions from cars which idle at a stop light, and those which pass by at 70mph on a highway may be significant, but could not be factored into these calculations. Thus, these measurements are only estimates of traffic volume counts. They are not intended to measure the exact quantity of emissions from these vehicles that may be released into the area surrounding the school. Instead, they are intended only to organize the schools according to traffic volume in order to estimate any association with pollutant concentration.

APPENDIX H: Carbonyl Data Summary Information

OUTSIDE MAIN ENTRANCE	SUMMER, 12 samples from 8 schools			FALL, 17 samples from 9 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.11	0.42	0.09	0.14	0.26	0.05
Maximum	0.90	2.24	4.51	0.47	0.87	0.51
Median Value	0.28	0.76	0.33	0.27	0.48	0.22
Average Value	0.34	0.88	0.65	0.30	0.56	0.26
75th Percentile	0.45	1.05	0.49	0.39	0.78	0.41
Standard Dev.	0.24	0.50	1.23	0.12	0.21	0.15
# Non Detects	1	0	1	0	0	0

INSIDE MAIN ENTRANCE	SUMMER, 16 samples from 9 schools			FALL, 19 samples from 9 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.11	0.50	0.36	0.23	0.65	0.23
Maximum	0.69	78.58	2.92	0.69	4.24	1.51
Median Value	0.30	1.25	1.27	0.36	1.05	0.60
Average Value	0.35	6.07	1.26	0.36	1.40	0.69
75th Percentile	0.49	1.60	1.60	0.44	1.85	0.81
Standard Dev.	0.17	19.34	0.65	0.16	0.86	0.36
# Non Detects	1	0	0	2	0	0

ALL INSIDE ROOMS	SUMMER, 36 samples from 9 schools			FALL, 51 samples from 9 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.12	0.23	0.66	0.10	0.21	0.23
Maximum	1.16	39.24	5.60	1.11	4.24	2.71
Median Value	0.45	1.45	1.75	0.46	1.43	0.91
Average Value	0.48	2.73	1.75	0.50	1.69	0.97
75th Percentile	0.63	2.19	2.15	0.61	2.16	1.23
Standard Dev.	0.29	6.37	1.09	0.23	0.94	0.53
# Non Detects	3	1	2	1	0	1

ROOMS WITHOUT CARPET	SUMMER, 16 samples, 6 schools			FALL, 24 samples, 6 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.12	0.23	0.67	0.10	0.21	0.23
Maximum	1.16	6.21	5.60	1.11	4.24	2.71
Median Value	0.48	1.23	1.77	0.49	1.74	0.89
Average Value	0.55	1.90	1.95	0.50	1.89	0.91
75th Percentile	0.69	2.39	2.81	0.65	2.71	1.14
Standard Dev.	0.34	1.55	1.37	0.24	1.07	0.54
# Non Detects	1	0	1	1	0	1

ROOMS WITH CARPET	SUMMER, 20 samples, 7 schools			FALL, 27 samples, 7 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.15	0.22	0.67	0.21	0.38	0.33
Maximum	0.85	39.24	3.39	1.05	4.17	2.09
Median Value	0.41	1.51	1.74	0.45	1.35	0.96
Average Value	0.42	3.40	1.59	0.51	1.51	1.03
75th Percentile	0.63	2.18	2.07	0.56	1.74	1.41
Standard Dev.	0.23	8.48	0.82	0.24	0.80	0.52
# Non Detects	2	1	1	0	0	0

ROOMS NEAR TRAFFIC	SUMMER, 14 samples, 8 schools			FALL, 16 samples, 7 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.12	0.70	0.71	0.29	0.73	0.23
Maximum	0.96	39.24	5.60	0.86	3.87	1.74
Median Value	0.51	2.03	1.75	0.38	1.26	0.91
Average Value	0.53	4.82	2.10	0.49	1.69	0.90
75th Percentile	0.61	2.98	2.45	0.67	2.37	1.10
Standard Dev.	0.22	10.01	1.30	0.19	0.98	0.41
# Non Detects	0	0	0	0	0	0

ROOMS NOT NEAR TRAFFIC	SUMMER, 22 samples, 7 schools			FALL, 35 samples, 8 schools		
	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)	Acetaldehyde (ug/m3)	Acetone (ug/m3)	Formaldehyde (ug/m3)
Minimum Detected	0.15	0.22	0.66	0.10	0.21	0.33
Maximum	1.16	4.04	3.11	1.11	4.24	2.71
Median Value	0.35	1.19	1.52	0.47	1.43	0.91
Average Value	0.45	1.41	1.53	0.51	1.70	1.00
75th Percentile	0.65	1.73	2.12	0.58	2.08	1.30
Standard Dev.	0.32	0.98	0.91	0.25	0.94	0.57
# Non Detects	3	1	2	1	0	1

Appendix I: Faulted Sample Error Calculation Table

Sample ID	Flow Rate Pre-Cal (ml/min)	Total Sample Volume (m^3)- LOW	Total Sample Volume (m^3)- High	Formaldehyde Concentration Reported µg/m^3	*Assuming Low Volume Sampled* - Formaldehyde µg/m^3	% difference
M-003	196.67	29	58	1.28	0.63	50.68%
F-005	206.73	45	61	1.17	0.87	25.60%
F-004	208.37	45	60	4.51	3.34	25.95%
F-003	192.53	41	56	1.38	1.02	25.86%
F-002	210.02	44	60	2.64	1.95	26.32%
F-003	191.37	35	40	0.13	0.11	11.90%
F-006	211.47	49	55	0.59	0.52	11.49%
F-004	206.87	37	42	1.17	1.03	12.32%
F-005	203.8	45	51	2.21	1.96	11.24%
O-005	204.57	59	65	0.13	0.12	9.40%
O-007	224.4	24	38	2.8	1.80	35.71%
O-003	206.97	42	58	0.48	0.35	28.01%
O-002	204.73	40	55	0.12	0.09	27.78%
2M-003	176.07	61	77	0.6	0.48	20.59%
2B-005	187.8	51	75	0.88	0.59	32.42%
2B-002	205.33	49	74	1.56	1.04	33.33%
2B-003	214.93	82	86	0.73	0.70	3.77%
2B-004	211.7	68	82	0.51	0.42	16.88%
2B-002	210.07	53	75	0.44	0.31	29.49%
2B-004	206.77	77	90	0.56	0.48	13.82%
2C-004	199.83	69	93	1.02	0.76	25.81%
2EM-002	206.4	60	74	0.62	0.51	18.16%
2EM-006	214.97	62	76	0.87	0.71	18.41%
2EM-004	200.67	47	59	1.15	0.91	20.48%
2EM-005	195.37	46	57	0.96	0.76	20.48%
2EM-006	226.33	78	91	1.86	1.58	14.89%
2W-004	208.6	24	54	0.33	0.15	55.77%
2W-005	222.4	37	64	0.93	0.54	41.67%
2W-005	225.6	81	87	0.51	0.48	6.48%
2W-003	203.6	75	84	0.57	0.51	10.92%
2W-002	212.9	70	86	0.73	0.59	18.52%
2W-006	187.03	44	61	0.57	0.41	27.61%
					median %:	**20.54%**

0535

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 9, 2004 VOL. 351 NO. 11

The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age

W. James Gauderman, Ph.D., Edward Avol, M.S., Frank Gilliland, M.D., Ph.D., Hita Vora, M.S., Duncan Thomas, Ph.D., Kiros Berhane, Ph.D., Rob McConnell, M.D., Nino Kuenzli, M.D., Fred Lurmann, M.S., Edward Rappaport, M.S., Helene Margolis, Ph.D., David Bates, M.D., and John Peters, M.D.

ABSTRACT

BACKGROUND

Whether exposure to air pollution adversely affects the growth of lung function during the period of rapid lung development that occurs between the ages of 10 and 18 years is unknown.

METHODS

In this prospective study, we recruited 1759 children (average age, 10 years) from schools in 12 southern California communities and measured lung function annually for eight years. The rate of attrition was approximately 10 percent per year. The communities represented a wide range of ambient exposures to ozone, acid vapor, nitrogen dioxide, and particulate matter. Linear regression was used to examine the relationship of air pollution to the forced expiratory volume in one second (FEV_1) and other spirometric measures.

RESULTS

Over the eight-year period, deficits in the growth of FEV_1 were associated with exposure to nitrogen dioxide (P=0.005), acid vapor (P=0.004), particulate matter with an aerodynamic diameter of less than 2.5 μm ($PM_{2.5}$) (P=0.04), and elemental carbon (P=0.007), even after adjustment for several potential confounders and effect modifiers. Associations were also observed for other spirometric measures. Exposure to pollutants was associated with clinically and statistically significant deficits in the FEV_1 attained at the age of 18 years. For example, the estimated proportion of 18-year-old subjects with a low FEV_1 (defined as a ratio of observed to expected FEV_1 of less than 80 percent) was 4.9 times as great at the highest level of exposure to $PM_{2.5}$ as at the lowest level of exposure (7.9 percent vs. 1.6 percent, P=0.002).

CONCLUSIONS

The results of this study indicate that current levels of air pollution have chronic, adverse effects on lung development in children from the age of 10 to 18 years, leading to clinically significant deficits in attained FEV_1 as children reach adulthood.

From the Department of Preventive Medicine, University of Southern California, Los Angeles (W.J.G., E.A., F.G., H.V., D.T., K.B., R.M., N.K., E.R., J.P.); Sonoma Technology, Petaluma, Calif. (F.L.); Air Resources Board, State of California, Sacramento (H.M.); and the University of British Columbia, Vancouver, B.C., Canada (D.B.). Address reprint requests to Dr. Gauderman at the Department of Preventive Medicine, University of Southern California, 1540 Alcazar St., Suite 220, Los Angeles, CA 90089, or at jimg@usc.edu.

N Engl J Med 2004;351:1057-67.

0538

THERE IS MOUNTING EVIDENCE THAT air pollution has chronic, adverse effects on pulmonary development in children. Longitudinal studies conducted in Europe[1-3] and the United States[4-6] have demonstrated that exposure to air pollution is associated with reductions in the growth of lung function, strengthening earlier evidence[7-12] based on cross-sectional data. However, previous longitudinal studies have followed young children for relatively short periods (two to four years), leaving unresolved the question of whether the effects of air pollution persist from adolescence into adulthood. The Children's Health Study[13] enrolled children from 12 southern California communities representing a wide range of exposures to ambient air pollution. We documented the children's respiratory growth from the ages of 10 to 18 years. Over this eight-year period, children have substantial increases in lung function. By the age of 18 years, girls' lungs have nearly matured, and the growth in lung function in boys has slowed considerably, as compared with the rate in earlier adolescence.[14] We analyzed the association between long-term exposure to ambient air pollution and the growth in lung function over the eight-year period from the ages of 10 to 18 years. We also examined whether any observed effect of air pollution on this eight-year growth period results in clinically significant deficits in attained lung function at the age of 18 years.

METHODS

STUDY SUBJECTS

In 1993, the Children's Health Study recruited 1759 fourth-grade children (average age, 10 years) from elementary schools in 12 southern California communities as part of an investigation of the long-term effects of air pollution on children's respiratory health.[6,12,13] Data on pulmonary function were obtained by trained field technicians, who traveled to study schools annually from the spring of 1993 through the spring of 2001 to perform maximal-effort spirometric testing of the children. Details of the testing protocol have been published previously.[12] We analyzed three measures of pulmonary function: forced vital capacity (FVC), forced expiratory volume in the first second (FEV_1), and maximal midexpiratory flow rate (MMEF). Pulmonary-function tests were not performed on any child who was absent from school on the day of testing, but such a child was still eligible for testing in subsequent years. Children who moved away from their recruitment community were classified as lost to follow-up and were not tested further. From the initial sample of the 1759 children in 1993, the number of children available for follow-up was 1414 in 1995, 1252 in 1997, 1031 in 1999, and 747 in 2001, reflecting the attrition of approximately 10 percent of subjects per year.

A baseline questionnaire, completed at study entry by each child's parents or legal guardian, was used to obtain information on the children's characteristics, including race, presence or absence of Hispanic ethnic background, level of parental education, presence or absence of a history of asthma diagnosed by a doctor, exposure to maternal smoking in utero, and household exposure to gas stoves, pets, and environmental tobacco smoke. Questions administered at the time of annual pulmonary-function testing were used to update information on asthma status, personal smoking status, and exposure to environmental tobacco smoke. The distribution of baseline characteristics of all study subjects and of two subgroups defined according to the length of follow-up (all eight years or less than eight years) is shown in the Supplementary Appendix (available with the full text of this article at www.nejm.org). The length of follow-up was significantly associated with factors related to the mobility of the population, including race, presence or absence of Hispanic ethnic background, presence or absence of exposure to environmental tobacco smoke, and parents' level of education. However, the length of follow-up was not significantly associated with baseline lung function or the level of exposure to air pollution, suggesting that the loss to follow-up did not differ with respect to the primary variables of interest.

The study protocol was approved by the institutional review board for human studies at the University of Southern California, and written informed consent was provided by a parent or legal guardian for all study subjects. We did not obtain assent from minor children, since this was not standard practice when the study was initiated.

AIR-POLLUTION DATA

Air-pollution–monitoring stations were established in each of the 12 study communities and provided continuous data, beginning in 1994. Each station measured average hourly levels of ozone, nitrogen

0539

dioxide, and particulate matter with an aerodynamic diameter of less than 10 μm (PM_{10}). Stations also collected two-week integrated-filter samples for measuring acid vapor and the mass and chemical makeup of particulate matter with an aerodynamic diameter of less than 2.5 μm ($PM_{2.5}$). Acid vapor included both inorganic acids (nitric and hydrochloric) and organic acids (formic and acetic). For statistical analysis, we used total acid, computed as the sum of nitric, formic, and acetic acid levels. Hydrochloric acid was excluded from this sum, since levels were very low and close to the limit of detection. In addition to measuring $PM_{2.5}$, we determined the levels of elemental carbon and organic carbon, using method 5040 of the National Institute for Occupational Safety and Health.[15] We computed annual averages on the basis of average levels in a 24-hour period in the case of PM_{10} and nitrogen dioxide, and a two-week period in the case of $PM_{2.5}$, elemental carbon, organic carbon, and acid vapor. For ozone, we computed the annual average of the levels obtained from 10 a.m. to 6 p.m. (the eight-hour daytime average) and of the one-hour maximal levels. We also calculated long-term mean pollutant levels (from 1994 through 2000) for use in the statistical analysis of the lung-function outcomes.

STATISTICAL ANALYSIS

The outcome data consisted of the results of 5454 pulmonary-function tests of 876 girls and 5300 tests of 883 boys over the eight-year period. We adopted a two-stage regression approach to relate the longitudinal pulmonary-function data for each child to the average air-pollution levels in each study community.

The first-stage model was a regression of each pulmonary-function measure (values were log-transformed) on age to obtain separate, community-specific average growth curves for girls and boys. To account for the growth pattern during this period, we used a linear spline model[14] that consisted of four straight lines over the age intervals of younger than 12 years, 12 to 14 years, 14 to 16 years, and older than 16 years, constrained to be connected at the three "knot" points. The model included adjustments for log values for height; body-mass index (the weight in kilograms divided by the square of the height in meters); the square of the body-mass index; race; the presence or absence of Hispanic ethnic background, doctor-diagnosed asthma, any tobacco smoking by the child in the preceding year, exposure to environmental tobacco smoke, and exercise or respiratory tract illness on the day of the test; and indicator variables for the field technician and the spirometer. In addition to these covariates, random effects were included to account for the multiple measurements contributed by each subject. An analysis of residual values confirmed that the assumptions of the model had been satisfied. The first-stage model was used to estimate the mean and variance of the growth in lung function over the eight-year period in each of the 12 communities, separately for girls and boys.

The second-stage model was a linear regression of the 24 sex- and community-specific estimates of the growth in lung function over the eight-year period on the corresponding average levels of each air pollutant in each community. Inverses of the first-stage variances were incorporated as weights, and a community-specific random effect was included to account for residual variation between communities. A sex-by-pollutant interaction was included in the model to evaluate whether there was a difference in the effect of a given pollutant between the sexes, and when this value was nonsignificant, the model was refitted to estimate the sex-averaged effect of the pollutant. Pollutant effects are reported as the difference in the growth in lung function over the eight-year period from the least to the most polluted community, with negative differences indicative of growth deficits with increasing exposure. We also considered two-pollutant models obtained by simultaneously regressing the growth in lung function over the eight-year period on pairs of pollutants.

In addition to examining the growth in lung function over the eight-year period, we analyzed the FEV_1 measurements obtained in 746 subjects during the last year of follow-up (average age, 17.9 years) to determine whether exposure to air pollution was associated with clinically significant deficits in attained FEV_1. We defined a low FEV_1 as an attained FEV_1 below 80 percent of the predicted value, a criterion commonly used in clinical settings to identify persons who are at increased risk for adverse respiratory conditions. To determine the predicted FEV_1, we first fitted a regression model for observed FEV_1 (using log-transformed values) with the following predictors: log-transformed height, body-mass index, the square of the body-mass index, sex, race or ethnic group, asthma status, field technician, and interactions between sex and log-transformed height, sex and asthma, and sex and

0540

race or ethnic group. This model explained 71 percent of the variance in the attained FEV_1 level. For each subject, we then computed the predicted FEV_1 from the model and considered subjects to have a low FEV_1 if the ratio of observed to predicted FEV_1 was less than 80 percent. Linear regression was then used to examine the correlation between the community-specific proportion of subjects with a low FEV_1 and the average level of each pollutant from 1994 through 2000. This model included a community-specific random effect to account for residual variation. Regression procedures in SAS software[16] were used to fit all models. Associations denoted as statistically significant were those that yielded a P value of less than 0.05, assuming a two-sided alternative hypothesis.

RESULTS

From 1994 through 2000, there was substantial variation in the average levels of study pollutants across the 12 communities, with relatively little year-to-year variation in the annual levels within each community (Fig. 1). From 1994 through 2000, the

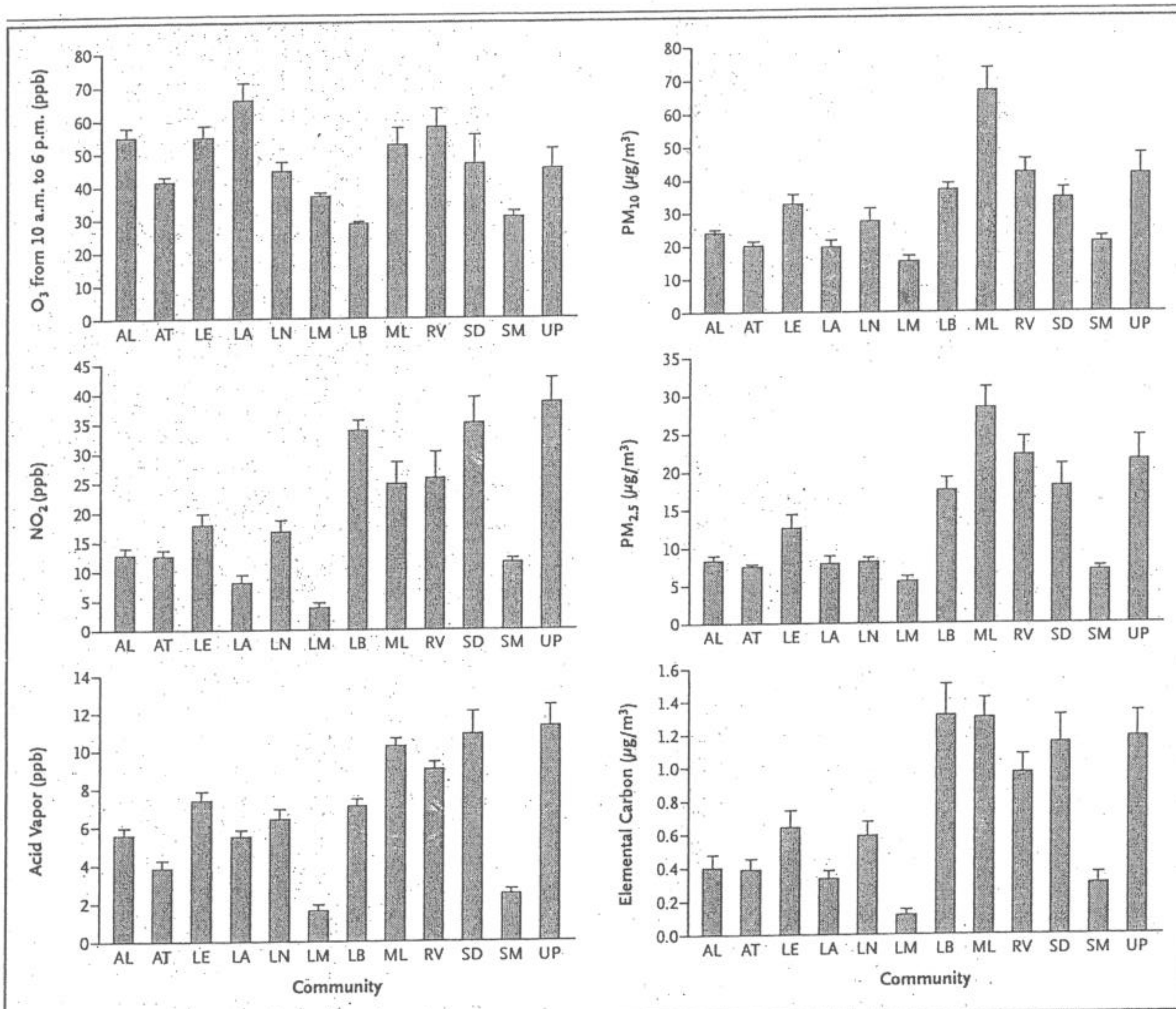


Figure 1. Mean (+SD) Annual Average Levels of Pollutants from 1994 through 2000 in the 12 Study Communities in Southern California.
AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

0541

average levels of ozone were not significantly correlated across communities with any other study pollutant (Table 1). However, correlations between other pairs of pollutants were all significant, ranging from an R of 0.64 ($P<0.05$) for nitrogen dioxide and organic carbon, to an R of 0.97 ($P<0.001$) for PM_{10} and organic carbon. Thus, nitrogen dioxide, acid vapor, and the particulate-matter pollutants can be regarded as a correlated "package" of pollutants with a similar pattern relative to each other across the 12 communities.

Among the girls, the average FEV_1 increased from 1988 ml at the age of 10 years to 3332 ml at the age of 18 years, yielding an average growth in FEV_1 of 1344 ml over the eight-year period (Table 2). The corresponding averages in boys were 2082 ml and 4464 ml, yielding an average growth in FEV_1 of 2382 ml over the eight-year period. Similar patterns of growth over the eight-year period were observed for FVC and MMEF (Table 2).

Although the average growth in FEV_1 was larger in boys than in girls, the correlations of growth with air pollution did not differ significantly between the sexes, as shown for nitrogen dioxide in Figure 2. The sex-averaged analysis, depicted by the regression line in Figure 2, demonstrated a significant negative correlation between the growth in FEV_1 over the eight-year period and the average nitrogen dioxide level ($P=0.005$). The estimated difference in the average growth in FEV_1 over the eight-year period from the community with the lowest nitrogen dioxide level to the community with the highest nitrogen dioxide level, represented by the slope of the plotted regression line in Figure 2, was −101.4 ml.

Estimated differences in the growth of FEV_1, FVC, and MMEF during the eight-year period with respect to all pollutants are summarized in Table 3. Deficits in the growth of FEV_1 and FVC were observed for all pollutants, and deficits in the growth of MMEF were observed for all but ozone, with several combinations of outcome variables and pollutants attaining statistical significance. Specifically, for FEV_1 we observed significant negative correlations between the growth in this variable over the eight-year period and exposure to acid vapor ($P=0.004$), $PM_{2.5}$ ($P=0.04$), and elemental carbon ($P=0.007$), in addition to the above-mentioned correlation with nitrogen dioxide. As with FEV_1, the effects of the various pollutants on FVC and MMEF did not differ significantly between boys and girls. Significant deficits in FVC were associated with exposure to nitrogen dioxide ($P=0.05$) and acid vapor ($P=0.03$), whereas deficits in MMEF were associated with exposure to nitrogen dioxide ($P=0.02$) and elemental carbon ($P=0.04$). There was no significant evidence that ozone, either the average value obtained from 10 a.m. to 6 p.m. or the one-hour maximal level, was associated with any measure of lung function. In two-pollutant models for any of the measures of pulmonary function, adjustment for ozone did not substantially alter the effect estimates or significance levels of any other pollutant (data not shown). In general, two-pollutant models for any pair of pollutants did not provide a significantly better fit to the data than the corre-

Table 1. Correlation of Mean Air-Pollution Levels from 1994 through 2000 across the 12 Study Communities.*

Pollutant	O_3 (10 a.m.–6 p.m.)	NO_2	Acid Vapor†	PM_{10}	$PM_{2.5}$	Elemental Carbon	Organic Carbon
			R value				
O_3							
1-Hour maximal level	0.98	0.10	0.53	0.31	0.33	0.17	0.25
10 a.m.–6 p.m.		−0.11	0.35	0.18	0.18	−0.03	0.13
NO_2			0.87	0.67	0.79	0.94	0.64
Acid vapor†				0.79	0.87	0.88	0.76
PM_{10}					0.95	0.85	0.97
$PM_{2.5}$						0.91	0.91
Elemental carbon							0.82

* Unless otherwise noted, values are the 24-hour average pollution levels. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.
† Acid vapor is the sum of nitric, formic, and acetic acid levels.

Table 2. Mean Levels of Growth in Pulmonary Function during the Eight-Year Study Period, from 1993 to 2001.*

Pulmonary-Function Measure	Girls			Boys		
	Age of 10 yr	Age of 18 yr	Average 8-yr growth	Age of 10 yr	Age of 18 yr	Average 8-yr growth
FVC (ml)	2262	3790	1528	2427	5202	2775
FEV_1 (ml)	1988	3332	1344	2082	4464	2382
MMEF (ml/sec)	2311	3739	1428	2287	4709	2422

* Levels at the ages of 10 and 18 years are derived from the growth model described in the Methods section. FVC denotes forced vital capacity, FEV_1 forced expiratory volume in one second, and MMEF maximal midexpiratory flow rate.

sponding single-pollutant models; this was not surprising, given the strong correlation between most pollutants.

The association between pollution and the growth in FEV_1 over the eight-year period remained significant in a variety of sensitivity analyses (Table 4). For example, estimates of the effect of acid vapor and elemental carbon (model 1 in Table 4) changed little with adjustment for in-utero exposure to maternal smoking (model 2), presence in the home of a gas stove (model 3) or pets (model 4), or parental level of education (model 5). To account for possible confounding by short-term effects of air pollution, we fitted a model that adjusted for the average ozone, nitrogen dioxide, and PM_{10} levels on the three days before each child's pulmonary-function test. This adjustment also had little effect on the estimates of the long-term effects of air pollution (model 6). Table 4 also shows that the effects of pollutants remained large and significant in the subgroups of children with no history of asthma (model 7) and those with no history of smoking (model 8). The effects of pollutants were not significant among the 457 children who had a history of asthma or among the 483 children who had ever smoked (data not shown), although the sample sizes in these subgroups were small. Model 9 demonstrates that the extremes in pollutant levels did not drive the observed associations; in other words, we found similar effect estimates after eliminating the two communities with the highest and lowest levels of each pollutant. Finally, model 10 shows the effects of pollutants in the subgroup of subjects who underwent pulmonary-function testing in both 1993 and 2001 (i.e., subjects who participated in both the first and last year of the study). The magnitudes of effects in this subgroup were similar to those in the entire sample (model 1), suggesting that observed effects of pollutants in the entire sample cannot be attributed to biased losses to follow-up across communities. These sensitivity analyses were also applied to the other pollutants and to FVC and MMEF, with similar results.

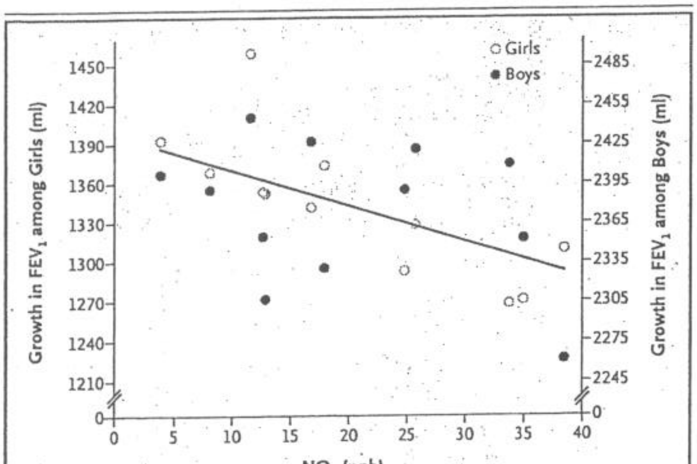


Figure 2. Community-Specific Average Growth in FEV_1 among Girls and Boys During the Eight-Year Period from 1993 to 2001 Plotted against Average Nitrogen Dioxide (NO_2) Levels from 1994 through 2000.

Pollution-related deficits in the average growth in lung function over the eight-year period resulted in clinically important deficits in attained lung function at the age of 18 years (Fig. 3). Across the 12 communities, a clinically low FEV_1 was positively correlated with the level of exposure to nitrogen dioxide ($P=0.005$), acid vapor ($P=0.01$), PM_{10} ($P=0.02$), $PM_{2.5}$ ($P=0.002$), and elemental carbon ($P=0.006$). For example, the estimated proportion of children with a low FEV_1 (represented by the regression line in Fig. 3) was 1.6 percent at the lowest level of exposure to $PM_{2.5}$ and was 4.9 times as great (7.9 percent) at the highest level of exposure to $PM_{2.5}$

0543

Table 3. Difference in Average Growth in Lung Function over the Eight-Year Study Period from the Least to the Most Polluted Community.*

Pollutant	FVC		FEV_1		MMEF	
	Difference (95% CI)	P Value	Difference (95% CI)	P Value	Difference (95% CI)	P Value
	ml		*ml*		*ml/sec*	
O_3						
10 a.m.–6 p.m.	−50.6 (−171.0 to 69.7)	0.37	−22.8 (−122.3 to 76.6)	0.62	85.6 (−130.0 to 301.1)	0.40
1-Hour maximal level	−70.3 (−183.3 to 42.6)	0.20	−44.5 (−138.9 to 50.0)	0.32	45.7 (−172.3 to 263.6)	0.65
NO_2	−95.0 (−189.4 to −0.6)	0.05	−101.4 (−164.5 to −38.4)	0.005	−211.0 (−377.6 to −44.4)	0.02
Acid vapor	−105.2 (−194.5 to −15.9)	0.03	−105.8 (−168.8 to −42.7)	0.004	−165.0 (−344.8 to 14.7)	0.07
PM_{10}	−60.2 (−190.6 to 70.3)	0.33	−82.1 (−176.9 to 12.8)	0.08	−154.2 (−378.3 to 69.8)	0.16
$PM_{2.5}$	−60.1 (−166.1 to 45.9)	0.24	−79.7 (−153.0 to −6.4)	0.04	−168.9 (−345.5 to 7.8)	0.06
Elemental carbon	−77.7 (−166.7 to 11.3)	0.08	−87.9 (−146.4 to −29.4)	0.007	−165.5 (−323.4 to −7.6)	0.04
Organic carbon	−58.6 (−196.1 to 78.8)	0.37	−86.2 (−185.6 to 13.3)	0.08	−151.2 (−389.4 to 87.1)	0.19

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 37.5 ppb of O_3 (measured from 10 a.m. to 6 p.m.), 46.0 ppb of O_3 (the one-hour maximal level), 34.6 ppb of NO_2, 9.6 ppb of acid vapor, 51.4 μg of PM_{10} per cubic meter, 22.8 μg of $PM_{2.5}$ per cubic meter, 1.2 μg of elemental carbon per cubic meter, and 10.5 μg of organic carbon per cubic meter. CI denotes confidence interval.

(P=0.002). Similar associations between these pollutants and a low FEV_1 were observed in the subgroup of children with no history of asthma and the subgroup with no history of smoking (data not shown). A low FEV_1 was not significantly correlated with exposure to ozone in any group.

DISCUSSION

The results of this study provide robust evidence that lung development, as measured by the growth in FVC, FEV_1, and MMEF from the ages of 10 to 18 years, is reduced in children exposed to higher levels of ambient air pollution. The strongest associations were observed between FEV_1 and a correlated set of pollutants, specifically nitrogen dioxide, acid vapor, and elemental carbon. The effects of these pollutants on FEV_1 were similar in boys and girls and remained significant among children with no history of asthma and among those with no history of smoking, suggesting that most children are susceptible to the chronic respiratory effects of breathing polluted air. The magnitude of the observed effects of air pollution on the growth in lung function during this age interval was similar to those that have been reported for exposure to maternal smoking[17,18] and smaller than those reported for the effects of personal smoking.[17,19]

Cumulative deficits in the growth in lung function during the eight-year study period resulted in a strong association between exposure to air pollution and a clinically low FEV_1 at the age of 18 years. In general, lung development is essentially complete in girls by the age of 18 years, whereas in boys it continues into their early 20s, but at a much reduced rate. It is therefore unlikely that clinically significant deficits in lung function at the age of 18 years will be reversed in either girls or boys as they complete the transition into adulthood. Deficits in lung function during young adulthood may increase the risk of respiratory conditions — for example, episodic wheezing that occurs during a viral infection.[20] However, the greatest effect of pollution-related deficits may occur later in life, since reduced lung function is a strong risk factor for complications and death during adulthood.[21-27]

Deficits in lung function were associated with a correlated set of pollutants that included nitrogen dioxide, acid vapor, fine-particulate matter ($PM_{2.5}$), and elemental carbon. In southern California, the primary source of these pollutants is motor vehicles, either through direct tailpipe emissions or downwind physical and photochemical reactions of vehicular emissions. Both gasoline- and diesel-powered engines contribute to the tons of pollutants exhausted into southern California's air every day, with diesel vehicles responsible for disproportionate amounts of nitrogen dioxide, $PM_{2.5}$, and ele-

Table 4. Sensitivity Analysis of the Effects of Acid Vapor and Elemental Carbon on Growth in FEV_1 over the Eight-Year Study Period.*

Model	Acid Vapor	Elemental Carbon
	Difference (95% Confidence Interval)	
Main model (model 1)†	−105.8 (−168.8 to −42.7)	−87.9 (−146.4 to −29.4)
Additional covariates‡		
Main model + in-utero exposure to maternal smoking (model 2)	−108.8 (−173.3 to −44.2)	−85.8 (−147.4 to −24.1)
Main model + exposure to gas stove (model 3)	−106.0 (−181.5 to −30.6)	−84.8 (−154.7 to −14.9)
Main model + pets in home (model 4)	−108.4 (−171.6 to −45.2)	−89.8 (−149.1 to −30.6)
Main model + parental level of education (model 5)	−100.7 (−167.2 to −34.2)	−80.9 (−142.7 to −19.0)
Main model + short-term effects of pollution (model 6)§	−112.4 (−201.4 to −23.3)	−103.2 (−181.8 to −24.5)
Subgroup effects		
No history of asthma (model 7)¶	−98.1 (−166.4 to −29.8)	−88.9 (−149.2 to −28.6)
No history of smoking (model 8)‖	−115.6 (−233.7 to 2.5)	−113.3 (−214.9 to −11.6)
After exclusion of communities with lowest and highest levels of pollution (model 9)**	−106.7 (−192.3 to −21.2)	−94.7 (−173.7 to −15.7)
Complete follow-up (model 10)††	−132.4 (−226.2 to −38.7)	−97.4 (−195.6 to 0.9)

* Values are the differences in the estimated rate of eight-year growth at the lowest and highest observed levels of the indicated pollutant. Differences are scaled to the range across the 12 study communities in the average level of each pollutant from 1994 through 2000 as follows: 9.6 ppb of acid vapor and 1.2 μg of elemental carbon per cubic meter.

† Model 1 is equivalent to effect estimates for FEV_1 in Table 3 and is based on data on 1759 children.

‡ The main model was adjusted for each of the covariates listed.

§ Values were adjusted for the average levels of O_3, NO_2, and PM_{10} on the three days before each child's pulmonary-function test.

¶ The analysis includes data on 1302 children with no history of doctor-diagnosed asthma.

‖ The analysis includes data on 1276 children with no history of active tobacco smoking at any time during follow-up.

** The analysis excludes children from the two communities with the lowest and highest levels of each pollutant. This leaves 1507 children (excluding those from Lompoc and Upland) in the analysis of acid vapor and 1484 children (excluding those from Lompoc and Long Beach) in the analysis of elemental carbon.

†† The analysis includes 713 children who underwent pulmonary-function testing in both 1993 and 2001 (i.e., those observed throughout the study).

mental carbon. In the current study, however, we could not discern the independent effects of pollutants because they came from common sources and there was a high degree of intercorrelation among them; similar difficulties have also been encountered in other studies of lung function and air-pollutant mixtures.[1,2,9,28-30] Since ozone is also formed during photochemical reactions involving fuel-combustion products, one might expect ozone to be correlated with the other study pollutants and therefore to show similar associations with lung function. However, the Children's Health Study was specifically designed to minimize the correlation of ozone with other pollutants across the 12 study communities. Thus, although ozone has been convincingly linked to acute health effects in many other studies,[11] our results provide little evidence that ambient ozone at current levels is associated with chronic deficits in the growth of lung function in children. Only a few other studies have addressed the long-term effects of ozone on lung development in children, and results have been inconsistent.[31] Although we found little evidence of an effect of ozone, this result needs to be interpreted with caution given the potential for substantial misclassification of exposure to ozone.[32,33]

The mechanism whereby exposure to pollutants could lead to reduced lung development is unknown, but there are many possibilities. Our observation of associations between air pollution and all three measures of lung function — FVC, FEV_1, and MMEF — suggests that more than one process is involved. FVC is largely a function of the number and size of alveoli, with differences in volume pri-

0545

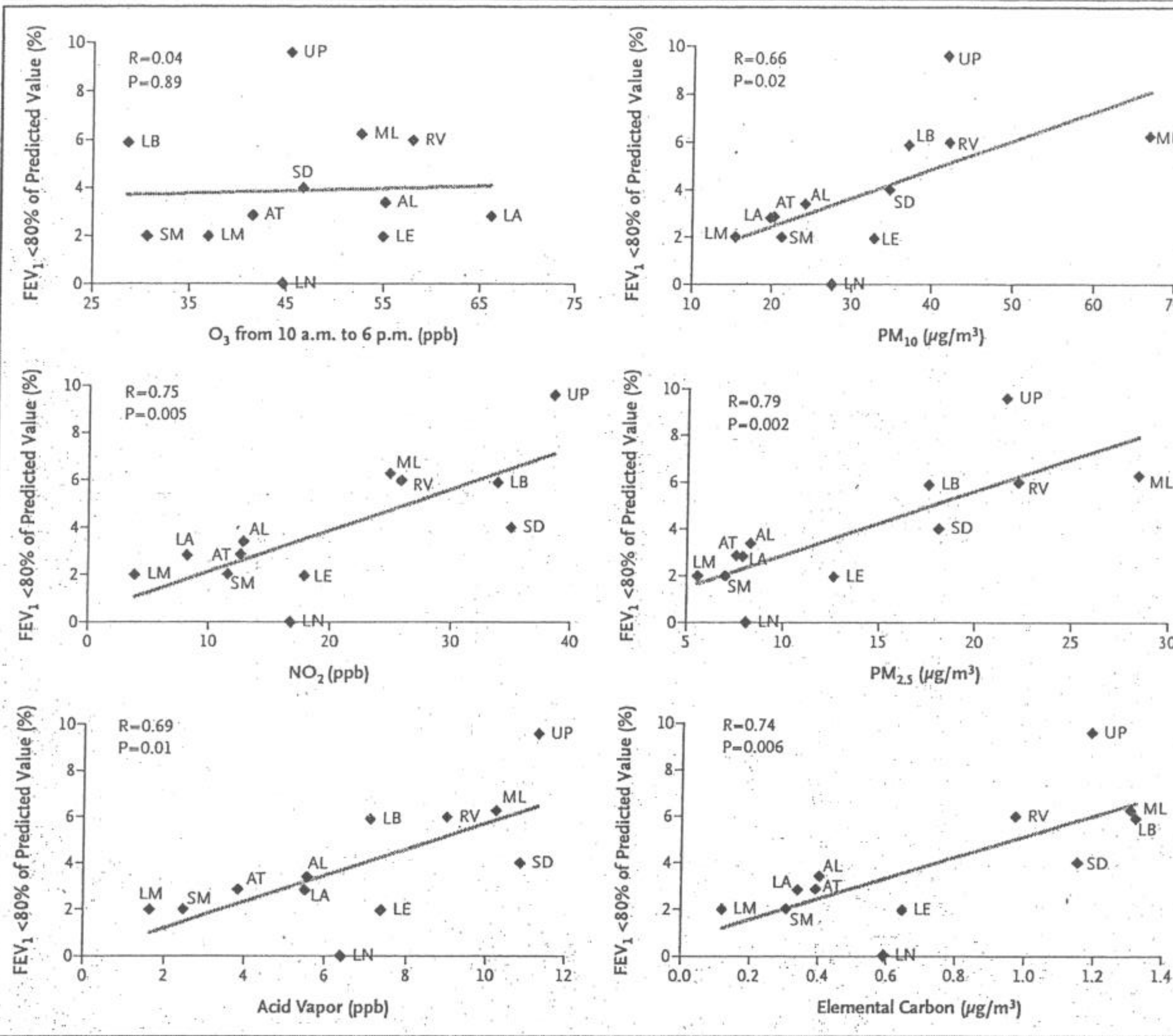


Figure 3. Community-Specific Proportion of 18-Year-Olds with a FEV_1 below 80 Percent of the Predicted Value Plotted against the Average Levels of Pollutants from 1994 through 2000.

The correlation coefficient (R) and P value are shown for each comparison. AL denotes Alpine, AT Atascadero, LE Lake Elsinore, LA Lake Arrowhead, LN Lancaster, LM Lompoc, LB Long Beach, ML Mira Loma, RV Riverside, SD San Dimas, SM Santa Maria, and UP Upland. O_3 denotes ozone, NO_2 nitrogen dioxide, and PM_{10} and $PM_{2.5}$ particulate matter with an aerodynamic diameter of less than 10 μm and less than 2.5 μm, respectively.

marily attributable to differences in the number of alveoli, since their size is relatively constant.[34] However, since the postnatal increase in the number of alveoli is complete by the age of 10 years, pollution-related deficits in the growth of FVC and FEV_1 during adolescence may, in part, reflect a reduction in the growth of alveoli. Another plausible mechanism of the effect of air pollution on lung development is airway inflammation, such as occurs in bronchiolitis; such changes have been observed in the airways of smokers and of subjects who lived in polluted environments.[35,36]

A strength of our study was the long-term, prospective follow-up of a large cohort, with exposure and outcome data collected in a consistent manner throughout the study period. As in any epidemiologic study, however, the observed effects could be biased by underlying associations of the exposure and outcome to some confounding variables. We adjusted for known potential confounders, includ-

0546

ing personal characteristics and other sources of exposure to pollutants, but the possibility of confounding by other factors still exists. Over the eight-year follow-up period, approximately 10 percent of study subjects were lost to follow-up each year. Attrition is a potential source of bias in a cohort study if loss to follow-up is related to both exposure and outcome. However, we did not see evidence that the loss of subjects was related to either baseline lung function or exposure to air pollution. In addition, we observed significant associations between air pollution and lung growth in the subgroup of children who were followed for the full eight years of the study, with effects that were similar in magnitude to those in the group as a whole, thus making loss of subjects an unlikely source of bias.

We have shown that exposure to ambient air pollution is correlated with significant deficits in respiratory growth over an eight-year period, leading to clinically important deficits in lung function at the age of 18 years. The specific pollutants that were associated with these deficits included nitrogen dioxide, acid vapor, $PM_{2.5}$, and elemental carbon. These pollutants are products of primary fuel combustion, and since they are present at similar levels in many other areas,[37,38] we believe that our results can be generalized to children living outside southern California. Given the magnitude of the observed effects and the importance of lung function as a determinant of morbidity and mortality during adulthood, continued emphasis on the identification of strategies for reducing levels of urban air pollutants is warranted.

Supported in part by a contract (A033-186) with the California Air Resources Board, grants (5P30ES07048 and 1P01ES11627) from the National Institute of Environmental Health Sciences, and the Hastings Foundation.

We are indebted to Morton Lippmann, Jonathan Samet, Frank Speizer, John Spengler, Scott Zeger, Paul Enright, William Linn, and Dane Westerdahl for important advice; to the school principals, teachers, students, and parents in each of the 12 study communities for their cooperation; and especially to the members of the health testing field team for their efforts.

REFERENCES

1. Frischer T, Studnicka M, Gartner C, et al. Lung function growth and ambient ozone: a three-year population study in school children. Am J Respir Crit Care Med 1999;160:390-6.

2. Jedrychowski W, Flak E, Mroz E. The adverse effect of low levels of ambient air pollutants on lung function growth in preadolescent children. Environ Health Perspect 1999;107:669-74.

3. Horak F Jr, Studnicka M, Gartner C, et al. Particulate matter and lung function growth in children: a 3-yr follow-up study in Austrian schoolchildren. Eur Respir J 2002; 19:838-45.

4. Gauderman WJ, McConnell R, Gilliland F, et al. Association between air pollution and lung function growth in southern California children. Am J Respir Crit Care Med 2000;162:1383-90.

5. Avol EL, Gauderman WJ, Tan SM, London SJ, Peters JM. Respiratory effects of relocating to areas of differing air pollution levels. Am J Respir Crit Care Med 2001; 164:2067-72.

6. Gauderman WJ, Gilliland GF, Vora H, et al. Association between air pollution and lung function growth in southern California children: results from a second cohort. Am J Respir Crit Care Med 2002;166:76-84.

7. Ware JH, Ferris BG Jr, Dockery DW, Spengler JD, Stram DO, Speizer FE. Effects of ambient sulfur oxides and suspended particles on respiratory health of preadolescent children. Am Rev Respir Dis 1986;133: 834-42.

8. Dockery DW, Speizer FE, Stram DO, Ware JH, Spengler JD, Ferris BG Jr. Effects of inhalable particles on respiratory health of children. Am Rev Respir Dis 1989;139: 587-94.

9. Schwartz J. Lung function and chronic exposure to air pollution: a cross-sectional analysis of NHANES II. Environ Res 1989; 50:309-21.

10. Raizenne M, Neas LM, Damokosh AI, et al. Health effects of acid aerosols on North American children: pulmonary function. Environ Health Perspect 1996;104:506-14.

11. Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society. Health effects of outdoor air pollution. Am J Respir Crit Care Med 1996;153:3-50, 477-98.

12. Peters JM, Avol E, Gauderman WJ, et al. A study of twelve Southern California communities with differing levels and types of air pollution. II. Effects on pulmonary function. Am J Respir Crit Care Med 1999;159:768-75.

13. Peters JM, Avol E, Navidi W, et al. A study of twelve Southern California communities with differing levels and types of air pollution. I. Prevalence of respiratory morbidity. Am J Respir Crit Care Med 1999; 159:760-7.

14. Wang X, Dockery DW, Wypij D, et al. Pulmonary function growth velocity in children 6 to 18 years of age. Am Rev Respir Dis 1993;148:1502-8.

15. Elemental carbon (diesel exhaust). In: NIOSH manual of analytical methods. No. 5040. Issue 3 (interim report). Cincinnati: National Institute for Occupational Safety and Health, 1999.

16. SAS/STAT user's guide, version 9. Cary, N.C.: SAS Institute, 2002.

17. Tager IB, Weiss ST, Munoz A, Rosner B, Speizer FE. Longitudinal study of the effects of maternal smoking on pulmonary function in children. N Engl J Med 1983;309: 699-703.

18. Wang X, Wypij D, Gold DR, et al. A longitudinal study of the effects of parental smoking on pulmonary function in children 6-18 years. Am J Respir Crit Care Med 1994; 149:1420-5.

19. Tager I, Munoz A, Rosner B, Weiss ST, Carey V, Speizer FE. Effect of cigarette smoking on the pulmonary function of children and adolescents. Am Rev Respir Dis 1985;131:752-9.

20. Mckean M, Leech M, Lambert PC, Hewitt C, Myint S, Silverman M. A model of viral wheeze in nonasthmatic adults: symptoms and physiology. Eur Respir J 2001;18: 23-32.

21. Schroeder EB, Welch VL, Couper D, et al. Lung function and incident coronary heart disease: the Atherosclerosis Risk in Communities Study. Am J Epidemiol 2003; 158:1171-81.

22. Schunemann HJ, Dorn J, Grant BJ, Winkelstein W Jr, Trevisan M. Pulmonary function is a long-term predictor of mortality in the general population: 29-year follow-up of the Buffalo Health Study. Chest 2000; 118:656-64.

23. Knuiman MW, James AL, Davitini ML, Ryan G, Bartholomew HC, Musk AW. Lung function, respiratory symptoms, and mortality: results from the Busselton Health Study. Ann Epidemiol 1999;9:297-306.

24. Hole DJ, Watt GC, Davey Smith G, Hart CL, Gillis CR, Hawthorne VM. Impaired

0547

lung function and mortality risk in men and women: findings from the Renfrow and Paisley prospective population study. BMJ 1996;313:711-5.
25. Kannell WB, Hubert H, Lew EA. Vital capacity as a predictor of cardiovascular disease: the Framingham Study. Am Heart J 1983;105:311-5.
26. Friedman GD, Klatsky AL, Siegelaub AB. Lung function and risk of myocardial infarction and sudden cardiac death. N Engl J Med 1976;294:1071-5.
27. Ashley F, Kannell WB, Sorlie PD, Masson R. Pulmonary function: relation to aging, cigarette habit, and mortality. Ann Intern Med 1975;82:739-45.
28. Detels R, Tashkin DP, Sayre JW, et al. The UCLA population studies of chronic obstructive respiratory disease. 9. Lung function changes associated with chronic exposure to photochemical oxidants: a cohort study among never-smokers. Chest 1987; 92:594-603.
29. Detels R, Tashkin DP, Sayre JW, et al. The UCLA population studies of CORD. X. A cohort study of changes in respiratory function associated with chronic exposure to SOx, NOx, and hydrocarbons. Am J Public Health 1991;81:350-9.
30. Tashkin DP, Detels R, Simmons M, et al. The UCLA population studies of chronic obstructive respiratory disease. XI. Impact of air pollution and smoking on annual change in forced expiratory volume in one second. Am J Respir Crit Care Med 1994;149:1209-17.
31. Tager IB. Air pollution and lung function growth: is it ozone? Am J Respir Crit Care Med 1999;160:387-9.
32. Avol EL, Navidi WC, Rappaport EB, Peters JM. Acute effects of ambient ozone on asthmatic, wheezy, and healthy children. Res Rep Health Eff Inst 1998;82:1-30.
33. Sarnat JA, Schwartz J, Catalano PJ, Suh HH. Gaseous pollutants in particulate matter epidemiology: confounders or surrogates? Environ Health Perspect 2001;109:1053-61.
34. Ochs M, Nyengaard JR, Jung A, et al. The number of alveoli in the human lung. Am J Respir Crit Care Med 2004;169:120-4.
35. Churg A, Brauer M, del Carmen Avila-Casado M, Fortoul TI, Wright JL. Chronic exposure to high levels of particulate air pollution and small airway remodeling. Environ Health Perspect 2003;111:714-8.
36. Sherwin RP, Richters V, Kraft P, Richters A. Centriacinar region inflammatory disease in young individuals: a comparative study of Miami and Los Angeles residents. Virchows Arch 2000;437:422-8.
37. Tolocka M, Solomon P, Mitchell W, Norris G, Gemmill D, Wiener R. East vs. West in the US: chemical characteristics of PM2.5 during the winter of 1999. Aerosol Sci Technol 2001;34:88-96.
38. Latest findings on national air quality: 2002 status and trends. Research Triangle Park, N.C.: Environmental Protection Agency, 2003. (Report no. 454/K-03-001.)

H

average joint distributions of wind speeds and directions were obtained from 1 surface-monitoring station in or near each study community. The dispersion model was applied to simulate the transport and dispersion of NO_x as a chemically inert pollutant. Although NO, NO_2, and ozone undergo rapid atmospheric chemical reactions immediately downwind of sources, NO_x can be treated as a chemically inert pollutant for the first hour of transport from sources because the time-scale for NO_x oxidation is 10 to 20 hours in urban atmospheres.[25] Vehicle NO_x emission rates were obtained from the California Air Resources Board's EMFAC2002 vehicle emissions model. Concentrations of NO_2 were estimated by applying the annual average ratio of observed NO_2 to NO_x for each hour of the day (from the community central site monitor) to the CALINE4 model's estimated NO_x concentrations. We estimated the contribution to residential exposure separately for freeway and for nonfreeway traffic.

Ambient NO_2 concentrations in the community are a result of meteorologic transport of pollutants into the community, local point and area source emissions, and local mobile source emissions. The CALINE4 model was used to model NO_2 from local traffic in each community and, therefore, always predicts concentrations lower than the total NO_2 from all sources. Separate regional modeling analysis has indicated that local mobile source emissions contribute 12% to 68% of the average NO_2 in the study communities.[23] For comparison purposes, we also generated exposure assignments based on fine particulate matter (PM) and carbon monoxide (CO) emission factors. Model-based estimates of NO_2, PM, and CO were very highly correlated with one another ($R > 0.90$), indicating that the NO_2-based estimates we use in this article should be considered an estimate of traffic-related pollution in general rather than simply exposure to this specific pollutant.

Questionnaire Data

When we originally enrolled subjects as fourth graders, each subject's parent or legal guardian completed a baseline medical history questionnaire. Asthma was defined as a "yes" response to the question "Has a doctor ever diagnosed your child as having asthma?" This questionnaire was also used to determine whether the child had recently (within the last 12 months) wheezed, recently wheezed during exercise, or was currently using any type of medication to control asthma. Questions about potential risk factors for asthma included parental income or education, environmental tobacco smoke exposure, in utero exposure to maternal tobacco smoking, and presence in the home of mildew, water damage, gas stove, pests, and pets.

Statistical Analysis

We used logistic regression to model the relationship of each traffic measure, including measured NO_2 at the home and the traffic indicators described previously, with baseline asthma prevalence in the 208 study participants. A natural-log transformation of each traffic indicator was used in these analyses, because the distribution of each variable was positively skewed. All models included adjustments for sex, race, Hispanic ethnicity, cohort (whether the subject was enrolled in 1993 or 1996), and indicator variables for study community. We considered separate models for 2-week average NO_2 concentrations measured in summer and in winter and for the 4-week average across seasons. Odds ratios (ORs) for asthma in analyses of measured NO_2 concentrations were scaled to an increase of 5.7 ppb, the average interquartile range (IQR) in 4-week average NO_2 within the 10 communities. ORs for the traffic indicators were also scaled to 1 IQR in exposure (specifically 1.2 km for distance to the nearest freeway; 2720 vehicles per m^2 per day for traffic volumes within 150 meters; and 0.64, 0.49, and 1.27 ppb for model-based estimates of NO_2 from freeways, nonfreeways, and all roads, respectively).

RESULTS

Doctor-diagnosed asthma was reported by 31 (15%) of the 208 children, with variability in prevalence across communities (Table 1). Overall community-average NO_2 levels measured at homes ranged from 12.9 ppb in Atascadero to 51.5 ppb in San Dimas, with similar patterns across communities in summer and winter. The NO_2 levels (average of summer and winter) measured at homes are shown in Figure 1. Within each community, there was substantial variation in NO_2 levels from home to home. Although the amount of variation in NO_2 was generally larger in more polluted communities, there were some exceptions. For example, there was little variation in the relatively high NO_2 community of Mira Loma, whereas there was considerable variation in the lower NO_2 community of Alpine.

The average NO_2 concentration measured at homes was associated with asthma prevalence (Table 2). For each increase of 5.7 ppb in average NO_2, the OR for asthma increased by 1.83 (95% CI = 1.04–3.21). Odds ratios were similar whether based on summer-only (1.55) or winter-only (1.50) measurements. The effect of average NO_2 was of similar magnitude after adjustment for several potential confounders, including socioeconomic status of participants and housing characteristics (Table 2).

Measured NO_2 concentrations at homes were correlated with residential distance from the nearest freeway and with model-based estimates of traffic-related pollution from roadways (Appendix Table, available with the online version of this article). In each community, we observed negative correlations between NO_2 concentration and distance of the home to the freeway. The overall correlation between NO_2 and freeway distance, adjusted for community, was $R = -0.54$. The corresponding correlations of measured NO_2

0400

TABLE 1. Distribution of Lifetime History of Asthma and Measured NO_2 by Community (n = 208)

Community	No.	Asthma (%)	NO_2 (ppb) Summer	Winter	Average†
Alpine (AL)	24	21	20.1	19.0	19.6
Atascadero (AT)	13	23	12.3	13.6	12.9
Lake Elsinore (LE)	22	5	17.6	27.4	22.5
Lancaster (LN)	16	19	16.9	22.0	19.5
Long Beach (LB)	20	10	34.6	50.5	42.5
Mira Loma (ML)	17	12	37.2	48.4	42.8
Riverside (RV)	30	20	37.9	42.8	40.3
San Dimas (SD)	34	15	52.0	51.0	51.5
Santa Maria (SM)	19	16	12.7	17.9	15.3
Upland (UP)	13	8	46.3	36.0	41.2

*Parent report of doctor-diagnosed asthma in the child.
†Mean in each community of NO_2 concentrations measured at homes for 2 weeks each in summer and winter. Average is the 4-week arithmetic average of summer and winter measurements.

with model-based estimates were 0.56 for pollution from freeways and 0.34 for pollution from nonfreeways. In each community, measured NO_2 was more strongly correlated with estimates of freeway-related pollution than with nonfreeway pollution. Measured NO_2 was less correlated with traffic counts within 150 meters of homes ($R = 0.24$), with inconsistent patterns of correlations from community to community.

Both distance to the freeway and the model-based estimate of freeway-related pollutants were associated with asthma history (Table 3). Asthma prevalence was higher with decreasing distance from the freeway; specifically when comparing the 25th to 75th percentile of freeway distance, the OR was 1.89 (95% CI = 1.19–3.02). For the comparison of 75th to 25th percentile of model-based pollutant exposure from freeways, the OR was 2.22 (1.36–3.63). Asthma was not associated with traffic volumes or with model-based exposure to nonfreeway roads. The associations observed with freeway distance and model-based pollution from freeways were robust to adjustment for all of the potential confounders shown in Table 2 (data not shown).

Measured NO_2 and the 2 freeway-related traffic indicators were also associated with recent wheeze, recent wheeze with exercise, and current use of asthma medication

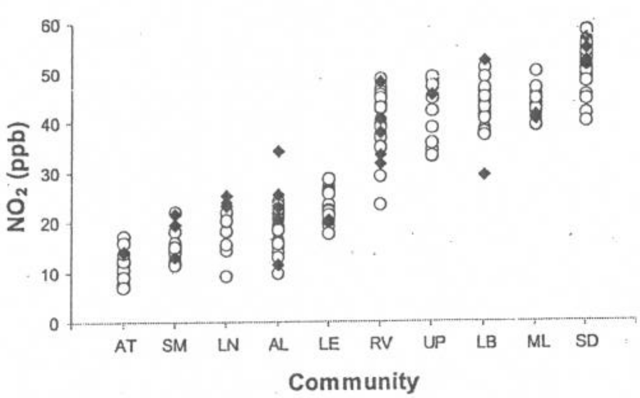


FIGURE 1. Four-week average of nitrogen dioxide measured at homes of asthmatic (solid black diamond) and nonasthmatic (open circle) children in 10 communities. See Table 1 for community abbreviations.

TABLE 2. Association Between 4-Week Average NO_2 at Homes and Asthma History, Adjusted for Several Potential Confounders

Description	OR* (95% CI)
Base model†	1.83 (1.04–3.21)
Base model, with additional adjustment for:	
Environmental tobacco smoke	1.93 (1.09–3.43)
In utero exposure to maternal smoking	1.85 (1.05–3.28)
Parental income	1.99 (1.11–3.57)
Parental education	1.90 (1.07–3.37)
Gas stove	1.87 (1.06–3.30)
Mildew	1.81 (1.01–3.23)
Water damage	1.82 (1.03–3.21)
Cockroaches	1.83 (1.04–3.21)
Pets	1.88 (1.06–3.33)

*Odds ratio per increase of 1 interquartile range (5.7 ppb) in NO_2.
†Base model includes adjustments for sex, race, Hispanic ethnicity, cohort, and community.

0461

TABLE 3. Associations Between Exposure to Traffic at Home and Asthma History

Exposure Metric	Odds Ratio per IQR OR* (95% CI)
Distance to freeway	1.89 (1.19–3.02)
Traffic volume within 150 meters	1.45 (0.73–2.91)
Model-based pollution from:	
Freeways	2.22 (1.36–3.63)
Other roads	1.00 (0.75–1.33)
Freeways and other roads	1.40 (0.86–2.27)

*Odds ratio per change of 1 IQR. For distance to freeway, OR for the 25th percentile compared with the 75th percentile (ie, living closer compared with farther from the freeway). For remaining traffic variables, OR for the 75th percentile compared with the 25th percentile. All models were adjusted for sex, race, Hispanic ethnicity, cohort, and community.

(Table 4). For example, the OR per increase of 5.7 ppb in measured NO_2 was 1.72 (1.07–2.77) for recent wheeze and was 2.19 (1.20–4.01) for current use of asthma medication.

DISCUSSION

We found robust associations of several indicators of exposure to traffic-related air pollution at homes in southern California with lifetime history of asthma, current asthma medication use, recent wheeze, and recent exercise-induced wheeze. Residential distance to a freeway and model-based estimates of freeway traffic-emission exposure at homes were each associated with the prevalence of asthma. Each of these traffic metrics was also correlated with measured concentrations of NO_2, and measured NO_2 was associated with asthma. Taken as a whole, these results indicate that exposure to outdoor levels of NO_2 or other freeway-related pollutants was a significant risk factor for asthma.

A strength of this asthma study is that it used both measured pollution and multiple indicators of exposure to traffic at the same homes in a large number of communities. The results suggest that measuring NO_2 or another pollutant is important for validation of the use of traffic measures and for selection of the most appropriate indicator of traffic exposure for the population under study. Those few studies that have measured residential exposure or that have validated models of exposure using measurements of pollutants have generally shown associations with asthma,[6,7,26] whereas the failure to validate traffic indicators may explain inconsistent results from several other studies.[8–11] In our study, simple distance to a freeway was as strongly and precisely associated with asthma and wheeze as was NO_2. It remains to be seen whether the association with this simple and widely available indicator is replicable in other studies or could be used for estimating risk in communities without having to make additional measurements of traffic-related pollutants.

We did not find associations between respiratory health and other indicators of traffic near homes, including modeled pollution from nonfreeway roads and traffic volumes within 150 meters of homes. One possible explanation for this lack of association is that the contribution to pollution levels from these smaller roads (where tens or hundreds of vehicles travel each day) is trivial compared with freeways that dominate the transportation grid in southern California with daily average counts in our communities between 50,000 to 270,000 vehicles. In addition, vehicle counts are accurately measured on freeways but are only estimated on smaller roads where participants lived. Our results are in contrast to several recent (mostly European) studies that have reported associations of asthma with traffic counts in close proximity to the home.[6,7,27,28] These differences in results may be partly the result of differences in urban geography and closer proximity of homes in Europe to heavily traveled roadways.

There have been a few other studies of traffic and childhood asthma in the United States. One large study in southern California found no association of asthma prevalence with traffic counts within 550 feet of the home,[9] similar to our finding of no association with traffic volumes within 150 meters of the home. Consistent with our findings related to measured NO_2, a recent study in northern California[29] found an association between measured traffic-related pollutants at schools and childhood asthma.

TABLE 4. Associations Between Measured NO_2 and Asthma-Related Outcomes (n = 208)

Outcome	No.	Measured NO_2 OR* (95% CI)	Distance to Freeway OR* (95% CI)	Model-based Pollution From Freeways OR* (95% CI)
Lifetime history of asthma	31	1.83 (1.04–3.22)	1.89 (1.19–3.02)	2.22 (1.36–3.63)
Recent wheeze†	43	1.72 (1.07–2.77)	1.59 (1.06–2.36)	1.70 (1.12–2.58)
Recent wheeze with exercise†	25	2.01 (1.08–3.72)	2.57 (1.50–4.38)	2.56 (1.50–4.38)
Current asthma medication use	26	2.19 (1.20–4.01)	2.04 (1.25–3.31)	1.92 (1.18–3.12)

*Odds ratio per change of 1 IQR in exposure (see footnotes to Tables 2 and 4).
†Within the last 12 months.

0462

The observed associations of traffic with asthma are biologically plausible. Increased oxidative and nitrosative stress associated with NO_2 exposure may impair respiratory responses to infection and thus result in lung injury and asthma exacerbation.[20,30] However, the association of NO_2 with asthma prevalence has been extensively evaluated in epidemiologic studies of exposure to indoor sources, often at levels considerably higher than the modest (5.7 ppb) IQR of exposure in our study, and the observed associations have not been consistent.[30,31] It is possible that outdoor NO_2, which occurs in a complex mixture that includes particulate matter and other pollutants known to affect respiratory health, is a marker of some other traffic-related pollutant(s) responsible for increasing asthma risk. For example, some field studies suggest that the concentration of fine particulate matter, especially black smoke (an indicator of diesel exhaust), varies with nearby high-traffic roads and with NO_2.[32–35] It has been hypothesized that particulate matter, especially diesel exhaust particulate, may contribute to the development of allergies and asthma.[36] Additional research is needed to study the health effects of specific pollutants that occur in complex mixtures of traffic emissions.

A possible limitation of this study is the assessment of asthma by questionnaire, which could be affected by access to care and differences in diagnostic practice among physicians.[37] However, we found associations of traffic indicators with recent wheeze and exercise-induced wheeze, 2 symptoms of asthma that are unlikely to be affected by access to care or diagnostic bias. Another limitation is the possibility of poor or biased reporting of asthma by parents. However, self-report of physician-diagnosed asthma has been found to reflect what physicians actually reported to patients, at least in adults, and validity as assessed by repeatability of response is good.[38] Self-report of physician diagnosis has been the main criterion for identifying asthma in epidemiologic studies of children and has been recommended as the epidemiologic gold standard because a more precise identification tool is not available.[39] Reporting bias is unlikely to have explained the observed associations, because parents were not aware of the specific focus of the study on air pollution at the time the questionnaire was completed. Biased participation with respect to disease status in this substudy is also unlikely, because the prevalence of doctor-diagnosed asthma in the sample of 208 children (15%, Table 1) was not very different from the asthma prevalence in the remaining 668 eligible children (13%, $P = 0.56$).

Another potential study limitation is that measured NO_2 and the traffic metrics were determined after the onset of asthma and extrapolated to earlier in life. However, the systems of freeways and other major roadways in the study communities have been in place and essentially unchanged for many years. We thus expect that the spatial pattern of exposure to traffic emissions from home to home was relatively similar over the lifetimes of these children. Bias could also have occurred if the families of asthmatic children had preferentially moved to a home near a freeway, but this seems unlikely. Additionally, our observed associations were robust to adjustment for factors known to be related to population mobility, housing location, and access to care, including race/ethnicity and indicators of socioeconomic status (as well as household characteristics). This robustness further suggests that our results were not the result of these potential confounders.

These results have both scientific and public health implications. They strengthen an emerging body of evidence that air pollution can cause asthma and that traffic-related pollutants that vary within communities are partly responsible for this association. The current regulatory approach that focuses almost exclusively on regional pollutants merits reevaluation in light of this emerging evidence and in light of the enormous costs associated with childhood asthma.[40] In addition, because NO_2 may be a surrogate for the pollutant or pollutants responsible for the observed effects, further study is indicated to identify the specific pollutant(s). In this regard, improved physical and chemical characterization of ambient ultrafine particles (including particle number concentration distributions, as well as more traditional chemical analyses) are topics of specific ongoing research interest in southern California and elsewhere.

ACKNOWLEDGMENTS

We are very grateful for input from the external advisory committee to this study, including David Bates, Morton Lippmann, Jonathan Samet, Frank Speizer, John Spengler, and Scott Zeger. We thank Tami Funk of Sonoma Technology for contributing to the assessment of residential distance to freeways, and Robert Weker of the Harvard School of Public Health for preparing and analyzing the Palmes tubes.

REFERENCES

1. Nicolai T. Air pollution and respiratory disease in children: what is the clinically relevant impact? *Pediatr Pulmonol Suppl.* 1999;18:9–13.
2. Clark NM, Brown RW, Parker E, et al. Childhood asthma. *Environ Health Perspect.* 1999;107(suppl 3):421–429.
3. Venn A, Lewis S, Cooper M, et al. Local road traffic activity and the prevalence, severity, and persistence of wheeze in school children: combined cross sectional and longitudinal study. *Occup Environ Med.* 2000;57:152–158.
4. Edwards J, Walters S, Griffiths RK. Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. *Arch Environ Health.* 1994;49:223–227.
5. Hirsch T, Weiland SK, von Mutius E, et al. Inner city air pollution and respiratory health and atopy in children. *Eur Respir J.* 1999;14:669–677.
6. van Vliet P, Knape M, de Hartog J, et al. Motor vehicle exhaust and chronic respiratory symptoms in children living near freeways. *Environ Res.* 1997;74:122–132.
7. Nicolai T, Carr D, Weiland SK, et al. Urban traffic and pollutant exposure related to respiratory outcomes and atopy in a large sample of children. *Eur Respir J.* 2003;21:956–963.
8. Wjst M, Reitmeir P, Dold S, et al. Road traffic and adverse effects on respiratory health in children. *BMJ.* 1993;307:596–600.
9. English P, Neutra R, Scalf R, et al. Examining associations between childhood asthma and traffic flow using a geographic information

0463

system. *Environ Health Perspect.* 1999;107:761–767.
10. Waldron G, Pottle B, Dod J. Asthma and the motorways—one district's experience. *J Public Health Med.* 1995;17:85–89.
11. Kramer U, Koch T, Ranft U, et al. Traffic-related air pollution is associated with atopy in children living in urban areas. *Epidemiology.* 2000;11:64–70.
12. Peters JM, Avol E, Gauderman WJ, et al. A study of twelve Southern California communities with differing levels and types of air pollution. II. Effects on pulmonary function. *Am J Respir Crit Care Med.* 1999; 159:768–775.
13. Gauderman WJ, McConnell R, Gilliland F, et al. Association between air pollution and lung function growth in southern California children. *Am J Respir Crit Care Med.* 2000;162:1383–1390.
14. Avol E, Gauderman W, Tan S, et al. Respiratory effects of relocating to areas of differing air pollution levels. *Am J Respir Crit Care Med.* 2001;164:2067–2072.
15. Gauderman WJ, Avol E, Gilliland F, et al. The effect of air pollution on lung function development in children aged 10 to 18 years. *New Engl J Med.* 2004;351:1057–1067.
16. McConnell R, Berhane K, Gilliland F, et al. Air pollution and bronchitic symptoms in southern California children with asthma. *Environ Health Perspect.* 1999;107:757–760.
17. McConnell R, Berhane K, Gilliland F, et al. Prospective study of air pollution and bronchitic symptoms in children with asthma. *Am J Respir Crit Care Med.* 2003;168:790–797.
18. McConnell R, Berhane K, Gilliland F, et al. Asthma in exercising children exposed to ozone: a cohort study. *Lancet.* 2002;359:386–391.
19. Palmes ED, Gunnison AF, DiMattio J, et al. Personal sampler for NO_2. *Journal of the American Industrial Hygiene Association.* 1976;37:570–577.
20. Linaker CH, Coggon D, Holgate ST, et al. Personal exposure to nitrogen dioxide and risk of airflow obstruction in asthmatic children with upper respiratory infection. *Thorax.* 2000;55:930–933.
21. Alm S, Mukala K, Pasanen P, et al. Personal NO2 exposures of preschool children in Helsinki. *J Expo Anal Environ Epidemiol.* 1998; 8:79–100.
22. Samet J, Lambert W, Skipper B, et al. Nitrogen dioxide and respiratory illnesses in infants. *Am Rev Respir Dis.* 1993;148:1258–1265.
23. Wu J, Lurmann F, Winer A, et al. Development of an individual exposure model for application to the Southern California children's health study. *Atmos Environ.* 2005;39:259–273.
24. Bensen P. *CALINE4—A Dispersion Model for Predicting Air Pollution Concentrations Near Roadways.* Sacramento: California Department of Transportation; 1989.
25. Trainer M, Parrish D, Goldan P, et al. Review of observation-based analysis of the regional factors influencing ozone concentrations. *Atmos Environ.* 2000;34:2045–2061.
26. Brauer M, Hoek G, Van Vliet P, et al. Air pollution from traffic and the development of respiratory infections and asthmatic and allergic symptoms in children. *Am J Respir Crit Care Med.* 2002;166:1092–1098.
27. Venn AJ, Lewis SA, Cooper M, et al. Living near a main road and the risk of wheezing illness in children. *Am J Respir Crit Care Med.* 2001;164:2177–2180.
28. Zmirou D, Gauvin S, Pin I, et al. Traffic related air pollution and incidence of childhood asthma: results of the Vesta case–control study. *J Epidemiol Community Health.* 2004;58:18–23.
29. Kim JJ, Smorodinsky S, Lipsett M, et al. Traffic-related air pollution near busy roads: the East Bay Children's Respiratory Health Study. *Am J Respir Crit Care Med.* 2004;170:520–526.
30. Health effects of outdoor air pollution. Part 2. Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society. *Am J Respir Crit Care Med.* 1996;153:477–498.
31. Bates DV. Observations on asthma. *Environ Health Perspect.* 1995; 103(suppl 6):243–247.
32. Brauer M, Hoek G, van Vliet P, et al. Estimating long-term average particulate air pollution concentrations: application of traffic indicators and geographic information systems. *Epidemiology.* 2003;14:228–239.
33. Fischer PH, Hoek G, Van Reeuwijka H, et al. Traffic-related differences in outdoor and indoor concentrations of particles and volatile organic compounds in Amsterdam. *Atmos Environ.* 2000;34:3713–3722.
34. Roorda-Knape MC, Janssen NAH, de Hartog JJ, et al. Air pollution from traffic in city districts near major motorways. *Atmos Environ.* 1998;32: 1921–1930.
35. Seaton A, Dennekamp M. Hypothesis: ill health associated with low concentrations of nitrogen dioxide—an effect of ultrafine particles? *Thorax.* 2003;58:1012–1015.
36. Li N, Kim S, Wang M, et al. Use of a stratified oxidative stress model to study the biological effects of ambient concentrated and diesel exhaust particulate matter. *Inhal Toxicol.* 2002;14:459–486.
37. Samet JM. Epidemiologic approaches for the identification of asthma. *Chest.* 1987;91:74S–78S.
38. Ehrlich RI, Du Toit D, Jordaan E, et al. Prevalence and reliability of asthma symptoms in primary school children in Cape Town. *Int J Epidemiol.* 1995;24:1138–1145.
39. Burr ML. Diagnosing asthma by questionnaire in epidemiological surveys [Editorial]. *Clin Exp Allergy.* 1992;22:509–510.
40. Smith DH, Malone DC, Lawson KA, et al. A national estimate of the economic costs of asthma. *Am J Respir Crit Care Med.* 1997;156:787–793.

0464

0465

PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Ambient Air Pollution: Health Hazards to Children

Committee on Environmental Health

Pediatrics 2004;114;1699-1707
DOI: 10.1542/peds.2004-2166

0468

AMERICAN ACADEMY OF PEDIATRICS

POLICY STATEMENT

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Committee on Environmental Health

Ambient Air Pollution: Health Hazards to Children

ABSTRACT. Ambient (outdoor) air pollution is now recognized as an important problem, both nationally and worldwide. Our scientific understanding of the spectrum of health effects of air pollution has increased, and numerous studies are finding important health effects from air pollution at levels once considered safe. Children and infants are among the most susceptible to many of the air pollutants. In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies have found links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma. This policy statement summarizes the recent literature linking ambient air pollution to adverse health outcomes in children and includes a perspective on the current regulatory process. The statement provides advice to pediatricians on how to integrate issues regarding air quality and health into patient education and children's environmental health advocacy and concludes with recommendations to the government on promotion of effective air-pollution policies to ensure protection of children's health. *Pediatrics* 2004;114:1699–1707; *air pollution, adverse effects, children, asthma, environmental health.*

ABBREVIATIONS. $PM_{2.5}$, particulate matter with a median aerodynamic diameter less than 2.5 μm; PM_{10}, particulate matter with a median aerodynamic diameter less than 10 μm; EPA, Environmental Protection Agency; HAP, hazardous air pollutant; AQI, air quality index.

INTRODUCTION

Although it has been 3 decades since passage of the Clean Air Act in 1970 (Pub L No. 91–604), the air in many parts of the United States is far from clean. Air quality has improved in some areas but decreased in others.[1] In addition, there are important health effects from air pollutants at levels once considered safe. Children and infants are among the most susceptible to many of the air pollutants.

In 2002, approximately 146 million Americans were living in areas where monitored air failed to meet the 1997 National Ambient Air Quality Standards for at least 1 of the 6 "criteria air pollutants": ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead (Table 1).[1] Although the standards for ozone and particulate matter were revised in 1997, legal barriers have delayed timely implementation.[2] Recent reports have identified adverse health effects at levels near or below the current standards for ozone, particulate matter, and nitrogen dioxide. Thus, the 1997 federal standards may not adequately protect children. Additionally, numerous other toxic air pollutants are of public health concern.[3]

Outdoor air pollution is also a major problem in developing countries. The World Health Organization found that the air quality in large cities in many developing countries is remarkably poor and that very large numbers of people in those countries are exposed to ambient concentrations of air pollutants well above the World Health Organization guidelines for air quality (www.who.int/ceh/publications/en/11airpollution.pdf).

Scientific understanding of the health effects of air pollution, including effects on children, has increased in the last decade. This statement updates a 1993 American Academy of Pediatrics (AAP) statement titled "Ambient Air Pollution: Respiratory Hazards to Children."[4]

EFFECTS OF AIR POLLUTION ON CHILDREN

Children are more vulnerable to the adverse effects of air pollution than are adults. Eighty percent of alveoli are formed postnatally, and changes in the lung continue through adolescence.[5] During the early postneonatal period, the developing lung is highly susceptible to damage after exposure to environmental toxicants.[5–7]

Children have increased exposure to many air pollutants compared with adults because of higher minute ventilation and higher levels of physical activity.[8] Because children spend more time outdoors than do adults, they have increased exposure to outdoor air pollution.[9,10]

Infants, children, the elderly, and those with cardiopulmonary disease are among the most susceptible to adverse health effects from criteria pollutants.[11–15] Lead is neurotoxic, especially during early childhood. Carbon monoxide interferes with oxygen transport through the formation of carboxyhemoglobin. Other criteria pollutants (ozone, sulfur dioxide, particulate matter, nitrogen dioxide) have respiratory effects in children and adults, including increased respiratory tract illness, asthma exacerbations, and decreased lung function (eg, changes in peak flow).[11–12] In adults, particulate air pollution is associated with respiratory and cardiovascular hos-

doi:10.1542/peds.2004-2166

0469

TABLE 1. National Ambient Air Quality Standards for Criteria Air Pollutants, 1997

Pollutant	Primary Standards*
Ozone	
1-h average	0.12 ppm (235 $\mu g/m^3$)
8-h average	0.08 ppm (157 $\mu g/m^3$)
PM_{10}	
Annual arithmetic mean	50 $\mu g/m^3$
24-h average	150 $\mu g/m^3$
$PM_{2.5}$	
Annual arithmetic mean	15 $\mu g/m^3$
24-h average	65 $\mu g/m^3$
Sulfur dioxide	
Annual arithmetic mean	0.03 ppm (80 $\mu g/m^3$)
24-h average	0.14 ppm (365 $\mu g/m^3$)
Nitrogen dioxide	
Annual arithmetic mean	0.053 ppm (100 $\mu g/m^3$)
Carbon monoxide	
8-h average	9 ppm (10 mg/m^3)
1-h average	35 ppm (40 mg/m^3)
Lead	
Quarterly average	1.5 $\mu g/m^3$

Additional information on air quality standards are available at www.epa.gov/air/criteria.html.
* People residing in regions with pollutant concentrations above the primary standard may experience adverse health effects from poor air quality.

pitalizations, cardiovascular mortality,[16] and lung cancer.[17] Air pollution also has effects on indirect health indicators such as health care utilization and school absences.[11–13]

Although numerous studies have shown that outdoor air pollution exacerbates asthma, the effect of outdoor air pollution on the development of asthma has been less clear. Recently, a prospective study found that the risk of developing asthma was not greater, overall, in children living in communities with high levels of ozone or particulate air pollution. However, in communities with high levels of ozone, there was an increased risk of developing asthma in a small subset of children involved in heavy exercise (participation in 3 or more team sports per year [relative risk: 3.3; 95% confidence interval: 1.9–5.8]). This increased risk with heavy exercise was not seen in low-ozone communities. Time spent outside was also associated with new cases of asthma in high-ozone communities (relative risk: 1.4; 95% confidence interval: 1.0–2.1) but not in low-ozone communities.[18] Additional studies are needed to define the role of outdoor air pollution in the development of asthma.

Children in communities with higher levels of urban air pollution (acid vapor, nitrogen dioxide, particulate matter with a median aerodynamic diameter less than 2.5 μm [$PM_{2.5}$], and elemental carbon [a component of diesel exhaust]) had decreased lung function growth, and children who spent more time outdoors had larger deficits in the growth rate of lung function.[19,20] Ambient air pollution (especially particulate matter with a median aerodynamic diameter less than 10 μm [PM_{10}]) has also been associated with several adverse birth outcomes, as discussed in the next section.

Levels of ozone and particulate matter are high enough in many parts of the United States to present health hazards to children.[1] Additionally, National Ambient Air Quality Standards for nitrogen dioxide may not be protective. Findings on these pollutants are summarized here.

Ozone

Ambient ozone is formed by the action of sunlight on nitrogen oxides and reactive hydrocarbons, both of which are emitted by motor vehicles and industrial sources. The levels tend to be highest on warm, sunny, windless days and often peak in midafternoon, when children are most likely to be playing outside.

Ozone is a powerful oxidant and respiratory tract irritant in adults and children, causing shortness of breath, chest pain when inhaling deeply, wheezing, and cough.[11] Children have decreases in lung function, increased respiratory tract symptoms, and asthma exacerbations on days with higher levels of ambient ozone.[11,21–23] Increases in ambient ozone have been associated with respiratory or asthma hospitalizations,[24,25] emergency department visits for asthma,[26] and school absences for respiratory tract illness.[27] In Atlanta, Georgia, summertime children's emergency department visits for asthma increased 37% after 6 days when ozone levels exceeded 0.11 ppm.[25] In southern California, school absences for respiratory tract illness increased 63% in association with a 0.02-ppm increase in ozone.[27]

In healthy adults, ozone causes airway inflammation and hyperreactivity, decrements in pulmonary function, and increased respiratory tract symptoms.[11] Ozone exposures at concentrations of 0.12 ppm or higher can result in decrements in lung function after subsequent challenge with aeroallergen.[28] Although most of the controlled studies of ozone exposure have been performed with adults, it is reasonable to believe that the results of these findings could be extended to children.

Ozone may be toxic at concentrations lower than 0.08 ppm, the current federal regulatory standard. Field studies suggest potential thresholds of between 0.04 and 0.08 ppm (1-hour average) for effects on lung function.[29–31] Recent studies of hospitalizations for respiratory tract illness in young children and emergency department visits for asthma suggest that the effects of ozone may occur at ambient concentrations below 0.09 ppm.[32,33] Another study found associations of ozone and respiratory symptoms in children with asthma at levels below the current US Environmental Protection Agency (EPA) standards.[34] If these findings are confirmed, the ozone standards may need additional revision.

In addition to studies on short-term effects, 2 recent studies of college freshmen suggest that increasing cumulative childhood exposure to ozone may affect lung function when exposed children reach young adulthood, particularly in measures of flow in small airways.[35,36] Early childhood exposures may, therefore, be particularly important.[35]

Particulate Matter

PM_{10} is small enough to reach the lower respiratory tract and has been associated with a wide range of serious health effects. PM_{10} is a heterogeneous mixture of small solid or liquid particles of varying composition found in the atmosphere. Fine particles ($PM_{2.5}$) are emitted from combustion processes (especially diesel-powered engines, power generation, and wood burning) and from some industrial activities. Coarse particles (diameter between 2.5 and 10 μm) include windblown dust from dirt roads or soil and dust particles created by crushing and grinding operations. Toxicity of particles may vary with composition.[37,38]

Particle pollution contributes to excess mortality and hospitalizations for cardiac and respiratory tract disease.[14,39–41] The mechanism for particulate matter–associated cardiac effects may be related to disturbances in the cardiac autonomic nervous system, cardiac arrhythmias, or increased blood concentrations of markers of cardiovascular risk (eg, fibrinogen).[16,42]

Daily changes in mortality rates and numbers of people hospitalized are linked to changes in particulate air pollution.[14,39–41] These studies and others have estimated that for every 10 $\mu g/m^3$ increase in PM_{10}, there is an increase in the daily mortality rate between 0.5% and 1.6%. Effects were seen even in cities with mean annual PM_{10} concentrations between 25 and 35 $\mu g/m^3$. These recent studies suggest that even the current federal standards for $PM_{2.5}$ (24-hour standard = 65 $\mu g/m^3$; annual standard = 15 $\mu g/m^3$) and PM_{10} (24-hour standard = 150 $\mu g/m^3$; annual standard = 50 $\mu g/m^3$) should be lowered to protect public health. In 2002, California adopted more stringent standards for particulate matter: the annual average standard for $PM_{2.5}$ is 12 $\mu g/m^3$ and for PM_{10} is 20 $\mu g/m^3$.[43]

In children, particulate pollution affects lung function[44–46] and lung growth.[19] In a prospective cohort of children living in southern California, children with asthma living in communities with increased levels of air pollution (especially particulates, nitrogen dioxide, and acid vapor) were more likely to have bronchitis symptoms. In this study, bronchitis symptoms refers to a parental report of "one or more episodes of 'bronchitis' in the past 12 months" or report that, "apart from colds, the child usually seems to be congested in the chest or able to bring up phlegm").[47] The same mix of air pollutants was also associated with deficits in lung growth (as measured by lung function tests).[19] Recent studies in different countries have also found associations between ambient air pollution (especially particulates and/or carbon monoxide) and postneonatal infant mortality (attributable to respiratory causes and possibly sudden infant death syndrome),[48,49] low birth weight,[50–53] and preterm birth.[51,54–56]

The relative contribution of fine versus coarse particles to adverse health effects is being investigated. In studies of cities on the East Coast, fine particles seem to be important.[57] In other areas, coarse particles have a stronger or similar effect.[58] Several studies have found that fine particles from power plants and motor vehicles[59] or industrial sources[60] may be more closely associated with mortality.

Nitrogen Dioxide

Nitrogen dioxide is a gaseous pollutant produced by high-temperature combustion. The main outdoor sources of nitrogen dioxide include diesel and gasoline-powered engines and power plants. Levels of nitrogen dioxide around urban monitors have decreased over the past 20 years. Currently, all areas of the country meet the national air quality standard for nitrogen dioxide of 0.053 ppm (100 $\mu g/m^3$), measured as an annual arithmetic mean. However, national emissions (overall production) of nitrogen oxides have actually increased in the past 20 years because of an increase in nitrogen oxide emissions from diesel vehicles.[1] This increase is of concern, because nitrogen oxide emissions contribute to ground-level ozone (smog) and other environmental problems such as acid rain.[1]

Controlled-exposure studies of people with asthma have found that short-term exposures (30 minutes) to nitrogen dioxide at concentrations as low as 0.26 ppm can enhance the allergic response after subsequent challenge with allergens.[61,62] These findings are of concern, because some urban communities that are in compliance with the federal standards for nitrogen dioxide (annual average) may experience substantial short-term peak concentrations (1-hour average) that exceed 0.25 ppm. Confirmation of these studies is needed.

Epidemiologic studies have reported relationships between increased ambient nitrogen dioxide and risks of respiratory tract symptoms[63,64] and asthma exacerbations.[65] As noted previously, children with asthma living in communities with increased levels of air pollution (especially nitrogen dioxide, acid vapor, and particulates) were more likely to have bronchitis symptoms.[47] The same mix of air pollutants was also associated with deficits in lung growth (as measured by lung function tests).[19] These effects were increased in children who spent more time outdoors.

The epidemiologic studies of health effects associated with nitrogen dioxide should be interpreted with caution. Increased levels of ambient nitrogen dioxide may be a marker for exposure to traffic emissions or other combustion-related pollution. An independent role of nitrogen dioxide cannot be clearly established because of the high covariation between ambient nitrogen dioxide and other pollutants. Nonetheless, these studies illustrate that adverse respiratory tract effects are seen in urban areas where traffic is a dominant source of air pollution.

Traffic-Related Pollution

Motor vehicles pollute the air through tailpipe exhaust emissions and fuel evaporation, contributing to carbon monoxide, $PM_{2.5}$, nitrogen oxides, hydrocarbons, other hazardous air pollutants (HAPs), and ozone formation. Motor vehicles represent the principal source of air pollution in many communities, and concentrations of traffic pollutants are greater near major roads.[66] Recently, investigators (primarily in Europe and Japan) have found increased adverse health effects among those living near busy roads.

0471

Studies examining associations between adverse respiratory tract health and traffic have been reviewed.[67] Increased respiratory tract complications in children (eg, wheezing, chronic productive cough, and asthma hospitalizations) have been associated with residence near areas of high traffic density (particularly truck traffic).[68–71] Other investigators have linked various childhood cancers to proximity to traffic.[72–74]

Diesel exhaust, a major source of fine particulates in urban areas, is carcinogenic. Numerous studies have found an association between occupational exposure to diesel exhaust and lung cancer.[75] On the basis of extensive toxicologic and epidemiologic evidence, national and international health authorities, including the EPA and the International Agency for Research on Cancer, have concluded that there is considerable evidence of an association between exposure to diesel exhaust and an increased risk of lung cancer.[76,77] Additionally, fine particles in diesel exhaust may enhance allergic and inflammatory responses to antigen challenge and may facilitate development of new allergies.[78,79] Thus, diesel exhaust exposure may worsen symptoms in those with allergic rhinitis or asthma.

School buses operate in proximity to children, and most of the nation's school bus fleets run on diesel fuel. The EPA and some state agencies are establishing programs to eliminate unnecessary school bus idling and to promote use of cleaner buses to decrease children's exposures to diesel exhaust and the amount of air pollution created by diesel school buses (www.epa.gov/cleanschoolbus). A recent pilot study found that a child riding inside a school bus may be exposed to as much as 4 times the level of diesel exhaust as someone riding in a car.[80] These findings underscore the importance of advocating for school districts to replace diesel buses or retrofit them with pollution-reducing devices and limit school bus idling where children congregate as soon as possible.

Other Air Pollutants

Airborne levels of lead, sulfur dioxide, and carbon monoxide have decreased dramatically because of the implementation of control measures. However, levels of these pollutants may still be high near major sources. For example, high lead levels may be found near metals-processing industries, high sulfur dioxide levels may occur near large industrial facilities (especially coal-fired power plants), and high levels of carbon monoxide may occur in areas with heavy traffic congestion.[1]

In addition to criteria air pollutants, there are numerous other air pollutants produced by motor vehicles, industrial facilities, residential wood combustion, agricultural burning, and other sources that are hazardous to children. More than 50000 chemicals are used commercially, and many are released into the air. For most of these chemicals, data on toxicity are sparse.[81] Some pollutants remain airborne or react in the atmosphere to produce other harmful substances. Other air pollutants deposit into and contaminate land and water. Some toxic air pollutants such as lead, mercury, and dioxins degrade slowly or not at all. These pollutants may bioaccumulate in animals at the top of the food chain, including humans. Children can be exposed to toxic air pollutants through contaminated air, water, soil, and food.[3] One example of a persistent pollutant emitted into ambient air that leads to exposure through another route is mercury, a developmental neurotoxicant.[82] Industrial emissions, especially from coal-fired power plants, are the leading source of environmental mercury. Although the levels of airborne mercury may not be hazardous, mercury deposits into soil and surface waters and ultimately accumulates in fish.[82]

The HAPs, often referred to as "toxic air contaminants" or "air toxics," refer to 188 pollutants and chemical groups known or suspected to cause serious health effects including cancer, birth defects, and respiratory tract and neurologic illness.[3,83] The Clean Air Act directs the EPA to regulate HAPs, which include compounds such as polycyclic aromatic hydrocarbons, acrolein, and benzene from fuel or fuel combustion; solvents such as hexane and toluene; hexavalent chromium from chrome-plating facilities; perchloroethylene from dry-cleaning plants; asbestos; metals (eg, mercury and cadmium); and persistent organic pollutants such as polychlorinated biphenyls. In 2001, diesel exhaust was listed as a mobile-source HAP. Many of these compounds are included in a priority list of 33 HAPs that are of special concern because of their widespread use and potential carcinogenicity and teratogenicity.[81] The priority list and general sources of these compounds are available on the EPA Web site (www.epa.gov/ttn/atw/nata).

Limited monitoring data suggest that concentrations of some HAPs may exceed the goals of the Clean Air Act in many cities.[84] Mobile sources (on- and off-road vehicles) account for approximately half of the emissions[3] but may contribute to 90% of the cancer risk (www.scorecard.org/env-releases/hap/us.tcl). A number of studies assessing health risks have found that estimated levels of some of the HAPs are a potential public health problem in many parts of the United States.[3,84–86] For example, estimated concentrations of benzene, formaldehyde, and 1,3-butadiene may contribute to extra cases of cancer (at least 1 extra case per million population exposed) in more than 90% of the census tracts in the contiguous United States. Additionally, the most recent national cancer-risk assessment for HAPs (1996 data) did not include diesel exhaust in the risk estimates.[3] The health risks may also be underestimated, because there is limited information on toxicity values for many of the HAPs,[87] and the risk models did not consider the potential for increased risk in children. These findings underscore the need for better ways to decrease toxic air emissions and assess exposures and risks.

Air-pollution episodes created by disasters (eg, accidents, volcanoes, forest fires, and acts of terrorism) can also create hazards for children. A discussion of these events and of bioaerosols in ambient air (eg, fungal spores and pollen) is beyond the scope of this policy statement. Additionally, this statement does not address the hazards of indoor air pollution.

PREVENTION

Public health interventions to improve air quality can improve health at the population level. A decrease in levels of air pollution in former East Germany after reunification was associated with a decrease in parent-reported bronchitis[88] and improved lung function.[89] During the 1996 Summer Olympics in Atlanta, Georgia, extensive programs were implemented to improve mass transportation and decrease anticipated downtown traffic congestion. These programs were successful and were associated with a prolonged decrease in ozone pollution and significantly lower rates of childhood asthma visits during this period.[90] Closure of a steel mill in Utah Valley and resultant reductions in particulate matter were associated with a twofold decrease in hospitalizations for asthma in preschool children.[91,92] Finally, lung function improved in children who moved away from communities with high particulate air pollution, compared with those who remained or moved to communities with comparable particulate air pollution.[93] These studies provide support for continued efforts to decrease air pollution and improve health via decreases in motor vehicle traffic and industrial emissions. Dietary factors may play a role in modulating the effects of air pollution in children. A recent study in Mexico City, Mexico, found that children with asthma given antioxidant supplements were less affected by ozone compared with a control group that did not receive supplementation.[94] Additional studies are needed to explore this issue further.

Air Pollution and the Regulatory Process

The Clean Air Act of 1970 mandated the EPA to establish the National Ambient Air Quality Standards (Table 1). Standards were set for criteria air pollutants because they are common, widespread, and known to be harmful to public health and the environment.[11,12,83,95] The standards are reviewed every 5 years and set to protect public health, including the health of "sensitive" populations such as people with asthma, children, and the elderly. These standards are set without considering the costs of attaining these levels.

The standards for ozone and particulate matter were revised in 1997 on the basis of numerous scientific studies showing that the previous standards were not adequate to ensure health protection. Legal challenges were made by the American Trucking Associations, the US Chamber of Commerce, and other state and local business groups. However, the Supreme Court ultimately supported the EPA and ordered implementation of the standards.[2] Establishing implementation plans will be a lengthy process that will require the coordinated efforts of the EPA, state and local governments, and industry and environmental organizations.

Population exposures to toxic air contaminants may be of substantial public health concern.[84,86] In contrast to criteria pollutants, monitoring of toxic air contaminants is more limited. Exposures are estimated on the basis of reported emissions and may underestimate actual exposures.[87] The EPA is mandated to develop regulations through a lengthy process that first sets standards to control emissions on the basis of best-available technology. After maximum available control technology emission standards are established, the EPA must assess the risk remaining after emission decreases for the source take effect (residual risk).

To date, the EPA has focused primarily on establishing technology-based emission standards,[3] and this has been a slow process for some sources (eg, mobile toxic air contaminants and mercury emissions). Nationwide, emissions of toxic air contaminants have dropped approximately 24% from baseline (1990–1993) because of regulation and voluntary decreases by industry. With the current plans for gradual fleet turnover and implementation of controls for motor vehicles and fuels, the EPA projects that toxic air-contaminant emissions from gasoline-powered and diesel mobile sources will not be decreased to 75% and 90% of baseline (1990–1993) levels, respectively, until the year 2020.[3] However, major decreases could be more rapidly achieved simply from a prompt, wider application of existing technology.

Protecting populations from exposure to the harmful effects of air pollutants will require effective control measures. Industry (eg, coal-burning power plants, refineries, and chemical plants) and motor vehicles (both gasoline- and diesel-powered) are major sources of criteria pollutants and HAPs.[11,12] For example, coal-fired power plants are important sources of nitrogen oxides (precursors of ozone), particulates, and sulfur dioxide and are the largest sources of mercury emission in the United States. Smaller sources such as dry cleaners, auto body shops, and wood-burning fireplaces can also affect air quality locally. Municipal and hospital waste incinerators release toxic air pollutants including mercury, lead, cadmium, and dioxin emissions. Depending on weather conditions and individual physicochemical properties, some pollutants can be carried by air currents to areas many miles from the source.

In numerous cities in the United States, the personal automobile is the single greatest polluter, because emissions from millions of vehicles on the road add up. Despite significant technologic advances that have led to tighter pollution control from vehicles, emissions vary substantially between vehicles, particularly between classes of vehicles, because of differences in fuel-economy standards set by regulatory agencies. For instance, the corporate average fuel-economy standards have less stringent fuel-economy requirements (average: 20.7 miles per gallon) for light-duty trucks, sport utility vehicles, and minivans, compared with passenger cars (average: 27.5 miles per gallon). The former group of vehicles tends to have higher emissions of air pollutants, higher fuel consumption, and higher emissions of greenhouse gases.[96,97] Information on emissions and fuel-economy ratings for recent models and a guide for choosing clean, fuel-efficient vehicles are available from the EPA Web site (www.epa.gov/greenvehicles/index.htm). The high levels of particulate emissions from diesel-powered buses and trucks must also be addressed. More than 70% of fine particle emissions from traffic are attributable to diesel-powered buses and trucks.

Driving a private car is probably a typical citizen's most "polluting" daily activity, yet in many cases, individuals have few alternative forms of transportation. Thus, urban planning and smart growth are imperative. Urban sprawl affects land use, transportation, and social and economic development and ultimately has important implications for public health.[98] Ways in which individuals can help to decrease air pollution are available at www.epa.gov/air/actions and www.arb.ca.gov/html/brochure/50things.htm.

Air Quality Index

The air quality index (AQI) provides local information on air quality and potential health concerns at the observed (or forecasted) levels of air pollution and can be a useful tool for educating families about local air quality and health.[99] The AQI is reported daily in metropolitan areas, often as part of local weather forecasts on television or radio or in newspapers. The AQI divides air-pollution levels into 6 categories of risk for 5 common pollutants (ozone, PM_{10}, nitrogen dioxide, carbon monoxide, and sulfur dioxide). Each category has a descriptive name reflecting levels of health concern (ranging from good through very hazardous), an associated color, and an advisory statement. Information about air quality in a specific area can be obtained from www.epa.gov/air/urbanair/index.html, www.scorecard.org, or www.weather.com. Although many states and local air districts actively forecast and disseminate health warnings, the challenge is to have people take actions to protect themselves and decrease activities that cause air pollution.

Pediatric Environmental Health[100] from the AAP provides additional information about the outdoor air pollutants and the use of the AQI.

CONCLUSIONS

Ambient air pollution has important and diverse health effects, and infants and children are among the most susceptible. Currently, levels of ozone and particulates remain unhealthful in many parts of the United States, and the current National Ambient Air Quality Standards may not protect the public adequately. There is a compelling need to move forward on efforts to ensure clean air for all.

The assurance of healthy air for children to breathe is beyond the control of an individual pediatrician, and there are no easy solutions. State chapters of the AAP, as well as individual members, can play an important role as advocates for children's environmental health. Areas of involvement might include working with community coalitions in support of strong pollution-control measures and informing local and national representatives and policy makers about the harmful effects of the environment on children's health. Advocates for children's health are needed in discussions about land use and transportation issues. Pediatricians can also advocate for energy-saving (and pollution-minimizing) lifestyles to their patients' families, especially regarding vehicles driven.

In communities with poor air quality, pediatricians can play a role in educating children with asthma or other chronic respiratory tract disease and their families about the harmful effects of air pollution. Patients and families can be counseled on following the AQI to determine when local air-pollution levels pose a health concern. Ozone levels tend to be highest in the afternoon, and it may be possible to decrease children's exposure by scheduling strenuous outdoor activity earlier in the day.

As pediatricians become better informed about local air quality issues in their communities (eg, ozone, nearby industrial facilities, traffic, diesel buses, wood burning, etc), these local concerns can provide a starting point for discussion and education.

Pediatricians who serve as physicians for schools or for team sports should be aware of the health implications of pollution alerts to provide appropriate guidance to school and sports officials, particularly in communities with high levels of ozone.

RECOMMENDATIONS

1. The National Ambient Air Quality Standards are designed to protect the public. To achieve this, the following points should be addressed:
   - The revised standards for ozone and particulate matter adopted by the EPA in 1997 should be promptly implemented.
   - During implementation, the standards should not be weakened in any way that decreases the protection of children's health.
   - Because recent studies suggest that current standards for PM_{10}, $PM_{2.5}$, ozone, and nitrogen dioxide may not be protecting children, the standards should be promptly reviewed and revised.
   - Because the law requires that the most vulnerable groups be protected when setting or revising the air quality standards, the potential effects of air pollution on the fetus, infant, and child should be evaluated, and all standards should include a margin of safety for protection of children.
2. The current measures to protect children from exposures to HAPs are not effective and should be critically reevaluated. The EPA should focus on prompt implementation of the Clean Air Act Amendments of 1990 (Pub L No. 101–549) to decrease HAPs. Additional monitoring for HAPs should be undertaken to allow more accurate characterization of children's exposures to these compounds. Risk assessments for HAPs should be reviewed to ensure that goals are protective of children. Control measures that specifically protect children's health should be implemented.
3. States and local air districts with air quality concerns should actively implement forecasting and

dissemination of health warnings in ways that help people take actions to protect themselves and decrease activities that cause air pollution.

4. Children's exposure to diesel exhaust particles should be decreased. Idling of diesel vehicles in places where children live and congregate should be minimized. Ongoing programs to fund conversion of diesel school bus fleets to cleaner alternative fuels and technologies should be pursued.
5. Industrial emissions of mercury should be decreased.
6. Federal and state governments' policies should encourage reductions in mobile and stationary sources of air pollution, including increased support for mass transit, carpooling, retiring or retrofitting old power plants that do not meet current pollution-control standards, and programs that support marked improvements in fuel emissions of gasoline- and diesel-powered vehicles. Additionally, the development of alternative fuel fleets, low-sulfur diesel, and other "low-emission" strategies (eg, retrofit of existing diesel engines) should be promoted. Before promoting new alternative fuels, these alternative fuel sources should be critically evaluated and determined by governmental authorities to have a good safety profile.
7. The same overall fuel-economy standard should apply to all passenger vehicles. Programs that allow certain passenger vehicles to be exempt from the usual fuel-economy standards should be abolished.
8. City and land-use planning should encourage the design and redevelopment of communities to promote mass transit, carpooling, pedestrian walkways, and bicycle use.
9. Siting of school and child care facilities should include consideration of proximity to roads with heavy traffic and other sources of air pollution. New schools should be located to avoid "hot spots" of localized pollution.

COMMITTEE ON ENVIRONMENTAL HEALTH, 2003–2004
Michael W. Shannon, MD, MPH, Chairperson
Dana Best, MD, MPH
Helen J. Binns, MD, MPH
Christine L. Johnson, MD
*Janice J. Kim, MD, PhD, MPH
Lynnette J. Mazur, MD, MPH
David W. Reynolds, MD
James R. Roberts, MD, MPH
William B. Weil, Jr, MD

Sophie J. Balk, MD
Past Committee Chairperson
Mark Miller, MD, MPH
Past Committee Member
Katherine M. Shea, MD, MPH
Past Committee Member

CONSULTANT
Michael Lipsett, MD
California Department of Health Services

LIAISONS
Robert H. Johnson, MD
Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry
Martha Linet, MD
National Cancer Institute
Walter Rogan, MD
National Institute of Environmental Health Sciences

STAFF
Paul Spire

*Lead author

REFERENCES

1. US Environmental Protection Agency. Latest findings on national air quality: 2000 status and trends. Research Triangle Park, NC: Environmental Protection Agency; 2001. Publication No. EPA 454/K-01-002. Available at: www.epa.gov/airtrends/reports.html. Accessed August 8, 2003
2. US Environmental Protection Agency. Supreme Court upholds EPA position on smog, particulate rules [press release]. Available at: www.epa.gov/airlinks/rehear.htm. Accessed October 29, 2004
3. US Environmental Protection Agency. About air toxics, health and ecologic effects. Available at: www.epa.gov/air/toxicair/newtoxics.html. Accessed August 8, 2003
4. American Academy of Pediatrics, Committee on Environmental Health. Ambient air pollution: respiratory hazards to children. *Pediatrics*. 1993;91:1210–1213
5. Dietert RR, Etzel RA, Chen D, et al. Workshop to identify critical windows of exposure for children's health: immune and respiratory systems work group summary. *Environ Health Perspect*. 2000;108(suppl 3):483–490
6. Plopper CG, Fanucchi MV. Do urban environmental pollutants exacerbate childhood lung diseases? *Environ Health Perspect*. 2000;108: A252–A253
7. Pinkerton KE, Joad JP. The mammalian respiratory system and critical windows of exposure for children's health. *Environ Health Perspect*. 2000;108(suppl 3):457–462
8. Plunkett LM, Turnbull D, Rodricks JV. Differences between adults and children affecting exposure assessment. In: Guzelian PS, Henry CJ, Olin SS, eds. *Similarities and Differences Between Children and Adults: Implications for Risk Assessment*. Washington, DC: ILSI Press; 1992: 79–96
9. Wiley JA, Robinson JP, Piazza T, et al. *Activity Patterns of California Residents: Final Report*. Sacramento, CA: California Air Resources Board; 1991. Publication No. A6-177-33
10. Wiley JA, Robinson JP, Cheng YT, Piazza T, Stork L, Pladsen K. *Study of Children's Activity Patterns: Final Report*. Sacramento, CA: California Air Resources Board; 1991. Publication No. A733-149
11. American Thoracic Society, Committee of the Environmental and Occupational Health Assembly. Health effects of outdoor air pollution. Part 1. *Am J Respir Crit Care Med*. 1996;153:3–50
12. American Thoracic Society, Committee of the Environmental and Occupational Health Assembly. Health effects of outdoor air pollution. Part 2. *Am J Respir Crit Care Med*. 1996;153:477–498
13. Bates DV. The effects of air pollution on children. *Environ Health Perspect*. 1995;103(suppl 6):49–53
14. US Environmental Protection Agency. *Air Quality Criteria for Particulate Matter*, Vol. II. Research Triangle Park, NC: Environmental Protection Agency; 2001. Publication No. EPA/600/P-99/002bB
15. US Environmental Protection Agency. *Air Quality Criteria for Ozone and Related Photochemical Oxidants*, Vol. III. Research Triangle Park, NC: Environmental Protection Agency; 1996. Publication No. EPA/600/P-93/004a-cF
16. Dockery DW. Epidemiologic evidence of cardiovascular effects of particulate air pollution. *Environ Health Perspect*. 2001;109(suppl 4): 483–486
17. Pope CA III, Burnett RT, Thun MJ, et al. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *JAMA*. 2002;287:1132–114118.
18. McConnell R, Berhane K, Gilliland F, et al. Asthma in exercising children exposed to ozone: a cohort study [published correction appears in: *Lancet*. 2002;359:896]. *Lancet*. 2002;359:386–391
19. Gauderman WJ, McConnell R, Gilliland F, et al. Association between air pollution and lung function growth in southern California children. *Am J Respir Crit Care Med*. 2000;162:1383–1390
20. Gauderman WJ, Gilliland GF, Vora H, et al. Association between air pollution and lung function growth in southern California children: results from a second cohort. *Am J Respir Crit Care Med*. 2002;166:76–84

21. Kinney PL, Thurston GD, Raizenne M. The effects of ambient ozone on lung function in children: a reanalysis of six summer camp studies. *Environ Health Perspect*. 1996;104:170–174
22. Thurston GD, Lippmann M, Scott MB, Fine JM. Summertime haze air pollution and children with asthma. *Am J Respir Crit Care Med*. 1997; 155:654–660
23. Ostro BD, Lipsett MJ, Mann JK, Braxton-Owens H, White MC. Air pollution and asthma exacerbations among African-American children in Los Angeles. *Inhal Toxicol*. 1995;7:711–722
24. Thurston GD, Ito K, Hayes CG, Bates DV, Lippmann M. Respiratory hospital admissions and summertime haze air pollution in Toronto, Ontario: consideration of the role of acid aerosols. *Environ Res*. 1994; 65:271–290
25. White MC, Etzel RA, Wilcox WD, Lloyd C. Exacerbations of childhood asthma and ozone pollution in Atlanta. *Environ Res*. 1994;65:56–68
26. Tolbert PE, Mulholland JA, MacIntosh DL, et al. Air quality and pediatric emergency room visits for asthma in Atlanta, Georgia, USA. *Am J Epidemiol*. 2000;151:798–810
27. Gilliland FD, Berhane K, Rappaport EB, et al. The effects of ambient air pollution on school absenteeism due to respiratory illnesses. *Epidemiology*. 2001;12:43–54
28. Molfino NA, Wright SC, Katz I, et al. Effect of low concentration of ozone on inhaled allergen responses in asthmatic subjects. *Lancet*. 1991;338:199–203
29. Castillejos M, Gold DR, Damokosh AI, et al. Acute effects of ozone on the pulmonary function of exercising schoolchildren from Mexico City. *Am J Respir Crit Care Med*. 1995;152:1501–1507
30. Chen PC, Lai YM, Chan CC, Hwang JS, Yang CY, Wang JD. Short-term effect of ozone on the pulmonary function of children in primary school. *Environ Health Perspect*. 1999;107:921–925
31. Korrick SA, Neas LM, Dockery DW, et al. Effects of ozone and other pollutants on the pulmonary function of adult hikers. *Environ Health Perspect*. 1998;106:93–99
32. Burnett RT, Smith-Doiron M, Stieb D, et al. Association between ozone and hospitalization for acute respiratory diseases in children less than 2 years of age. *Am J Epidemiol*. 2001;153:444–452
33. Stieb DM, Burnett RT, Beveridge RC, Brook JR. Association between ozone and asthma emergency department visits in Saint John, New Brunswick, Canada. *Environ Health Perspect*. 1996;104:1354–1360
34. Gent JF, Tiche EW, Holford TR, et al. Association of low-level ozone and fine particles with respiratory symptoms in children with asthma. *JAMA*. 2003;290:1859–1867
35. Kunzli N, Lurmann F, Segal M, Ngo L, Balmes J, Tager IB. Association between lifetime ambient ozone exposure and pulmonary function in college freshmen—results of a pilot study. *Environ Res*. 1997;72:8–23
36. Galizia A, Kinney PL. Long-term residence in areas of high ozone: associations with respiratory health in a nationwide sample of nonsmoking young adults. *Environ Health Perspect*. 1999;107:675–679
37. Ghio AJ, Silbajoris R, Carson JL, Samet JM. Biologic effects of oil fly ash. *Environ Health Perspect*. 2002;110(suppl 1):89–94
38. Pandya RJ, Solomon G, Kinner A, Balmes JR. Diesel exhaust and asthma: hypotheses and molecular mechanisms of action. *Environ Health Perspect*. 2002;110(suppl 1):103–112
39. Dockery DW, Pope CA III. Acute respiratory effects of particulate air pollution. *Annu Rev Public Health*. 1994;15:107–132
40. Schwartz J. Air pollution and daily mortality: a review and meta analysis. *Environ Res*. 1994;64:36–52
41. Samet JM, Dominici F, Curriero FC, Coursac I, Zeger SL. Fine particulate air pollution and mortality in 20 U.S. cities, 1987–1994. *N Engl J Med*. 2000;343:1742–1749
42. Schwartz J. Air pollution and blood markers of cardiovascular risk. *Environ Health Perspect*. 2001;109(suppl 3):405–409
43. California Air Resources Board. June 20, 2002 board meeting summary. Sacramento, CA: California Air Resources Board; 2002. Available at: www.arb.ca.gov/research/aaqs/std-rs/bdsum620/bdsum620.htm. Accessed August 8, 2003
44. Hoek G, Dockery DW, Pope A, Neas L, Roemer W, Brunekreef B. Association between PM10 and decrements in peak expiratory flow rates in children: reanalysis of data from five panel studies. *Eur Respir J*. 1998;11:1307–1311
45. Ostro B, Lipsett M, Mann J, Braxton-Owens H, White M. Air pollution and exacerbation of asthma in African-American children in Los Angeles. *Epidemiology*. 2001;12:200–208
46. Yu O, Sheppard L, Lumley T, Koenig JQ, Shapiro GG. Effects of ambient air pollution on symptoms of asthma in Seattle-area children enrolled in the CAMP study. *Environ Health Perspect*. 2000;108: 1209–1214
47. McConnell R, Berhane K, Gilliland F, et al. Air pollution and bronchitic symptoms in Southern California children with asthma. *Environ Health Perspect*. 1999;107:757–760
48. Woodruff TJ, Grillo J, Schoendorf KC. The relationship between selected causes of postneonatal infant mortality and particulate air pollution in the United States. *Environ Health Perspect*. 1997;105:608–612
49. Bobak M, Leon DA. The effect of air pollution on infant mortality appears specific for respiratory causes in the postneonatal period. *Epidemiology*. 1999;10:666–670
50. Ritz B, Yu F. The effect of ambient carbon monoxide on low birth weight among children born in southern California between 1989 and 1993. *Environ Health Perspect*. 1999;107:17–25
51. Bobak M. Outdoor air pollution, low birth weight, and prematurity. *Environ Health Perspect*. 2000;108:173–176
52. Dejmek J, Solansky I, Benes I, Lenicek J, Sram RJ. The impact of polycyclic aromatic hydrocarbons and fine particles on pregnancy outcome. *Environ Health Perspect*. 2000;108:1159–1164
53. Wang X, Ding H, Ryan L, Xu X. Association between air pollution and low birth weight: a community-based study. *Environ Health Perspect*. 1997;105:514–520
54. Ritz B, Yu F, Chapa G, Fruin S. Effect of air pollution on preterm birth among children born in Southern California between 1989 and 1993. *Epidemiology*. 2000;11:502–511
55. Ha EH, Hong YC, Lee BE, Woo BH, Schwartz J, Christiani DC. Is air pollution a risk factor for low birth weight in Seoul? *Epidemiology*. 2001;12:643–648
56. Xu X, Ding H, Wang X. Acute effects of total suspended particles and sulfur dioxides on preterm delivery: a community-based cohort study. *Arch Environ Health*. 1995;50:407–415
57. Schwartz J. Air pollution and hospital admissions for respiratory disease. *Epidemiology*. 1996;7:20–28
58. Ostro BD, Broadwin R, Lipsett MJ. Coarse and fine particles and daily mortality in the Coachella Valley, California: a follow-up study. *J Expo Anal Environ Epidemiol*. 2000;10:412–419
59. Laden F, Neas LM, Dockery DW, Schwartz J. Association of fine particulate matter from different sources with daily mortality in six US cities. *Environ Health Perspect*. 2000;108:941–947
60. Ozkaynak H, Thurston GD. Associations between 1980 U.S. mortality rates and alternative measures of airborne particle concentration. *Risk Anal*. 1987;7:449–461
61. Strand V, Svartengren M, Rak S, Barck C, Bylin G. Repeated exposure to an ambient level of NO_2 enhances asthmatic response to a nonsymptomatic allergen dose. *Eur Respir J*. 1998;12:6–12
62. Tunnicliffe WS, Burge PS, Ayres JG. Effect of domestic concentrations of nitrogen dioxide on airway responses to inhaled allergen in asthmatic patients. *Lancet*. 1994;344:1733–1736
63. Hajat S, Haines A, Goubet SA, Atkinson RW, Anderson HR. Association of air pollution with daily GP consultations for asthma and other lower respiratory conditions in London. *Thorax*. 1999;54:597–605
64. Shima M, Adachi M. Effect of outdoor and indoor nitrogen dioxide on respiratory symptoms in schoolchildren. *Int J Epidemiol*. 2000;29: 862–870
65. Lipsett M, Hurley S, Ostro B. Air pollution and emergency room visits for asthma in Santa Clara County, California. *Environ Health Perspect*. 1997;105:216–222
66. Zhu Y, Hinds WC, Kim S, Sioutas C. Concentration and size distribution of ultrafine particles near a major highway. *J Air Waste Manag Assoc*. 2002;52:1032–1042
67. Delfino RJ. Epidemiologic evidence for asthma and exposure to air toxics: linkages between occupational, indoor, and community air pollution research. *Environ Health Perspect*. 2002;110(suppl 4):573–589
68. Edwards J, Walters S, Griffiths RK. Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. *Arch Environ Health*. 1994;49:223–227
69. van Vliet P, Knape M, de Hartog J, Janssen N, Harssema H, Brunekreef B. Motor vehicle exhaust and chronic respiratory symptoms in children living near freeways. *Environ Res*. 1997;74:122–132
70. Brunekreef B, Janssen NA, de Hartog J, Harssema H, Knape M, van Vliet P. Air pollution from truck traffic and lung function in children living near motorways. *Epidemiology*. 1997;8:298–303
71. Ciccone G, Forastiere F, Agabiti N, et al. Road traffic and adverse respiratory effects in children. SIDRIA Collaborative Group. *Occup Environ Med*. 1998;55:771–778
72. Feychting M, Svensson D, Ahlbom A. Exposure to motor vehicle exhaust and childhood cancer. *Scand J Work Environ Health*. 1998;24: 8–11

0476

73. Pearson RL, Wachtel H, Ebi KL. Distance-weighted traffic density in proximity to a home is a risk factor for leukemia and other childhood cancers. *J Air Waste Manag Assoc.* 2000;50:175–180
74. Raaschou-Nielsen O, Hertel O, Thomsen BL, Olsen JH. Air pollution from traffic at the residence of children with cancer. *Am J Epidemiol.* 2001;153:433–443
75. Lipsett M, Campleman S. Occupational exposure to diesel exhaust and lung cancer: a meta-analysis. *Am J Public Health.* 1999;89:1009–1017
76. US Environmental Protection Agency. *Health Assessment Document for Diesel Engine Exhaust.* Washington, DC: Office of Research and Development NCfEA; 2002. EPA/600/8–909/057F
77. International Agency for Research on Cancer. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Diesel and Gasoline Engine Exhausts and Some Nitroarenes.* Vol 46. Lyon, France: International Agency for Research on Cancer; 1989:458
78. Diaz-Sanchez D, Garcia MP, Wang M, Jyrala M, Saxon A. Nasal challenge with diesel exhaust particles can induce sensitization to a neoallergen in the human mucosa. *J Allergy Clin Immunol.* 1999;104: 1183–1188
79. Nel AE, Diaz-Sanchez D, Ng D, Hiura T, Saxon A. Enhancement of allergic inflammation by the interaction between diesel exhaust particles and the immune system. *J Allergy Clin Immunol.* 1998;102:539–554
80. Solomon GM, Campbell T, Feuer GR, Masters J, Samkian A, Paul KA. *No Breathing in the Aisles: Diesel Exhaust Inside School Buses.* New York, NY: Natural Resources Defense Council; 2001. Available at: www.nrdc.org/air/transportation/schoolbus/sbusinx.asp. Accessed August 8, 2003
81. Leikauf GD. Hazardous air pollutants and asthma. *Environ Health Perspect.* 2002;110(suppl 4):505–526
82. American Academy of Pediatrics, Goldman LR, Shannon MW, Committee on Environmental Health. Technical report: mercury in the environment: implications for pediatricians. *Pediatrics.* 2001;108: 197–205
83. Suh HH, Bahadori T, Vallarino J, Spengler JD. Criteria air pollutants and toxic air pollutants. *Environ Health Perspect.* 2000;108(suppl 4): 625–633
84. Woodruff TJ, Axelrad DA, Caldwell J, Morello-Frosch R, Rosenbaum A. Public health implications of 1990 air toxics concentrations across the United States. *Environ Health Perspect.* 1998;106:245–251
85. Nazemi MA. *Multiple Air Toxics Exposure Study (MATES-II) in the South Coast Air Basin.* Diamond Bar, CA: South Coast Air Quality Management District; 2000
86. Morello-Frosch RA, Woodruff TJ, Axelrad DA, Caldwell JC. Air toxics and health risks in California: the public health implications of outdoor concentrations. *Risk Anal.* 2000;20:273–291
87. Kyle AD, Wright CC, Caldwell JC, Buffler PA, Woodruff TJ. Evaluating the health significance of hazardous air pollutants using monitoring data. *Public Health Rep.* 2001;116:32–44
88. Heinrich J, Hoelscher B, Wichmann HE. Decline of ambient air pollution and respiratory symptoms in children. *Am J Respir Crit Care Med.* 2000;161:1930–1936
89. Frye C, Hoelscher B, Cyrys J, Wjst M, Wichmann HE, Heinrich J. Association of lung function with declining ambient air pollution. *Environ Health Perspect.* 2003;111:383–387
90. Friedman MS, Powell KE, Hutwagner L, Graham LM, Teague WG. Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. *JAMA.* 2001;285:897–905
91. Pope CA III. Respiratory hospital admissions associated with PM10 pollution in Utah, Salt Lake, and Cache Valleys. *Arch Environ Health.* 1991;46:90–97
92. Pope CA III. Particulate pollution and health: a review of the Utah valley experience. *J Expo Anal Environ Epidemiol.* 1996;6:23–34
93. Avol EL, Gauderman WJ, Tan SM, London SJ, Peters JM. Respiratory effects of relocating to areas of differing air pollution levels. *Am J Respir Crit Care Med.* 2001;164:2067–2072
94. Romieu I, Sienra-Monge JJ, Ramirez-Aguilar M, et al. Antioxidant supplementation and lung functions among children with asthma exposed to high levels of air pollutants. *Am J Respir Crit Care Med.* 2002;166:703–709
95. US Environmental Protection Agency. *The Plain English Guide To The Clean Air Act.* 1993. EPA-400-K-93-001. Available at: www.epa.gov/oar/oaqps/peg_caa/pegcaain.html. Accessed October 26, 2004
96. National Research Council. *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards.* Washington, DC: National Academies Press; 2002. Available at: www.nap.edu/books/0309076013/html. Accessed August 8, 2003
97. Hwang R, Millis B, Spencer T. *Clean Getaway: Toward Safe and Efficient Vehicles.* New York, NY: Natural Resources Defense Council; 2001. Available at: www.nrdc.org/air/transportation/cafe/cafeinx.asp. Accessed August 8, 2003
98. Jackson RJ, Kochtitzky C. *Creating a Health Environment: The Impact of the Built Environment on Public Health.* Washington, DC: Sprawl Watch Clearinghouse. Available at: www.sprawlwatch.org/health.pdf. Accessed August 8, 2003
99. US Environmental Protection Agency, Office of Air and Radiation. *Air Quality Index: A Guide to Air Quality and Your Health.* Research Triangle Park, NC: Environmental Protection Agency; 2000. Publication No. EPA-454/R-00-005. Available at: www.epa.gov/airnow/aqibroch. Accessed August 8, 2003
100. American Academy of Pediatrics, Committee on Environmental Health. Outdoor air pollutants. In: Etzel RA, Balk SJ, eds. *Pediatric Environmental Health.* 2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003;:69–86

All policy statements from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

0477

Appreciation

We gratefully acknowledge the funding support by the United States Environmental Protection Agency (US EPA), Region I.

This pilot project and the important data collected during its completion would not have been possible without the generous collaboration of the participating schools. The monitoring team was provided with open access to facilities, and the administration, faculty and students at each school provided a warm welcome and demonstrated intense interest in our work. NESCAUM extends its sincere appreciation to the study participants.

NESCAUM would also like to thank the following members of the Air Quality and Public Health Committee and our project partners from the University of Connecticut Health Center, Center for Indoor Environments and Health who provided technical advice and thoughtful suggestions for the pilot project and this report:

Dave Brown, NESCAUM
Paula Schenck, UCONN
Eileen Storey, UCONN
Barbara Morin, RI DEM
Rick Rumba, NH DES
Ellen Morris, CT DEP
Rich Greves, ME DEP

0478

EXECUTIVE SUMMARY

Northeast States for Coordinated Air Use Management Indoor/Outdoor School Air Monitoring Pilot Project

For over thirty years, the Northeast States for Coordinated Air Use Management (NESCAUM) has been working in the field of air quality control with its members, who include air quality management officials from the New England states, New York and New Jersey. The top priority of state air quality management officials is to protect the public from exposure to unhealthy levels of air pollutants. NESCAUM's greatest concerns in the Northeast are outdoor levels of ozone, particulates, and hazardous air pollutants. More recently, awareness has grown of the importance of indoor air quality, when considering exposure and public health impacts, and of the need for better understanding of the influence of outdoor air pollution on indoor air quality.

This report describes the results of a pilot air quality monitoring project conducted by NESCAUM in nine elementary and middle schools across New England during the summer and fall of 2001. The intent of the pilot project was to develop methods to characterize the impact of ambient air pollution and human activity on the indoor air quality in a variety of schools in the Northeast. The main goal for this study was to use these methods to determine whether ambient air pollution concentrations penetrate indoor environments to establish a baseline of exposure for individuals in these specific environments. A secondary goal was to investigate whether urban areas and areas near heavy roadway traffic have higher indoor concentrations of the targeted ambient air pollutants.

The study focused on schools because of recent attention to the health effects of air pollution on sensitive populations, one of which is children. According to recent reports by the Centers for Disease Control, children have experienced a dramatic increase in asthma, which is exacerbated by air pollution. Consequently, the impact of outdoor air pollution on an indoor environment where children spend time became the subject of this report. Besides their own homes, where studies of this type have been conducted, children spend a vast majority of their time in schools.

The nine schools in the study constitute a diverse set in terms of ambient pollution sources, geographic location, population density, motor vehicle traffic patterns, and building construction types. Given the schools' widely different characteristics, the limited number of monitoring days, and the small sample size, any results should be viewed as a data set targeted to investigate the stated goals and to explore the effectiveness of the monitoring strategy. These data are also expected to be useful to structure future studies. Results from a single school should not be viewed as a conclusive representation of "healthy" or "unhealthy" conditions.

In order to test the hypotheses of this pilot project, it was important to characterize the variability in ambient and indoor pollutant concentrations between urban and rural (or rural-near roadway) schools. To this end, the methods that were used and developed in this project measured the concentrations of fine respirable particulate matter and several other air pollutants.[1] These pollutants are characterized as lung irritants, which are believed to trigger asthma attacks at moderate to high exposures, and are potential cancer-causing agents, associated with a potential increased risk of certain forms of cancer, following long-term exposures to relatively low concentrations. Fossil fuel combustion, particularly from motor vehicles, is a primary outdoor emissions source of these pollutants.

This project had two phases. Phase One consisted of monitoring during the summer of 2001 to obtain baseline measurements when schools were not in session (referred to as "summer monitoring" throughout this report), in order to minimize the impact of student/faculty occupancy and emissions from school buses. Phase Two involved monitoring during the fall of 2001 when schools were in session (referred to as "fall monitoring" in this report). Summer pollutant concentrations serve as a baseline that was compared with measurements taken during normal building occupancy during the fall.

In this pilot study, NESCAUM employed the ACCESS air monitoring system to evaluate changes in carbon dioxide, criteria air pollutants and meteorology. The ACCESS system senses and records information for each criteria every minute, providing real-time data. NESCAUM was interested in obtaining real-time data because short-term, episodic exposures to a number of air pollutants may be very important when considering non-cancer health effects, and a time-averaged, integrated sample would not provide an adequate level of resolution. For this study, NESCAUM was particularly interested in real-time measurements for carbon dioxide and fine particulate matter ($PM_{2.5}$). Tracking minute-to-minute variations in these two compounds is instrumental to the aims of this and future studies since: 1) measurement of the indoor carbon dioxide concentration is an indicator of the rate of air exchange in the school buildings which will aid in understanding the amount of outdoor air infiltration, and 2) short-term episodic exposures to fine particulate matter ($PM_{2.5}$) are important to characterize because of the potential adverse impact on asthmatics or other individuals susceptible to respiratory irritation. The ACCESS system was used in this pilot study because these multi-pollutant monitoring systems have been used effectively in past NESCAUM projects to provide qualitative evidence of the real-time variations of these and other compounds.

The real-time monitoring techniques were sensitive enough to detect variability in concentrations of pollutants including carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter throughout the monitoring day. The sensitivity and accuracy of the ACCESS monitoring system was not sufficient in many cases to make quantitative conclusions (see Appendix D for details). Despite the limitations of the ACCESS system, data collected during the pilot project demonstrate that specific outside pollutant sources (e.g., carbon monoxide generated by an idling delivery truck) can affect indoor air concentrations if prevailing wind patterns carry

[1] Fine respirable particulate matter has an aerodynamic diameter of less than 2.5 microns. Criteria pollutants and several hazardous air pollutants were measured including a suite of fifteen carbonyls and twenty-eight volatile organic compounds.

pollutants from the sources toward schools. Since the initiation of the pilot project, more accurate and sensitive real-time monitoring systems are now available to NESCAUM for these types of projects. NESCAUM will focus on carbon dioxide and particulate matter monitoring with more state-of-the-art technology in all future work.

NESCAUM also measured carbonyls using Gilian personal sampling pumps, which draw air through an absorbent tube at a constant rate for a specified amount of time. Testing for volatile organic compounds was performed using Summa canisters. Summa canisters are evacuated stainless steel canisters, which were fitted with an orifice calibrated to draw in one liter of air over a period of seven to eight hours. NESCAUM believes these methods collected reliable data. In the body of the report, the strengths and limitations of each of these methods are described in greater detail. The results from the carbonyl and volatile organic compound monitoring are described below.

The pilot project monitoring data suggest that outdoor air concentrations and indoor air concentrations of several pollutants are related. This is most evident when comparing indoor and outdoor concentrations of selected volatile organic compounds, such as benzene, with the degrees of urbanization around the school. The pilot project monitoring data illustrate that the greater the ambient concentration of selected pollutants, in most instances, the greater the indoor concentration. Existing air pollution literature supports this observation and indicates that outdoor and indoor concentrations are indeed related to one another, with urbanized regions demonstrating the highest concentrations. This larger body of evidence also suggests that the infiltration of outdoor concentrations of persistent, low reactivity volatile organic compounds like benzene, often approaches 100%, but varies by conditions during the day of monitoring and the pollutant. The understanding of the impact of ambient concentrations and the infiltration of more reactive compounds, such as acetaldehyde and formaldehyde, is more complicated since the atmospheric formation and destruction of these compounds and their persistence during infiltration into indoor environments is less well understood. Additionally, the indoor concentration of these pollutants is often dominated by indoor sources and activity levels, which makes it difficult to ascertain the degree of ambient infiltration directly.

When considering our primary research interest regarding ambient air infiltration, our limited data suggest that during the summer months of the pilot project, the median indoor concentration of low reactivity volatile organic compounds (such as acetone, benzene, methyl ethyl ketone, and toluene) range from approximately 65% to 90% of the outdoor concentrations. Fall monitoring data indicate median indoor concentrations of these same pollutants range from 130% to 500% of outdoor concentrations, respectively. When considering more reactive pollutants, the summer monitoring data suggest that the median indoor concentrations of acetaldehyde and formaldehyde range from approximately 130% to 375% of the outdoor concentrations, respectively. During the fall, the range of median values for these pollutants increased to approximately 150% to 430%, respectively.

This observation that indoor concentrations of volatile organic compounds and carbonyls often track outdoor concentrations is consistent with studies by other researchers. These studies underscore the importance of considering seasonality and of the potential contribution of indoor emissions sources and activities when attempting to evaluate infiltration. Further analysis of air exchange rates is needed to more thoroughly investigate infiltration by these pollutants. Additionally, a more detailed survey of indoor sources and their contribution as well as a comprehensive outdoor emissions inventory would help in characterizing the impact of ambient air on indoor air quality.

When considering our secondary research interest regarding the impact of urbanization and motor vehicle traffic on the concentrations of these pollutants, these preliminary data suggest that concentrations of pollutants primarily generated by motor vehicle fuel combustion or evaporation (e.g., benzene and toluene), are higher in urban areas and in areas in close proximity (< 500 meters) to roadways with higher vehicle density. For instance, the highest benzene concentrations were recorded for schools located near roadways with high traffic counts. Importantly, despite the limited data set, this study suggests that rural, near-roadway schools have airborne concentrations of benzene and toluene similar to urban schools. However, the potential association between population density and ambient or indoor concentrations of pollutants generated primarily by industrial sources or personal products such as acetone and methyl ethyl ketone is less clear. For instance, there was no clear association between population density and the levels of acetone or methyl ethyl ketone, unlike the observations for benzene and toluene described above.

NESCAUM's observations of higher concentrations of these pollutants in more urban environments in this pilot are consistent with previous monitoring results in numerous locations across the northeast region.[2] State ambient air monitoring results have consistently shown a substantial difference between urban and rural concentrations for motor vehicle-related pollutants.

The preliminary findings provide initial support for our operating hypotheses and confirm that our study design and methods are generally sound. However, NESCAUM's ability to interpret these data more thoroughly is limited by the degree of variability between sites, the lack of information regarding air exchange rates, and the incomplete emissions inventory inside and outside each of the monitored schools which confound a quantitative assessment at this time. Future studies will need to include more comprehensive emissions inventories for participating schools. Indoor air sources for a number of the compounds evaluated must be more thoroughly characterized in order appropriately interpret the data and to suggest activities to minimize if exposure reduction is warranted. For this pilot project, the research team sought to track product use and the presence of building materials known to emit any of the target compounds. This was a difficult task and additional work is needed in this area.

---

[2] http://www.nescaum.org/committees/CEPmay99/regnlsumm2.html

0483

NEXT STEPS:

This pilot project demonstrates that it is possible to use available occupational or environmental monitoring methods to evaluate ambient and indoor air concentrations of a number of important air pollutants. With the exception of the ACCESS air monitoring system that was used to monitor for real-time criteria air pollutants, NESCAUM recommends the use of the same monitoring methods for future studies. Instead of the ACCESS system, NESCAUM suggests using other real-time monitoring methods focusing on particulates ($PM_{2.5}$) and carbon dioxide that offer greater reliability and accuracy.

NESCAUM will be completing a follow up study to this pilot in the fall of 2002. The central and secondary hypotheses will be the same: that ambient pollutants penetrate indoor environments to establish a baseline of exposure for individuals in the indoor environment, and that urban areas and areas near heavy roadway traffic have higher indoor concentrations of the targeted pollutants. However, building on our experience with the monitoring equipment and the interpretation of the monitoring results from the pilot project, we will monitor fewer schools using more exhaustive inventory characterization and more comprehensive monitoring strategies. Variability within the dataset will be reduced by:

- Limiting the variability between sites by choosing schools near roadways in distinctly urban vs. rural environments;
- Measuring air exchange rates to help ascertain and verify whether pollutant sources originate outside or inside the building;
- Documenting a comprehensive emissions inventory inside and outside of the monitored schools; and
- Choosing schools near state air monitoring stations that sample for hazardous air pollutants to help verify our monitoring data.

The results of this follow up study will be used to understand and document the infiltration of mobile source pollutants into the indoor environment and the potential public health impact nationwide when considering the combustion of fossil fuel products. It is anticipated that these and other data will help support more effective and appropriately targeted national and regional policy development regarding mobile source pollution.

TABLE OF CONTENTS

Northeast States for Coordinated Air Use Management Indoor/Outdoor School Air Monitoring Pilot Project

For over thirty years, the Northeast States for Coordinated Air Use Management (NESCAUM) has been working in the field of air quality control with its members, who include state air quality management officials from New England, New York and New Jersey. The top priority of state air quality management officials is to protect the public from exposure to unhealthy levels of air pollutants. NESCAUM's greatest concerns in the Northeast are outdoor levels of ozone, particulates, and hazardous air pollutants. More recently, awareness has grown of the importance of indoor air quality, and of the need for better understanding of the relationship between indoor and outdoor air pollution when considering exposure and public health impacts. This report discusses the results of our pilot study to evaluate air monitoring methods that could be utilized to better understand the infiltration of outdoor pollution into the specific environment of schools, and to begin to investigate two research hypotheses with a focus on pollution from cars, trucks and buses.

This report is structured to provide a regional overview of project results and additional resources for interested parties, while maintaining confidentiality for participating schools. It includes a discussion of the impact of ambient and indoor air pollutants on health and a brief overview of the current state of knowledge in this field. The report also provides a general description of sampling and analytical methods used.

BACKGROUND: AMBIENT AIR QUALITY AND PUBLIC HEALTH

The U.S. Environmental Protection Agency (EPA) established a program to control six key air pollutants: ozone, carbon monoxide, lead, sulfur dioxide, nitrogen dioxides and particulate matter over 30 years ago. EPA set standards for ambient (outdoor) air quality and established limits on air emissions from power plants, industries and motor vehicles to protect public health. It targeted these six "criteria pollutants" because scientific evidence showed that adverse health effects, such as heart and lung disease, resulted from exposure to them.[3]

Recently, EPA and the public health community have paid special attention to particulate matter. When the air program began in the 1970s, EPA regulated coarse particulates, or PM_{10}.[4] These particles reach the bronchiolar region of the lung (mid-lung) and have been associated with adverse effects on the lungs for decades by health scientists. The agency developed a new fine particulate, or $PM_{2.5}$,[5] standard in 1997, in response to a growing body of evidence suggesting that these smaller particles – which reach the alveolar (deep-

[3] For more detailed information regarding health effects associated with these pollutants, see Appendix A.

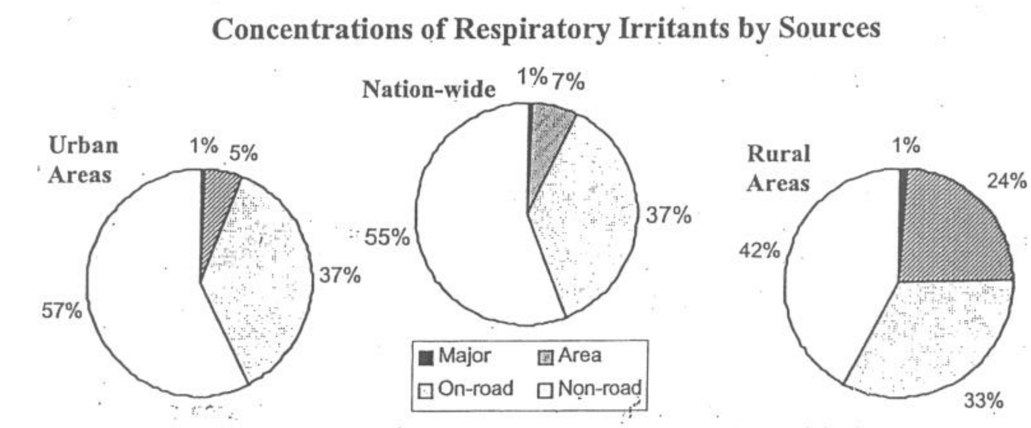
[4] Particulate matter with an aerodynamic diameter of 10 microns (µm) or less.

[5] Particulate matter with an aerodynamic diameter of 2.5µm or less.

lung) region – might be even more toxic than larger particles. A recent review of past studies by Samet *et. al* supports a linkage cited by EPA between increased mortality and $PM_{2.5}$ and PM_{10} levels in 20 major U.S. cities, underscoring the importance of reducing public exposure to particulate matter (Samet, 2000). Additional studies have also suggested that increased levels of particulates may exacerbate asthma symptoms (Pearson, 2000; Kinney, 2000; Yu, 2000; and Freidman, 2001).

In addition to regulating the six criteria pollutants described above, the Northeast states have been controlling emissions of hazardous air pollutants from industrial sources since the early 1980s. Since 1990, EPA has been developing federal regulations to control the emissions of 188 compounds referred to as hazardous air pollutants (HAPs) under the Clean Air Act. Like the toxic air pollutants regulated through state programs, the federal HAPs are targeted because they are associated with adverse health effects, including cancer and respiratory disease. HAPs present in ambient air originate from a variety of sources, including on-road sources such as motor vehicles, non-road vehicles such as construction equipment, "major" industrial sources such as electric utilities and factories, and "area" sources including dry cleaners, gasoline stations, and use of architectural coatings and paints. Control programs focused on HAPs are designed to reduce emissions from this full range of sources. Figure 1 illustrates evidence from a recent national air quality assessment, which identifies on-road and non-road vehicle emissions as a dominant emission source for a number of respiratory irritants.[6]

Figure 1. Important emission sources of potent hazardous air pollutants nationwide.



Irritants include acetaldehyde, acrolein, diesel and formaldehyde.

Data is from the National Air Toxics Screening Assessment, modeled ambient concentration data.

In 1998, the Northeast states reviewed air pollution data and identified a subset of ten HAPs from the federal list of 188 that are presently detectable in the region at levels above thresholds set to protect public health (NESCAUM, 1999b).[7] These ten HAPs are

[6] Please see http://www.epa.gov/ttn/atw/nata

[7] The thresholds or health benchmarks for these pollutants are described in greater detail in Appendix B.

benzene, 1,3-butadiene, formaldehyde, carbon tetrachloride, chloroform, ethylene dibromide, ethylene dichloride, methyl chloride, chromium, and acrolein. Concurrent analyses by the EPA have demonstrated that this subset of HAPs is also present in similar amounts in the ambient air nationwide (Woodruff, 1998). These ten HAPs primarily exceed the benchmark levels for cancer risks. However, acrolein – one of the most potent respiratory irritants currently present in ambient air – has been estimated to exceed health protective thresholds for respiratory irritation in all areas of the country in these assessments (Woodruff, 1998; Caldwell, 1998).

To date, review of available outdoor air monitoring data demonstrates that urban areas and traffic corridors typically have the highest concentrations of these pollutants. Primary sources include motor vehicles, construction equipment and small area sources of air emissions, such as dry cleaners, personal product use, and gasoline stations (NESCAUM, 1999b).

CONNECTIONS BETWEEN OUTDOOR AND INDOOR AIR QUALITY

It is estimated that people spend over 90% of their time indoors.[8] Recent policy development in various offices of the EPA has suggested that assessing ambient air concentrations for many pollutants is insignificant when considering public health impacts, since any exposure will be dwarfed by indoor microenvironmental exposures to these same compounds.[9] NESCAUM and others have argued that ambient pollutant concentrations may, in some cases, establish the baseline for total exposure. As such, indoor emission sources or human activities only add to this baseline when considering total exposure. It should be noted that this baseline is only applicable to pollutants that are generated outdoors, as there are many indoor pollutants that do not have an outdoor baseline.

A review of peer-reviewed published literature and some indoor residential monitoring surveys conducted in rural areas of the Northeast region indicate that ambient concentrations of some volatile organic compounds such as benzene and toluene exhibit infiltration ratios ranging from 0.2 to greater than 1 when considering indoor vs. outdoor concentrations (Lewis, 1991; Gilli, 1996; Wallace, 1996; Lewis, 1992). At a one-to-one ratio, ambient concentrations would establish a baseline for continuous exposure in indoor microenvironments. Indoor concentrations of other HAPs, such as acetaldehyde and formaldehyde, are typically measured at higher concentrations indoors than outdoors, this is likely due to individual residential activities supplementing the airborne concentration. However, it may be due to other factors including nearby outdoor sources. Further characterization of the relative contributions of indoor vs. outdoor sources of these pollutants is fundamental to a thorough understanding of the impact of ambient air on indoor air quality.

---

[8] http://www.epa.gov/iaq/
[9] public presentation by EPA staff on 202(l) rulemaking and the 2002 National Scale Assessment activities

In addition to the target compounds assessed during this pilot project, a number of other air pollutants can have significant adverse health effects in exposed populations. One of the most significant indoor air quality concerns involves biological agents such as fungus, bacteria, and plant and animal products. These materials, in addition to some of the chemical compounds identified in this study, are known to serve as respiratory irritants and potential triggers for asthma attacks. Testing for biological contaminants was beyond the scope of this pilot project. However, in an effort to evaluate the potential for biological agent exposure in the schools, the project team attempted to identify and record the presence of water damage or visible mold or mildew during the monitoring days at each facility.[10]

INTRODUCTION TO THE PILOT PROJECT

NESCAUM conducted the Indoor/Outdoor School Air Monitoring Pilot Project to develop methods to characterize the impact of ambient air pollution and human activity on the indoor air quality in a variety of schools in the Northeast. The pollutants targeted by this project include particulate matter, other criteria pollutants, and hazardous air pollutants (HAPs). NESCAUM's primary research interest for this pilot study was in pollutants from motor vehicle fuel combustion. Gasoline and diesel powered vehicles and non-road machines emit up to one-half of smog forming volatile organic compounds (VOCs), particulate matter, and oxides of nitrogen (NO_X) in the Northeast. Furthermore, Northeast regional ambient monitoring and emissions inventory data have concluded that about half of the public health risk from exposure to HAPs (i.e. acetaldehyde, benzene, formaldehyde) is associated with automobile emissions (NESCAUM, 1999a). Thus, the study focused on the aforementioned HAPs, criteria pollutants (particulate matter, ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide), and volatile organic compounds.

The nine schools studied constitute a diverse set in terms of ambient pollution sources, geographic locations, population density, motor vehicle traffic patterns, and building construction types. The first aim of the pilot project was to determine whether federally approved occupational or environmental monitoring techniques[11] could be used to monitor daylong exposures to ambient and indoor air pollutants. The second aim was to test two central hypotheses: (1) ambient air pollution concentrations penetrate indoor environments to establish or contribute to a baseline of exposure for individuals in the indoor environment; and (2) urban areas and areas near heavy roadway traffic have higher outdoor and indoor concentrations of the targeted pollutants than other areas. The study will not provide a definitive estimate of potential health impacts given its limited scope and sample size.

Given the widely varying characteristics of schools included in this pilot project, the limited number of monitoring days, and the small sample size, these initial data alone can

---

[10] More detailed information and resources available to assist schools in identifying and addressing indoor air quality concerns may be found in Appendix C and E.

[11] The ACCESS system, which measures criteria pollutants in real-time, is not a federally approved monitoring technique.

neither confirm nor reject the central or secondary hypotheses. These data are expected to be useful in refining our central and secondary hypotheses, in method development, and to structure future studies, but not as a conclusive representation of "healthy" or "unhealthy" conditions at any particular school.

Numerous studies analyzing exposure to these pollutants in the outdoor (ambient) environment have been used to support EPA rulemaking activities. Some researchers have sought to evaluate both the outdoor and indoor (home, workplace, school) concentration of pollutants (Woodruff, 1998; Caldwell, 1998; NESCAUM, 1999b; Lewis, 1991; and Gilli, 1996). This pilot project explored the feasibility of methods that combine these past approaches in an effort to more accurately characterize total exposure. Doing so requires consideration of both ambient concentrations and indoor concentrations of these pollutants in selected environments. This juxtaposition illustrates how outdoor pollutant concentrations impact indoor environments, and provides a more complete picture of total exposure for individuals living and working in both indoor and outdoor environments. This study considered daylong exposures, typically eight-hour,[12] in contrast to the 24-hour averages of many previous studies. The purpose for monitoring eight-hour exposure in this pilot project was to assess the typical exposure window for students and teachers in the nine schools studied.

This study focused on characterizing a single microenvironment: schools. NESCAUM thought it was appropriate to look at the impact of outdoor air pollution on an indoor environment where children spend time. Besides their homes, where studies of this type have been conducted, children spend a vast majority of their time in schools. We focused on children because of the recent reports in the dramatic increase in childhood asthma. The Center for Disease Control and Prevention (CDC) has documented that between 1980 and 1994, the prevalence of asthma increased 74% among children 5 to 14 years of age. According to the CDC, asthma now affects nearly 5 million Americans younger than 18 years of age.[13] Children and a majority of adults have been shown to be susceptible to lung irritants that exacerbate asthma symptoms. These lung irritants, mentioned above, are the target compounds monitored in our study.

This project had two phases. The intent of Phase One was to monitor during the summer of 2001 to obtain baseline measurements when schools were not in session (referred to as "summer monitoring" throughout this report), in order to minimize the impact of student/faculty traffic and emissions from school buses. However, summertime maintenance and cleaning activities may have introduced pollutants. Phase Two involved monitoring during the fall of 2001 when schools were in session (referred to as "fall monitoring" in this report), to contrast summer baselines against fall pollutant concentrations measured with heating and ventilation systems operating, normal building occupancy levels, and buses and other vehicular traffic.

---

[12] Four-hour samples were also collected for some pollutants in an effort to understand whether short-episodic peak exposures were occurring that might be minimized if averaged over an eight-hour sampling duration.

[13] http://www.cdc.gov/nceh/airpollution/asthma/children.htm

The nine schools studied were selected based on their accessibility, availability, and willingness to participate, as well as their different geographic and demographic characteristics. The schools are characterized and referred to as Schools A through I, moving from urban to rural.[14] Information used to make this characterization is presented in Table 1 below.

Schools A, B and C are all located in a Northeastern inland city. It is a busy commercial and manufacturing center, with a nearby airport, surrounding highways and congested city streets. Students' homes are close to these schools, so most students walk instead of taking the bus. However, nearby traffic from the rest of the city is heavier in this area than it is near rural or suburban schools. School A is located in a commercial area of the city next to a large intersection, so School A's estimated vehicle traffic is higher than Schools B and C, while School A's population density is lower than B and C. School B is located in a mixed residential and commercial area where streets are less busy. School C is located on smaller roads in a mostly residential part of the city and so has less truck and bus traffic.

School D is located in a coastal city in the Northeast, which is generally upwind of a city larger than the town surrounding Schools A, B and C. The school is located in a residential part of the city. There are large city streets near the school, but immediately surrounding the school are smaller streets, houses and a golf course. School E is located inland in a moderately sized city. The school is located on the edge of a residential area, but is also very close to the largest downtown intersection, which is often congested. The city is also located in a valley, which can lead to the potential inversion of pollution (increased concentration and atmospheric residency) under certain meteorological conditions.

School F is located in a coastal town about half a mile from a large interstate highway. Many buses serve this school because students come from a large residential area. School G is also in a coastal town and is only a few yards from a large interstate highway. The area surrounding the school is farmland and largely unsettled. School H is located in a northern inland town that is sparsely settled, although it is only a mile or two from a large interstate highway. The closest city is about 30 miles away, with a population near 35,000. School I is also located in an inland town and its closest large street is a small state highway. The closest urban center is located about 15 miles away from School I, with a population of 22,000.

[14] Urban to rural for this purpose is defined in terms of population density, with the exception of School A, which has a lower population density than Schools B and C, but is much more "urban" in terms of vehicle traffic and is placed ahead of those schools in this ranking.

Table 1. Characterization of Schools A-I

School	City/Town Population*	Population Density (people/sq mile)	Vehicle Count**	Geographic Characteristics
School A	100,000+	4124-6443	41,500	Inland, urban, commercial
School B	100,000+	12840-20257	10,000	Inland, urban, commercial/residential
School C	100,000+	12840-20257	10,000	Inland, urban, residential
School D	50,000	2300-3940	10,000	Coastal, urban, residential
School E	22,000	701-711	26,000	Inland, valley, small urban center
School F	7,500	216-342	2,000	Coastal, Residential
School G	3,500	149-219	25,000	Coastal, rural open space, next to highway
School H	2,400	66	3,500	Inland, very rural, farmland
School I	2,100	45	2,300	Inland, small rural town

* Rounded from Census 2000 to maintain the anonymity of the schools.
** Annual Average Daily Traffic estimates of local school area, from state Department of Transportation offices. (see Appendix G for calculation details)

METHODS AND LIMITATIONS

This study was designed to monitor criteria pollutants, carbonyls, and volatile organic compounds, and also to qualitatively assess the indoor environment by implementing a walkthrough assessment. As mentioned previously, one of the primary sources of these pollutants in the outdoor environment is fossil fuel combustion, particularly from motor vehicles. The methods used for this pilot study include real-time monitoring, four and eight-hour sampling and instantaneous sampling. Except for the real-time monitoring equipment, these are all adapted from standard methods used in ambient monitoring and industrial hygiene practice. Equipment and methods for monitoring each pollutant category are described below, along with limitations of the methods and equipment that were experienced by the monitoring team.

- **Criteria Pollutant Monitoring**

Methods:

The ACCESS air monitoring system was used to monitor criteria pollutants and other atmospheric indicators.[15] The system senses and records information from each sensor every minute, providing real-time data. NESCAUM was interested in obtaining real-time data for selected pollutants since short-term, episodic exposures to a number of air pollutants may be very important when considering non-cancer health effects. For this study, NESCAUM was particularly interested in real-time measurements for carbon dioxide and fine particulate matter ($PM_{2.5}$). Tracking minute-to-minute variations in these two compounds is instrumental to the aims of this and future studies since: 1) measurement of the indoor carbon dioxide concentration indicates the amount of fresh air exchange in the school buildings which aids in understanding the amount of air infiltration and 2) short-term episodic exposures to fine particulate matter ($PM_{2.5}$), are important to characterize because of the potential adverse impact on asthmatics or other individuals susceptible to respiratory irritation. In addition to sensors for carbon dioxide (CO_2) and $PM_{2.5}$, the ACCESS system has been used effectively by NESCAUM in the past to monitor for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and sulfur dioxide (SO_2). In addition to these compounds, the ACCESS system tracks temporal variation in barometric pressure, temperature, and relative humidity. Concentrations of the pollutants measured with the ACCESS system appear to be well within the limits of detection for the different sensors.[16] However, operational limitations and sensor interferences described in more detail in Appendix D will affect the quantitative accuracy of this equipment.

Real-time data provides an important source of information on minute-by-minute fluctuations of pollutants. Because pollutants that are lung irritants can produce acute health effects from high-concentration exposures over very short durations, real-time data is an important component of a multi-pollutant analysis. Without this information, short-term spikes in pollutant levels are obscured when data is collected and averaged over several hours. Accordingly, this study examines real-time data in conjunction with average values from four and eight-hour samples of carbonyls and volatile organic compounds (VOCs).

In schools where two ACCESS systems were available, one system was placed outside and the other system was placed 50 feet inside the main hallway. In cases where the ACCESS system could not be placed outside, one system was placed immediately inside the doorway, and the other was placed approximately fifty feet down the hall. These placements were designed to measure the difference between ambient air and indoor air, and also to track detectable movements of pollution as it traveled into and down the hall.

[15] For details on the ACCESS system, see Appendix D.

[16] For example, O_3, NO_2, and SO_2 accuracy is ±20 ppb and CO sensor accuracy is ±2 ppb.

Strengths and Limitations:

The main problems experienced in monitoring criteria pollutants with the ACCESS system were variations in placement in each school, differences in the actual machines that were used, and limitations with individual sensors on the machines. Placement issues stemmed from logistical difficulties (such as outlet location, length of power cord, weather conditions and student traffic) and difficulties defining the "main entrance" at some schools: at urban schools such as A, B, and C, a majority of students walked to school, so the small number of buses did not always have a drop-off area at an identified "entrance" for each school. Some other schools had a number of entrances from the bus stop area. In each case, the most commonly used entrance was monitored, but this did not represent all foot traffic entering the school or vehicle traffic near the school. These discrepancies between locations from school to school make it difficult to compare schools, but outside (or immediately inside) measurements and indoor measurements can be compared to each other for a given monitoring day at a single location.[17]

Another factor contributing to the uncertainty of ACCESS monitoring results is the fact that different ACCESS systems were used during summer and fall monitoring. ACCESS systems used during the fall were upgraded and recalibrated by the manufacturer prior to the beginning of fall monitoring. However, despite these upgrades, some problems were experienced with the new equipment. For instance, one system lost part of the computer code, which resulted in difficulties with calibration, datalogging and downloading results. Also, one of the newly installed particulate sensors became temporarily clogged with debris during a monitoring study at one of the project sites. The change in monitoring equipment between the summer and fall monitoring undermines the direct comparison of results between monitoring phases. The ACCESS system results are quantitative in nature only within operational limitations and sensor accuracy, and are most effective when used to track events at a given school during a given time period.[18]

Notwithstanding these issues, however, the ACCESS systems provided a valuable tool during this pilot study. The systems were relatively reliable, and provided excellent qualitative data, as well as quantitative measures within the operational limits of the system. Because levels of uncertainty are relatively constant for specific monitoring periods, trends throughout a day of monitoring are still valid. The primary purpose of real-time monitoring was to track movement and relative trends of criteria pollutants inside and outside of schools. When specific sensors recorded erroneous data, it was evident and that portion of the data was not included during our data analyses efforts, recognizing the effect these outliers may have on our analyses.

---

[17] The specific locations of the ACCESS systems are specified in each school's attached individual data.
[18] Please review Appendix D, part I, for more information

- Carbonyls

Methods:

Carbonyls were measured with Gilian personal sampling pumps, which draw air through an absorbent tube at a constant rate for a specified amount of time.[19] Each cartridge was analyzed by an EPA approved laboratory for the presence of a suite of fifteen carbonyls, of which the primary compounds of interest for our pilot study were formaldehyde, acetaldehyde and acetone. Acetaldehyde and formaldehyde are of particular concern to air quality and public health professionals of the NESCAUM region due to exceedances of the highly conservative health benchmarks for cancer risks across the nation. These health benchmarks have been used historically in all NESCAUM states to target emissions control efforts through state air toxic control programs. These compounds are also known to be present in certain types of building materials used in schools, such as carpeting (particularly the adhesive that holds the carpeting down) and some pressed plywood.

Samples were taken over four- to eight-hour periods; the results show average pollutant concentrations for the given time period. Eight-hour samples are typically collected in occupational exposure studies and are appropriate for recording average, long-term exposures. Most of the long-term samples taken were from six to eight hours in length. Some four-hour samples were taken to determine whether short-term peaks (which would be diluted in an eight-hour sample volume) could be measured. Short-term peaks are of interest because they are likely to contribute to respiratory irritation. Although the sample volume collected was greater than the minimum required under the monitoring methods selected, the total concentration of carbonyls collected in four hours in the schools during the summer was below the detection level for the analytical method. As a result, during the fall, all samples were collected over six- to eight-hour periods.

On each day of monitoring a total of four to seven samples were taken in various locations around the school. One pump was placed outside to obtain an ambient baseline measurement. A second pump was placed inside and down the main hallway approximately 50 feet inside the entrance. The remaining indoor pumps were placed in "problem" classrooms (as identified by schools and teachers), in classrooms with carpeting, or in rooms close to roadways or bus stops in an effort to characterize the potential range in airborne concentrations in a given school.

Strengths and Limitations:

The main methodological problem experienced in carbonyl monitoring was faulting [i.e. the pumps stopped working] by the Gilian pumps. Faulting is a common problem when using the Sep-pak collection media and the Gilian pumps that were used for this project. Faulting occurs because the pressure drop across the sample bed becomes too extreme with elevated airborne concentrations or high atmospheric humidity, which saturates the absorbent media during sampling. Faulting occurred less frequently during fall

[19] For more detailed information, see Appendix D, part II.

monitoring due to lower humidity levels and because of the use of two Gilian low-flow pumps. These low-low pumps sample for longer duration more reliably because they sample at a significantly slower airflow rate and are less affected by the pressure drop across the Sep-pak cartridges.

- **Volatile Organic Compounds**

Methods:

Testing for volatile organic compounds was performed using Summa canisters. Summa canisters are evacuated stainless steel canisters, which were fitted with an orifice calibrated to draw in one liter of air over a period of seven to eight hours.[20] The sampling duration was set at eight hours in order to provide data for the risk associated with long-term health effects and a comparison with the carbonyl sampling described previously. For each day of monitoring, canisters were co-located with the ACCESS system, with one evacuated canister placed outside near the main entrance and one canister with the ACCESS system inside the school. The canisters were elevated a few feet when possible to more accurately sample the breathing zone for school children. These locations were selected to evaluate relative concentrations of these chemicals in ambient air and in the school environment.

Twenty-eight VOCs were reported by the laboratory that analyzed the samples, including benzene, toluene, and methyl ethyl ketone, which are targeted HAPs under the Clean Air Act. Importantly for this pilot study, benzene and toluene are known to be present in large percentages in evaporating fuel or as fuel combustion products. In addition, methyl ethyl ketone, benzene, and toluene are all emitted by a number of other sources, such as industrial solvents, personal care products, and chemicals used by schools for cleaning, such as floor strippers and waxing products. Because they are emitted from multiple sources, it is difficult to associate ambient or indoor concentrations with a single activity.

These chemicals do not have known acute health effects. However, benzene is a known human carcinogen and toluene and methyl ethyl ketone, although low in potency, may cause other adverse non-cancer health effects such as central nervous system depression and liver damage following long-term exposure.

Strengths and Limitations:

Summa canister monitoring is widely used, is very reliable, and indicates clearly when a full sample has not been collected. The limitations experienced with the Summa cans were due to difficult attachment of the orifices, which only happened on a few occasions. During summer monitoring, two different styles of orifices were used. The two styles varied slightly in design and in ease of use, but both styles facilitated collection of a seven- to eight-hour sample at each school. During fall monitoring, five- to seven-minute grab samples were collected for five schools, and seven to eight-hour samples were

[20] See Appendix D, part III, for more information.

collected for the remaining four schools.[21] Grab samples had to substitute for the seven-eight-hour samples because the calibrated orifices for the Summa canisters were not available on those monitoring days. These grab samples provide a "snapshot" of the ambient air concentration as they do not integrate a sample over a full eight-hour sampling period.

- **Indoor Air Walkthrough Assessment**

As part of this study, NESCAUM developed a walkthrough assessment, partially adapting EPA's Tools for Schools Indoor Air Quality Checklist (see Appendix E), and integrating questions about building layout and surrounding areas.[22] The purpose of the checklist is to identify and describe potential sources of pollution in and around schools that may result in poor indoor air quality. One of the most important topics on the checklist is moisture sources in buildings, which can enhance mold growth. Water infiltration is indicated by evidence of leaks in roofs or pipes, water stains on ceiling or floor tiles, and observable condensation. Available sources of moisture and nutrition create an environment that supports the growth of mold, a common respiratory allergen and irritant. Details such as the number and location of water stains, the number of tiles affected, and musty odors were noted.

Effective ventilation is another important factor in maintaining healthy levels of fresh air in buildings. Thorough inspections of the inner workings of ventilation systems was beyond the scope of this study, but the checklist includes a section that addresses some central aspects of ventilation, including the type of system; areas in which it operates; and the presence of sealed windows and blocked vents. The effectiveness of ventilation systems was also characterized in most schools with instantaneous sampling of carbon dioxide (CO_2) levels, which indicate the amount of fresh air in buildings. A high CO_2 concentration may indicate that the air exchange rate is low or nonexistent, either because only a small amount of fresh air entering the building or due to a high occupancy rate.[23]

When equipment for grab sampling was available, samples were taken outside, at main entrances, and in many rooms within schools, some of which had been identified as possible problem areas by teachers. Samples of CO_2 were taken during summer and fall in order to compare unoccupied and occupied schools. Samples were taken with a Dräger CMS handheld monitor.[24] CO_2 samples were taken in occupied and unoccupied spaces and were collected at different times throughout the day in an effort to qualify the degree of fresh air intake and distribution in schools.

Walkthroughs also attempted to characterize some potentially important indoor pollution sources, such as chemicals used for cleaning and use of photocopiers. Additionally,

---

[21] Data is presented in Appendix H.
[22] See Appendix E for EPA's Tools for Schools checklist and Appendix F for the NESCAUM checklist.
[23] These are all comfort criteria; there are no health effects associated with levels of CO_2 which are expected to be found in a school building.
[24] See Appendix D, part IV for more information.

0496

walkthroughs identified whether exhaust hoods and fans were present above combustion appliances and if so, whether they were free of soot and discoloration. The general condition and cleanliness of buildings was also recorded, since dust exposure is known to result in respiratory irritation. Temperature and humidity levels were observed, since these factors often influence the comfort level of buildings, as well as growth of biogenic pollutants such as molds. Outside of buildings the air intake locations, water drainage patterns, and characteristics of surrounding areas were also noted.

FINDINGS

- **Criteria Pollutant Monitoring**

Real-time monitoring results for respirable particulate matter[25] carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen dioxide, and ozone are shown in Figure 2, panels A – H. Figure 2 presents eight panels of representative data (one for each monitoring criteria) from schools in this study. To illustrate temporal variation in target compounds, monitoring results are shown for an entire day. Further, data from a variety of schools is shown to best illustrate the qualitative importance of real-time monitoring. The operational limits of the ACCESS system prevent quantitative interpretation (see Appendix D for details).

In some instances, it is possible to correlate variations in measured concentrations with indoor or outdoor events. In these cases, we have attempted to identify potential sources of the observed variation in measured values as detailed below. These data represent quantitative results only within the operational limitations for the individual sensors.[26] Future NESCAUM analyses will track real-time carbon dioxide and $PM_{2.5}$ concentrations with more sensitive and accurate monitoring equipment now available to researchers.

In the few instances where the ACCESS system recorded levels above EPA standards, they are not definitive exceedances because of the margin of error present in each sensor. Additionally, the standards for criteria pollutants are for 24-hour averages of ambient pollutants, which is very different from episodic peaks recorded by the ACCESS system.

Panel A shows carbon dioxide (CO_2) levels in a school's main entrance and 50 feet down the hallway. Carbon dioxide was measured because it is an indicator of ventilation effectiveness and air exchange rates for buildings. It is not a criteria pollutant and is not associated with any health effect at levels found in schools. At the school shown in Panel A, CO_2 levels at the entry were lower than in the hallway for the entire day. This difference may illustrate the smaller number of occupants in the entrance or a higher rate of ventilation given proximity to an exterior door used throughout the day. The measurements in the two locations changed together: both levels increased when students arrived (around 9:00 a.m.), and then again when they entered the hallway for

[25] The Access System was calibrated to selectively measure particulate matter with a mean aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$).
[26] See Appendix D for more detail.

dismissal (2:30 p.m.). Other smaller spikes throughout the day likely due to indoor activity patterns. The results in Panel A are representative of most carbon dioxide levels recorded at schools during the fall. There was typically some variation during the day due to movement and activity in hallways. Levels in hallways at some schools were slightly higher than those seen in Panel A.

Panel B displays $PM_{2.5}$ levels at a school's entrance and 50 feet down the hallway. The measurements indicate fluctuations occurring throughout the day ranging between 0 - 25 $\mu g/m^3$. Fluctuations in the two locations coincide or closely follow each other, indicating that they may be influenced by the same events, such as movement of students throughout the school (which may re-entrain dust and small particles within the school and which may be reported as $PM_{2.5}$ by the ACCESS system). The additional 10 $\mu g/m^3$ found in entryway versus hallway measurements may be due to calibration of the ACCESS system and not to concentration differences, since the margin of error for the particulate monitor is greater than 10 $\mu g/m^3$. The concentrations of $PM_{2.5}$ shown in Panel B are typical results for schools monitored during the fall, which all varied with the movement of people around the school. Some schools experienced spikes higher than those seen in Panel B during periods of high activity in the hallways. These spikes may be attributed to differences in $PM_{2.5}$ concentrations or measurement artifact from dusts generated by disruption of floor material, school cleaning practices, or calibration and operational limitations of the sensors.

The level of carbon monoxide (CO) detected in one school during the summer is shown in Panel C. Measurements were taken at the main entrance and 50 feet down the hallway. These concentrations varied throughout the day and demonstrate an apparent relationship between outside activity and inside concentrations. The spike around 8:00 a.m. correlates with the observation of the arrival and idling of a delivery truck outside the main entrance of the school during this time. Peak CO levels 50 feet down the hallway occur a few minutes after the peak at the entrance, marking the potential migration of the pollutant into the school. CO levels recorded by the ACCESS monitor 50 feet down the hallway are higher than those at the main entrance. However, this is likely an artifact of differences in zeroing of the sensors or simply a variance within the accuracy of the CO sensor itself. At some other schools, low levels of carbon monoxide were also measured in the building, possibly from the infiltration of carbon monoxide from idling school buses or other traffic in the local area or due to low level release of indoor combustion sources (i.e. a heating system boiler).

Ozone levels detected outside and inside a school during the summer is shown in Panel D. The graph indicates that the levels of ozone outside were higher than the levels detected inside. This is expected during the summer when outdoor ozone is at its highest, due to atmospheric residence. Additionally, one would expect a lower ozone concentration inside a microenvironment because it is a highly reactive, relatively short-lived pollutant indoors. Also ambient ozone typically peaks in the afternoon, around 1:30 p.m. Therefore, the peak of indoor ozone at the same time suggests that the indoor detection may be attributable to the infiltration of ambient ozone. Ozone was detected at many schools over the summer, due in large part to elevated ambient summertime concentrations. In addition, when monitoring was done at the end of the summer while schools were preparing for the start of classes, sources of indoor ozone, such as copiers and printers, may have been detected.

Panel E shows NO_2 concentrations detected at the entrance to a school and 50 feet inside the entrance. Indoor concentrations fluctuated between 0 and 10 ppb, with two spikes of up to 45 ppb during the day. The ACCESS sensor located outside recorded a steady increase from 10 ppb to 60 ppb around 2:45 p.m., with a small decline by the end of the monitoring day. This steady increase may be due to ambient sources or local traffic. At other schools NO_2 was sometimes seen in the fall, but no consistent pattern emerged.

SO_2 concentrations at the "front" and "back" entrance of a school are shown in Panel F. There was almost no detection at the "front" entrance except at the start of monitoring. The fluctuation in the "back" entrance represents a small level of SO_2, which may be due to the fact that this entrance is only a few feet away from a street, and is located near the bus stop.

Temperatures and relative humidity levels at each school were recorded on every day of monitoring to help explain the behavior of pollutants and of sensors on the ACCESS system. The temperature levels shown in Panel G are representative of temperatures seen in most schools during the fall. The humidity levels shown in Panel H are from the same school and same day of monitoring as Panel G and are also representative of levels seen at other schools during the fall.

response to criticisms of using aggregate zonal analysis. However, this does not undermine the benefits of aggregate analysis which is intended to look at aggregate effects and can provide valuable information to policy makers on the overall impact of capacity expansion.

Rodier et al. (2001) use disaggregate data from the Sacramento, California region to examine induced travel effects. Their study uses the integrated land use/transportation model, MEPLAN, to analyse the impact of various scenarios in the Sacramento region. They compare the effect of holding various modelling elements constant, such as changes in land use and trip distribution, as opposed to allowing these to be endogenously determined by the model. What they find is that allowing these inputs to be endogenous results in a large elasticity of VMT with respect to lane miles of 0.8 for a forecast out to 2015 and 1.1 for a forecast out to 2040. If land development is not endogenous, but instead is assumed constant, the elasticity values are reduced to 0.6 and 1.0, respectively. Holding population and employment location constant further reduces these values to 0.4 and 0.6, respectively. This latter is equivalent to the assumptions underlying most state of the art in regional travel demand models where trip distribution is derived through feedbacks and multiple iterations. Without feedback of the trip distribution step, which is more common amongst state of the practice travel demand models, an elasticity of 0.0 (for both future forecast years) is calculated, essentially assuming totally inelastic travel demand.

Rodier et al. (2001) make several major contributions. First, the range of elasticity values derived using a disaggregate regional integrated land use and travel demand model assuming full endogeneity gives elasticities similar to the aggregate studies discussed previously. In fact, their elasticities are even higher than those studies that employ two-stage least squares to account for causality. Second, they show that state of the art improvements to regional travel demand models can capture about 50% of the induced travel effect relative to current practice capturing no effect. Obviously, this latter result has important implications for assessment of alternative projects (which is discussed further below). Lastly, their analysis is based on individual behavioural elements establishing a clear causal link between behaviour and induced travel. Rodier et al. (2001) also show that about 50% of the long-term induced travel effect is not captured by the use of travel demand models; in order to fully account for induced travel, regions would have to capture both travel and land use changes interactively.

Strathman et al. (2000) combined the 1995 Nationwide Personal Transportation Survey (NPTS) data for 12,009 households with the Texas Transportation Institute (TTI) data (Schrank and Lomax, 1997) on road capacity in 48 metropolitan areas in order to produce a system of equations that include both a wide range of exogenous variables and four endogenous variables (commute mode, workplace density, residential density, and VMT). In addition they use three instrumental variables (likelihood of payment for parking at work, commute distance, and vehicle ownership). In this study, per capita roadway capacity was found to have a significant effect upon mode choice, residential density, workplace density, and VMT. Given an increase in roadway capacity, the cross-sectional analysis indicated that persons within the metropolitan area tended to be more likely to drive alone to work, live and work at lower densities, and generate higher VMT.

The direct effect of a 10% increase in per capita roadway capacity is estimated to be a 2.9% increase in VMT, when all other variables are controlled for. This elasticity is consistent with the findings of Noland (2001); Noland and Cowart (2000), and Fulton et al. (2000). In addition to the

0421

Table 3
Instrumental variable regressions (with fixed effects)[a]

Dependent variable: Growth in VMT	All states		Maryland		North Carolina		Virginia	
	Instrument = growth in lane miles over two years	Instrument = growth in lane miles over three years	Instrument = growth in lane miles over two years	Instrument = growth in lane miles over three years	Instrument = growth in lane miles over two years	Instrument = growth in lane miles over three years	Instrument = growth in lane miles over two years	Instrument = growth in lane miles over three years
Growth in lane miles	0.505 (4.823)	0.457 (2.796)	0.397 (1.972)	0.290 (0.948)	0.638 (6.491)	0.479 (3.705)	0.288 (4.405)	0.444 (4.958)
Growth in population	0.031 (0.234)	0.031 (0.214)	0.251 (0.864)	0.219 (0.726)	0.166 (0.589)	0.387 (1.293)	0.120 (1.998)	0.114 (1.694)
Growth in per capita income	0.002 (0.037)	− 0.028 (−0.372)	0.255 (1.923)	0.292 (2.047)	0.114 (1.423)	0.133 (1.573)	0.088 (2.232)	0.080 (1.959)
Constant	−0.003 (−0.148)	−0.004 (−0.176)	0.009 (0.451)	0.008 (0.396)	0.038 (1.900)	0.038 (1.824)	0.040 (3.098)	0.043 (3.222)
N	1980	1760	598	575	1000	900	2400	2304
Adjusted R^2	0.031	0.024	0.112	0.089	0.060	0.060	0.172	0.199

[a] T-stats are in parentheses; County and time specific constants are omitted for brevity.

elasticity of 0.559, very similar to the results of Fulton et al. (2000). They used various political and demographic variables to help explain the increase in road supply including the party of the governor (lagged by one year) and the proportion of a county's population that was white. They also found that the supply of lane miles can be explained by VMT, but with a smaller coefficient value of 0.328. Therefore their results suggest that causality may run in both directions but that the effect of lane miles on VMT is greater than the opposite effect. They also conducted a Granger test and found the results consistent with their instrumental variable model. Fulton et al. (2000) also conduct a Granger test with Maryland and Virginia data. While this test is not a basis for causality, they do confirm that VMT growth is preceded by lane mile growth, while the reverse cannot be established.

Overall the results of Fulton et al. (2000) and Cervero and Hansen (2001) are the most persuasive at showing a causal linkage between growth in lane miles and growth in VMT.

The work of Noland and Cowart (2000); Fulton et al. (2000) and Cervero and Hansen (2001) using two-stage least squares estimation generally produces lower elasticity values than the studies of Hansen and Huang (1997) and Noland (2001), although the latter overlaps at the low end. This may indicate that there is some upward bias in the estimates from the latter two studies.

The studies mentioned above have all used aggregate data to test for statistical significance and to derive elasticity values. This is common practice in the economics literature, but has been criticized by transportation planners. The basis of this criticism is that we need to understand how individuals respond to changes in capacity to truly capture all the behavioural effects that might occur. A disaggregate analysis of this sort would certainly be of interest and is motivated largely by the desire of transportation planners to understand how specific projects may influence the behaviour of specific categories of individuals. This has been a goal of transportation modelling in where people want to travel. On the other hand, these studies certainly do not build a case for rejecting the induced travel hypothesis.

One approach for definitively addressing the issue of causality is to use an instrumental variable in the regression with a two-stage least squares estimation procedure. Noland and Cowart (2000) use a two-stage least squares regression testing several instruments to use for lane miles per capita. Results are shown in Table 2. Urbanized land is tested as an instrument in model (A). This variable is not strongly correlated with per capita VMT but is significantly related to total lane miles per capita (increasing urbanized land area results in lower lane miles per capita). Model (A) has coefficient values very similar to OLS estimates. Model (B) removes population density which tends to interact with the dependent variable which is specified as a per capita variable. This reduces the value of the lane mile coefficient. Model (C) which has population/area as an instrument indicates some instability and lack of robustness in the lane mile coefficient. These results, while relatively weak, do suggest a causal linkage between increasing lane miles and increased VMT.

A study by Fulton et al. (2000) used cross-sectional time series county-level data from North Carolina, Virginia, and Maryland and estimated a two-stage least squares model. Their model is specified as a growth model with growth in VMT as a function of growth in lane miles. As an instrument they find that lane mile growth over either 2 years or 3 years is correlated with 1 year growth in lane miles, but not with 1 year growth in VMT. This is used to estimate individual state models and a model with data from all three states combined. Results are quite robust with an elasticity between 0.3 and 0.5. This model is reproduced in Table 3. Fulton et al. (2000) do not provide an estimate of long-run elasticities but one would expect these to be somewhat higher.

Cervero and Hansen (2001) estimate a two-stage least squares model with instrumental variables using county level data from California. They estimated a statistically significant lane mile

Table 2
Instrumental variable (two-stage least squares) regressions[a]

	(A)	(B)	(C)
LN (VMT per capita)	Insrument = LN (area)	Insrument = LN (area)	Instrument = LN (population/area)
LN (lane miles per capita)	0.760	0.289	1.944
	(18.092)	(2.873)	(6.035)
LN (per capita income)	0.315	0.557	−0.135
	(6.198)	(8.051)	(−0.798)
LN (fuel cost)	−0.005	−0.023	0.135
	(−0.179)	(−0.713)	(2.186)
LN (population density)	−0.160		
	(−7.077)		
Constant	0.476	−3.193	3.595
	(0.887)	(−4.701)	(2.224)
N	1050	1050	1050
Adjusted R^2	0.975	0.967	0.902

[a] T-stats are in parentheses.

0423

Table 1
Seemingly unrelated regression by road type and urban/rural area: distributed lag model[a]

Dependent variable is log of VMT by road type Lane miles are by road type per capita	Urban interstates	Urban arterials	Urban collectors	Rural interstates	Rural arterials	Rural collectors
LN (VMT, lagged one year)	0.464 (17.981)	0.370 (12.915)	0.528 (20.251)	0.669 (30.774)	0.485 (16.658)	0.649 (21.658)
LN (urban interstate lane miles, per capita)	0.439 (17.136)					
LN (urban arterial lane miles, per capita)		0.498 (18.002)				
LN (urban collector lane miles, per capita)			0.513 (15.097)			
LN (rural interstate lane miles, per capita)				0.234 (6.473)		
LN (rural arterial lane miles, per capita)					0.369 (10.621)	
LN (rural collector lane miles, per capita)						0.407 (6.726)
LN (population)	0.625 (9.561)	0.652 (10.279)	0.690 (6.645)	0.250 (4.057)	0.509 (8.159)	0.307 (2.950)
LN (per capita income)	0.748 (12.227)	0.489 (9.788)	0.328 (3.545)	0.531 (9.858)	0.630 (11.450)	0.313 (4.387)
LN (cost per BTU of fuel)	−0.085 (−4.191)	−0.047 (−2.308)	−0.019 (−0.478)	−0.064 (−3.590)	−0.035 (−1.746)	−0.033 (−1.106)
Constant	−9.149 (−9.479)	−5.908 (−7.864)	−6.219 (−4.907)	−4.702 (−6.574)	−7.349 (−10.093)	−3.350 (−2.786)
N	583	583	583	583	583	583
Long run elasticities						
Lane miles per capita	0.819	0.790	1.087	0.707	0.717	1.160
Population	1.166	1.035	1.462	0.755	0.988	0.875
Personal income	1.396	0.776	0.695	1.604	1.223	0.892
Gasoline price	−0.159	−0.075	−0.040	−0.193	−0.068	−0.094

[a] *T*-stats are in parentheses.

An analysis of nationwide metropolitan level data by Noland and Cowart (2000) tells the same story. Long run elasticity values of 0.8 to 1.0 are derived using a distributed lag model estimated for VMT and lane miles specific to interstates and arterial road capacity.

One criticism of this work has been that it does not resolve the issue of causality, merely showing a correlation between lane mile expansion and VMT growth. Highway planners argue that since they have accurately forecast where individuals desire to travel they expect roads to fill up with travellers after they are built. However, this ignores the fact that they often become more congested more rapidly than initially planned, as Goodwin (1996) and the Standing Advisory Committee on Trunk Road Assessment (1994) showed for a sampling of projects in the UK. This may partially be a function of analytical forecasting tools that are not accurately capturing induced travel effects. In any case, many planners discount econometric analyses as merely proving that a correlation has been found and that these studies show that planners are putting highways highway lane miles for region i and time $t - l$, where l is a time lag, λ^k, ω^l are coefficients which are estimated, ε_{it} is an error term, assumed to be normally distributed. Fixed effect models with panel data include dummy (0–1) variables for each cross-sectional unit (less one) and sometimes for each year (again, less one). They are then normally estimated using ordinary least squares regression (OLS). Other variables included by Hansen and Huang (1997) in their analysis are population, personal income, population density, and gasoline prices, all of which are expected to have an effect on VMT growth.

The use of panel data and fixed effects estimation allows estimation of models when the analyst may not have data on all the causal factors that influence the dependent variable (Johnston and DiNardo, 1997). This is of critical importance in the analysis of VMT growth. Many factors have been suggested as drivers of recent growth in VMT. These include increased female participation in the work force, changing lifestyles amongst individuals, changes in family structure, levels of available public transport, spatial patterns of development, and other factors that are either unknown or for which data are not easily available. Many of these factors may also be highly correlated with other variables such as per capita income or overall population growth, which can cause problems in estimating standard errors for the coefficients of interest.

As outlined by Johnston and DiNardo (1997), analysis of simple cross-sectional data using OLS estimation can result in biased estimates due to orthogonality between the independent variables and the time-invariant error term. Panel data allow the time-invariant terms to drop out, thereby removing the bias in estimation. Johnston and DiNardo (1997) point out that "with panel data it is possible to obtain consistent estimates of parameters of interest even in the face of correlated omitted effects when OLS on individuals' cross-sections would fail to do so!".

Hansen and Huang (1997) estimate statistically significant coefficients on their lane mile variable using panel data and both OLS and a Prais–Winsten regression. The latter was done to correct for autocorrelated error terms that they found using OLS regression. Lane mile elasticities (with respect to VMT) between 0.3 and 0.7 were found for models using county-level data.[9] Elasticities of between 0.5 to 0.9 were found for models using metropolitan level data. Various lag structures were also tested and a two to four year lag structure resulted in long run elasticities that were greater than those in the unlagged models.

Noland (2001) estimated a number of similar panel regression models using nationwide data at the state level. In general, Noland finds similar elasticity values ranging from 0.3 to 0.6 in the short run and from 0.7 to 1.0 in the long run. The models estimated by Noland include a disaggregation of the data by road facility type (i.e., interstates, arterials, and collector roads by urban and rural road categories). These are estimated using Zellner's seemingly unrelated regression and with a distributed lag (thereby allowing the derivation of a long run elasticity). Results for one of these models are displayed in Table 1. In addition, Noland (2001) estimates a growth (or difference) model. This has the beneficial effect of removing virtually any multicollinearity in the independent variables. The resulting lane mile coefficient estimates remain similar, ranging from 0.5 to 0.8, all with high levels of statistical significance.

[9] These elasticities represent changes in VMT with respect to lane miles, therefore a positive sign implies that there is an increase in VMT with an increase in lane miles. Alternatively, travel time elasticities, as discussed by Goodwin (1992), will have a negative sign implying an increase in VMT with a decrease in travel times.

etc.). The SACTRA report also included recommendations on how to improve appraisal and forecasting methodologies to account for induced travel. We address issues related to this below in our discussion of policy implementation.

Cairns et al. (1998) consider additional evidence for induced travel effects. Their study analysed the impact of highway capacity reductions on traffic, essentially the reverse of adding new capacity. This study was commissioned in response to changes in the goals of transportation policy in the UK on finding ways of supporting alternative modes of travel while reducing total vehicle traffic levels. Improvements in public transport, pedestrian and walking facilities often require the reallocation of road space from motor vehicles. Many proposed projects would be avoided due to fears of "traffic chaos" should this occur. Cairns et al. (1998) reviewed both the theoretical evidence and over 40 specific case studies where road space had been either temporarily or permanently removed. The overall conclusion was that traffic chaos did not occur, though there may be short-term transitional impacts. Overall traffic volumes were found to generally be reduced when road capacity was removed.

3.2. Studies in the US

Shortly after the completion of the Standing Advisory Committee on Trunk Road Assessment (1994) report, the Transportation Research Board (1995) examined the issue of induced travel and the implications for air quality and energy use. This report provides extensive detail on the behavioural impacts from expanding road capacity. The primary focus of the report was on the capability of analytical models used for forecasting regional transportation growth and emissions of criteria pollutants to adequately account for induced travel effects. The consensus was that most modelling procedures are deficient and probably do not adequately capture induced travel effects or the behavioural and economic development impacts of road projects. Johnston and Ceerla (1996a,b) verified this conclusion by modelling various infrastructure improvements in the Sacramento region and comparing results with and without feedback of initial travel time changes. They also showed that the lack of fully accounting for feedback effects could result in different rankings of the projects on their congestion reduction potential.

The TRB report was inconclusive on how induced travel may effect air quality. This issue is complicated by the relationship between traffic dynamics (such as changes in speed and acceleration characteristics) and emissions. However, the report clearly concludes that reductions in travel time or generalized costs will result in both increased highway use and have a decentralizing effect on urban development.

Empirical work has attempted to separate the effects of other exogenous variables using econometric techniques. This recent body of work began with the work of Hansen et al. (1993) and Hansen and Huang (1997). They estimated econometric models using time series data on VMT and lane miles for state highways in California, by county and metropolitan area. The key innovation was the use of a fixed effects model specified as follows,

$$\log(\mathrm{VMT}_{it}) = \alpha_i + \beta_t + \sum_k \lambda^k \log\left(X_{it}^k\right) + \sum_{l=0}^{L} \omega^l \log(\mathrm{SHLM}_{it-l}) + \varepsilon_{it}, \tag{1}$$

where VMT_{it} is the VMT in region i in year t, α_i is the fixed effect for region i, β_t is the fixed effect for year t, X_{it}^k is the value of explanatory variable k for region i, and year t, SHLM_{it-l} is state

0426

Trunk Road Assessment discounted this argument for several reasons including potential problems with the timing of the measurements (taken only one year after the schemes were completed) and the lack of a broader measurement of total traffic on alternative roads. They also note that forecast traffic on motorways and bypasses was usually larger than for smaller schemes, which would be expected if induced traffic was occurring. The arguments in the SACTRA report also hint at the endogeneity of economic growth and highway capacity additions. The latter may have an impact on overall economic growth as we discuss further below. To some extent, however, the potential forecasting errors could be from numerous factors, including lack of accounting for induced travel, therefore it is difficult to draw firm conclusions from this analysis, other than to demonstrate the weakness of current forecasting procedures.

Rodier and Johnston (2001) analysed errors in various socioeconomic forecasts and the impact on travel forecast error. This was done for the Sacramento, California region. They found that plausible errors in personal income and fuel price forecasts had no significant impact. However, errors in population and employment growth had a significant impact. Therefore it is reasonable to assume that some of the forecast errors reviewed by the Standing Advisory Committee on Trunk Road Assessment (1994) are from these type of errors, though separating the sources of errors in demographic projections and omission of induced travel effects is questionable.

The Standing Advisory Committee on Trunk Road Assessment (1994) and Goodwin (1996) derive travel time elasticities with respect to VMT using fuel price elasticities with respect to VMT. This is done for the elasticity range −0.15 to −0.30 reported by Goodwin (1992). Using an assumption of 6 pence (9 cents) per minute as the value of time, 25 min of average time spent traveling and 50 pence (75 cents) spent per day on fuel, he derives an elasticity range between −0.45 to −0.90 (or as he summarizes, nearly −1.00).

While it is not clear how the assumptions on time spent traveling and fuel costs were derived, it is clear that if we use US prices for gasoline, which are about 4 times less than in the UK and assume somewhat lower average vehicle efficiency, we can easily see that elasticity values in the US must be larger. Assuming a gasoline price of $1.25 per gallon, average speed of 30 mph, and fuel efficiency of 27.5 mpg, then US elasticities would range from −0.56 (short run) to −1.18 (long run). [8] The key result must be that if fuel prices are low, then more of a behavioural response can be expected from changes in travel speeds. That is, highway capacity effects will be larger if travel time accounts for a greater fraction of the total generalized cost of travel.

The Standing Advisory Committee on Trunk Road Assessment (1994) report had been commissioned to answer specific questions regarding induced travel. The first question was whether induced traffic is a "real phenomenon". They concluded that induced traffic "can and does occur, probably quite significantly, though its size and significance are likely to vary widely in different circumstances." They also concluded that induced traffic can affect the economic evaluation of a road scheme, i.e., affirmatively answering the question of whether induced traffic does matter. They also conclude that it matters most under conditions where the network is operating close to capacity, where demand elasticity is high, and in cases where a specific scheme is likely to result in large changes in travel costs. They were not able to draw any conclusions on which elements of travel behaviour are affected more or less (i.e., generation, distribution, mode choice, land use,

[8] Other assumptions used by Goodwin (1996) are held to be the same.

to a report done for the UK Ministry of Transport in 1938 that evaluated a significant increase in traffic on a new road. Much of the historical literature has been based on observational traffic counts within travel corridors. These studies have generally not accounted for other exogenous effects that could also contribute to growth in VMT. Pells (1989) also cited many previous publications to estimate that much of the increase in traffic flows was due to induced traffic.

The Transportation Research Board (1995) also reviewed historical literature. The methods used in many of these studies involved measuring traffic counts before and after the construction of a new facility (e.g. Jorgensen, 1947; Lynch, 1955). Adjustments were then made to control for 'normal' growth in the corridor and the resulting difference was attributed to the new highway capacity. While these studies are suggestive of an effect, statistically it is not possible to explicitly attribute differences in traffic to the new capacity.

While much of this historical literature is suggestive of strong induced travel effects, these studies did not use statistical models to control for other effects that cause VMT growth. In addition, much of the historical research appears within the "grey literature", consisting of consultant reports, conference proceedings, and other sources not normally subjected to academic peer review.[7]

The remainder of this review will focus on two distinct streams of research on induced travel that have been pursued over the last several years. These parallel streams occurred in the UK and the US. We review both strands of research, most of which has been published in academic journals, and which provide persuasive empirical evidence for the existence of induced travel.

3.1. Studies in the UK

The recent spate of empirical work in induced travel was initiated by the Standing Advisory Committee on Trunk Road Assessment (1994) investigation and report to the UK Department of Transport. This study, commonly referred to as the SACTRA report, included a review of relevant theory and empirical studies. It also included a detailed review of traffic growth within specific corridors that had an increase in capacity, concluding that many corridors had seen greater than expected traffic growth and that this growth was probably not solely attributable to other impacts such as increases in income. In addition, the studies reviewed focused on traffic counts, rather than changes in VMT, which may mask the effect of some trips now being longer than they were previously. On average, actual use of a road during the first year after its completion was more than 10% greater than the forecast usage. While some of this may simply be due to inaccuracy in the forecasts (other than the lack of accounting for induced travel effects), these studies also showed that traffic flows on parallel routes that the roads were intended to relieve were also either higher or about the same as before.

The Standing Advisory Committee on Trunk Road Assessment (1994) report indicates that some of the forecast inaccuracy may be due to underestimates of the rate of increase in GDP (as used by the National Road Traffic Forecast). The UK Department of Transport considered this to be the primary effect of the underestimation of traffic growth on the schemes studied and thus discounted the evidence for induced travel occurring. The Standing Advisory Committee on

[7] These reports are not always archived in university libraries, making them difficult to find.

residences, employees, and businesses will tend to relocate over time often resulting in longer distance trips (Gordon and Richardson, 1994). [6] The concentration of retail activities in "big box" stores or auto-dependent regional shopping centers (rather than centrally located business districts) further increases VMT. Finally, increases in highway capacity may lead to changes in land development patterns within a region.

The theory of induced travel is consistent with Downs (1992) theory of "triple convergence". Downs (1992) formulated this theory to explain the difficulty of removing peak-hour congestion from highways. In response to a capacity addition three immediate effects occur. Drivers using alternative routes begin to use the expanded highway, those previously traveling at off-peak times (either immediately before or after the peak) shift to the peak (rescheduling behaviour as defined previously), and public transport users shift to driving their vehicles.

Mogridge et al. (1987) extends this idea to the Downs–Thomson paradox whereby road capacity increases can actually make overall congestion on the road worse. This occurs when the shift from public transport causes a disinvestment in the mode such that the operator either reduces frequency of service or raises fares to cover costs. This shifts additional passengers into cars. Ultimately the public transport system may be eliminated and congestion on the original (expanded) road is worse than before. Arnott and Small (1994) provide a mathematical example of this effect.

Another theoretical framework assumes that total time budgets allocated to travel remain relatively constant over time. This was shown empirically by Zahavi and Ryan (1980) and Zahavi and Talvitie (1980). Gordon and Richardson (1994) have shown that over time, relatively constant average commute travel times are maintained. The travel time savings from increased travel speeds tend to be off-set by increased travel distance, rather than actual travel time savings. Thus, individual travel time budgets tend to remain constant. One could argue that full induced travel effects could actually increase the travel time budget if the generalized cost of travel is reduced. However, even without an increase in the travel time budget, a constant travel budget could result in an increase in VMT from capacity additions and the increased travel speeds that are then possible.

Clearly, the theoretical understanding and the potential behavioural characteristics for induced travel effects are well established. Clear empirical evidence has, until recently, remained elusive. This is partly due to the difficulty of statistically separating the many effects that also increase total VMT and establishing clear causal relationships. These issues and a review of the empirical work is presented next.

3. Induced travel: empirical studies and verification of the theory

Induced travel has been a topic of research in transportation planning and economics for many years. Goodwin (1996) provides a review of some of the historical evidence in the UK going back

[6] While the work of Gordon and Richardson is generally meant to extoll the virtues of suburban land development patterns, their analysis of stability in work travel times while travel speeds increase, provides good empirical evidence for induced travel.

between Q2 and Q1, while the effect from exogenous growth is the difference between Q3 and Q2. [3]

Induced travel naturally assumes some elasticity of demand associated with travel. That is, as the price (or time cost) of travel changes, the amount of travel demanded changes. Goodwin (1992) reviewed a number of studies of the elasticity of travel with respect to fuel prices. He concludes that elasticities of VMT with respect to gasoline prices range from about −0.16 in the short run up to −0.30 in the long run. [4] However, traffic engineers have traditionally assumed that travel demand has totally inelastic demand implying that total travel will be constant irrespective of changes in the price (or time cost) of travel. This and the attribution of travel growth to exogenous factors is the source of much of the disagreement over the fundamental existence and nature of induced travel effects.

Another common source of disagreement is how to define induced travel. For example, does this just include new trips or should longer trips also be included? Litman (2001), for example, distinguishes between induced traffic and generated traffic, where the latter includes diverted traffic (from other routes), while induced traffic does not include any diverted traffic. We define induced travel to be an increase in VMT, since VMT growth is one of the primary sources of increased environmental and social costs as well as representing the potential benefits of increased mobility. In the simplest terms induced travel (or VMT) can be broadly defined as the increase in VMT attributable to any transportation infrastructure project that increases capacity.

Hills (1996) and Litman (2001) provide a useful categorization of the various behavioural effects one can expect from highway upgrades or capacity expansions. Immediate behavioural effects include: changes in the timing of departure due to rescheduling of trips (Small, 1982); switching of routes to take advantage of new capacity; switches between transportation modes such as switching to private vehicle use from public transport; longer trips; and an increase in total trips taken. The most visible of these effects (as shown by the difficulty of reducing peak period congestion) tends to be rescheduling behaviour that results in travellers returning to their preferred peak travel times. However, this effect does not necessarily result in an increase in VMT and so would not represent induced travel. [5] However, shifts to the peak that free up capacity at other times of the day can result in new trips being made at those times that are now less congested.

Route switching can result in either shorter or longer distances being travelled. If the net effect is more travel this is clearly defined as induced VMT. If speeds are now faster, some additional long trips (perhaps recreational in nature or to more distant shopping centers) are likely to be taken increasing total VMT.

In addition to these short run effects, various longer run effects are hypothesized to have a significant impact on total VMT growth. One long run effect would be increases in household auto ownership levels. Other long run effects occur due to changes in relative accessibility within an urbanized area and can result in the spatial reallocation of activities. If speeds are higher, many

[3] The relative scale of the effects in Fig. 2 does not necessarily represent actual magnitudes.

[4] This is distinct from Goodwin's conclusions on the price elasticity of fuel consumption, which ranges from about −0.25 in the short run up to about −0.8 in the long run.

[5] Peak shifting that does not noticeably reduce aggregate travel times does suggest that the benefits of most projects are not accurately assessed. This suggests that rather than assessing benefits based only on travel times an assessment based on the ability to travel at a preferred time should be done (Small, 1992).

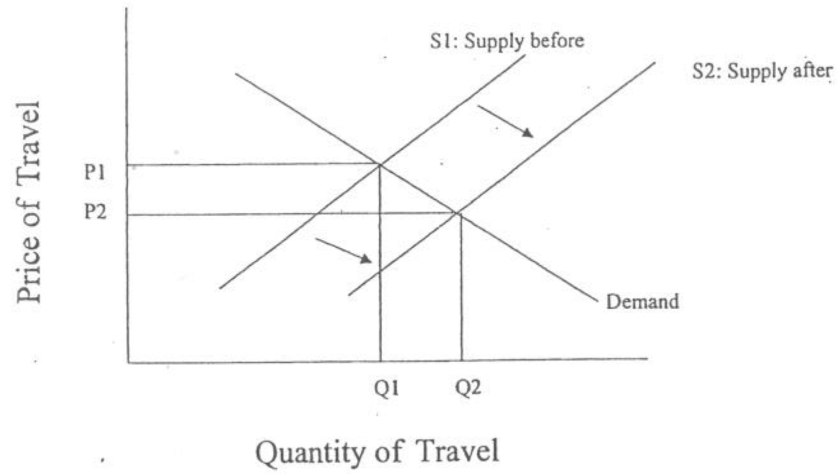


Fig. 1. Induced travel.

In measuring the induced travel effect there are many confounding factors that also drive growth in vehicle miles of travel (VMT). Population growth, increases in income, and other demographic effects, such as increased numbers of women in the workplace, are often cited. Fig. 2 shows how these effects can be graphically illustrated. The demand curve shifts outward from D1 to D2 because total demand for travel is larger at a given price when, for example, population increases in an area. The demand and supply curves shift simultaneously in Fig. 2, and the resulting quantity of travel increases even more than in Fig. 1 (to Q3). Empirically, it is difficult to isolate these two concurrent effects, and the relative contribution to VMT growth of different factors. In Fig. 2, the induced travel effect is measured along the horizontal axis as the difference

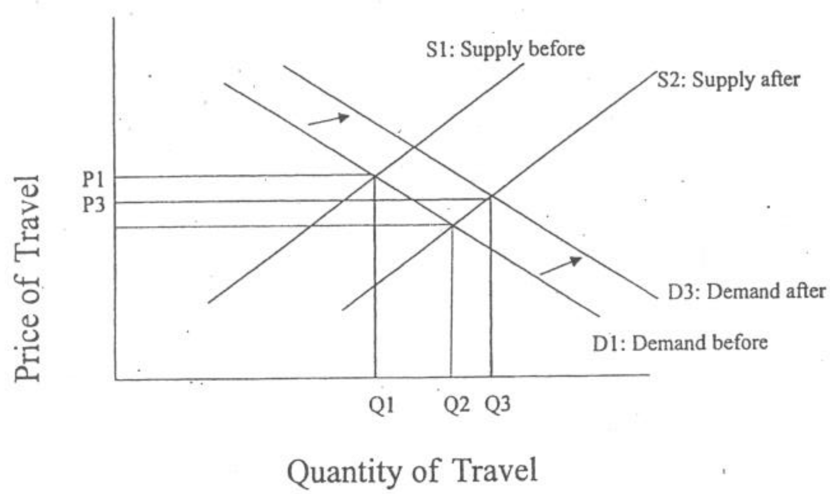


Fig. 2. Induced travel during period of underlying growth in demand.

0431

with a large expansion of the Trunk Road system. [2] Historically the UK has placed great emphasis on cost benefit assessment of road projects to help prioritize projects. In the US, assessment procedures have normally focused on evaluating alternative options, mainly to assess and mitigate environmental impacts. Recent research into induced travel effects, which we review, suggests that these procedures do not fully account for the impact of changes in transportation facilities.

Recently both countries have attempted to move towards more integrated transportation policies. This began in the US with enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and subsequent reauthorization as the Transportation Equity Act for the 21st Century (TEA-21) in 1998. In the UK the central government issued a White Paper in 1998 laying out a strategic direction for transportation policy (Department of Environment, Transport and the Regions, 1998a). The latter reflected research conducted by the Standing Advisory Committee on Trunk Road Assessment (1994), commonly known as SACTRA, on the impacts of induced travel as well as environmental concerns over future growth in travel (Goodwin, 1999). In the US capacity enhancing projects are increasingly being challenged as either ineffective at reducing congestion or as likely to result in the continuation of sprawl development patterns and inefficient land use.

This paper reviews the theoretical and recent empirical evidence for induced travel effects, focusing on the US and the UK. We begin with a review of the behavioural relationships underlying the theory of induced travel and review much of the recent research that documents and empirically measures induced travel effects. We then examine how transportation and environmental policy is changing in response to the empirical findings both in the US and the UK. We suggest areas of improvement in the decision making process to fully recognize the consequences of induced travel behaviour on both transportation and environmental policy.

2. Induced travel: theory and definitions

The underlying theory behind induced travel is based upon the simple economic theory of supply and demand. Any increase in highway capacity (supply) reduces the generalized cost of travel, especially on congested highways, by reducing the time cost of travel. Travel time is the major component of variable costs experienced by those using private vehicles for travel. When any good (in this case travel) is reduced in cost, the quantity demanded of that good increases.

Travel supply and demand and the induced travel effect are illustrated graphically in Fig. 1. The line S1 is supply before a capacity expansion or other changes that lower the generalized cost of travel. The line S2 is supply after the change in capacity, resulting in a lower generalized cost of travel due to lower travel time costs. The quantity of travel demanded increases from Q1 to Q2 as the change in supply lowers the cost of travel from P1 to P2. Fig. 1 assumes no change in underlying demand. For example, population growth is not depicted in Fig. 1. The increase in the quantity of travel from Q1 to Q2 represents the induced travel effect.

[2] Trunk roads in the UK are the responsibility of the central government and carry the bulk of long distance and through traffic.

PERGAMON

Transportation Research Part D 7 (2002) 1–26

TRANSPORTATION RESEARCH PART D

www.elsevier.com/locate/trd

A review of the evidence for induced travel and changes in transportation and environmental policy in the US and the UK

Robert B. Noland [a,*], Lewison L. Lem [b,1]

[a] *Department of Civil and Environmental Engineering, Centre for Transport Studies, Imperial College of Science, Technology and Medicine, London SW7 2BU, UK*

[b] *Jack Faucett Associates, 2855 Mitchell Dr. Suite 203, Walnut Creek, CA 94598, USA*

Abstract

This paper reviews recent research into the demand inducing effects of new transportation capacity. We begin with a discussion of the basic theoretical background and then review recent research both in the UK and the US. Results of this research show strong evidence that new transportation capacity induces increased travel, both due to short run effects and long run changes in land use development patterns. While this topic has long been debated amongst transportation planners, the fundamental hypothesis and theory has long been apparent in studies of transportation economics and planning that evaluated different issues (e.g. travel time budgets and urban economic development effects). We summarize much of this work and relate the theoretical issues to recent empirical research. We then proceed to examine recent changes in transportation and environmental policy in the US and the UK. The role of the new knowledge of induced travel effects would be expected to lead to changes in the conduct of transportation and environmental policy. Changes in policy and implementation of those policies are still occurring and we provide some suggestions on how to move forward in these areas. © 2001 Elsevier Science Ltd. All rights reserved.

1. Introduction

Transportation policy has normally been influenced by the desire to provide mobility and efficient access to alternative destinations primarily by alleviating traffic congestion. In the US this has focused around construction of the Interstate Highway System and provision of capital assistance for public transport systems in urbanized areas. The UK has followed a similar approach

* Corresponding author. Tel.: +44-20-7594-6036; fax: +44-20-7594-6102.

E-mail addresses: r.noland@ic.ac.uk (R.B. Noland), LewisonLem@aol.com (L.L. Lem).

[1] Tel.: +1-415-533-5316.

PII: S1361-9209(01)00009-8

PAH mass to primary motor vehicle emissions. Of this, 65% of the PAH mass was attributable to buses and trucks and 35% was attributable to cars. Although the basis for vehicle classification differs, these results are comparable to the simple linear regression results that showed 2-axle and >2-axle vehicles explaining 47 and 75% of the particle-bound PAH concentration variability.

Based on 3-hr integrated measurements, the coefficient given by the regression of traffic count on curbside ambient concentration provides an estimate of the mobile source effect on curbside concentration relevant to the location and meteorology of sampling. The magnitude of the source effect varied by pollutant and vehicle class. The highest mobile source effect was 0.2711 ng/m^3/vehicle for particle-bound PAH from >2-axle vehicles. This exceeded the 2-axle mobile source effect of 0.0045 ng/m^3/vehicle by a factor of 60. These results compare with Dunbar et al.,[44] who attributed 65% of the total PAH mass to buses and trucks that comprised 6% of the total traffic volume, suggesting a 29-fold difference in mobile source effect between passenger vehicles and trucks and buses. Additional corroboration for high particulate matter emission of diesel vehicles relative to gasoline vehicles is given by Durbin et al.,[47] indicating diesel light-duty vehicles emit 1–2 orders of magnitude more particulate matter relative to gasoline vehicles.

For 1,3-butadiene and benzene, the current study suggests that >2-axle vehicles have mobile source effects that are 32 and 9 times greater than 2-axle vehicles, respectively. This difference is consistent in direction but higher than the 3- to 4-fold difference in hydrocarbon emissions suggested by EPA[40] for light-duty gasoline powered vehicles (approximately 0.6 g/mi for 1991–1997 vehicles with 50,000 mi) relative to heavy-duty diesel-powered vehicles (2.1 g/mi for 1991–1997 vehicles with 50,000 mi).

The observed difference in mobile source effect by number of vehicle axles is likely attributable to a combination of fuel type and consumption; that is, larger vehicles with >2 axles are likely to burn more fuel per mile and are more likely to have diesel engines. From the current study design, it is not possible to disentangle these two possible contributing effects. However, based on the Federal Highway Administration's (FHA) database of vehicle miles traveled,[35] it is possible to estimate fuel consumption by vehicle type. To compare the vehicle classification from the current study (i.e., by number of axles) to FHA's classification, it is necessary to assign the FHA classification to categories by axle: 2-axle vehicles = motorcycle, light-duty gas, and light-duty diesel; >2-axle vehicles = heavy-duty gas and heavy-duty diesel. Assuming this classification and based on the FHA database for the surrounding vicinity (Baltimore City, Baltimore County, and Anne Arundel County),[48] 99.7% of the gasoline is consumed by 2-axle vehicles whereas 72.2% of diesel fuel is consumed by >2-axle vehicles. These data indicate that although the 2-axle vehicle class is nearly all gasoline-powered, the >2-axle vehicle class is comprised of a mixture of diesel and gas, although predominantly diesel. Therefore, these data provide some substantiation that a difference between the vehicle axle categories considered in this study is caused by type of fuel.

The regression coefficients for wind speed and temperature were significant in explaining pollutant variability; however, a different effect was observed for the gas-phase VOCs relative to particle-bound PAHs. For 1,3-butadiene and benzene, an inverse association was observed, such that increasing wind speed was associated with decreased pollutant levels. This effect is likely caused by horizontal mixing with relatively less polluted regional air. In contrast, for particle-bound PAH, a direct association was observed with wind speed. The reason for this direct association is unclear. However, it may be because of the instrument's inlet configuration and collection bias caused by size. Because PAH adsorption and the instrument's response are both particle size-dependent,[34,49] it follows that alteration of the particle collection efficiency by size will alter the PAH concentration measurement. The observed effect is consistent with a bias of greater efficiency in sampling small particles with increased wind speed. Alternatively, this effect could result from resuspension of surface-deposited particle-bound PAH. It is unlikely that the observed effect was caused by some regional industrial source because no association was observed with wind direction.

CONCLUSIONS

The current study provides unique time-resolved measurements of traffic counts and vehicle class combined with the curbside concentrations of three key mobile source-related environmental carcinogens, that is, benzene, 1,3-butadiene, and particle-bound PAH. An examination of the variability in the source term relative to the resulting pollutant levels using multivariate regression analysis yielded a statistically significant association ($p <$ 0.001), providing an empirical model for estimating pollutant levels from traffic volume and class taking into account wind speed and temperature. Because the traffic volume profile between 2-axle and >2-axle vehicles differed, it was possible to tease out a mobile source effect term (ng/m^3/vehicle) for these two classes. For all three pollutants, the mobile source effect of >2-axle vehicles exceeded that of 2-axle vehicles by as much as a factor of 60 for particle-bound PAH to factors of 9 and 32 for benzene and 1,3-butadiene, respectively. However, because 2-axle vehicles outnumber >2-axle vehicles by

0435

Table 3. Coefficient of determination (R^2).

	2-Axle	>2-Axle	Temp	Wind Speed	Humidity	1,3-Butadiene	Benzene	PAH
2-Axle	1.0							
>2-Axle	0.5	1.0						
Temp	0.3	0.2	1.0					
Wind Speed	0.3	0.1	0.3	1.0				
Humidity	0.2	0.2	0.7	0.3	1.0			
1,3-Butadiene	0.4	0.5	0.2	0.1	0.2	1.0		
Benzene	0.6	0.5	0.4	0.1	0.3	0.7	1.0	
PAH	0.5	0.8	0.0	0.3	0.0	0.6	0.4	1.0

take into account a host of meteorological factors, including wind speed, temperature, and humidity. Furthermore, because the traffic patterns of 2-axle and >2-axle vehicles differed substantively, it has been possible to resolve their relative contribution to ambient levels.

Although the observed tollbooth 1,3-butadiene and benzene concentrations (means ranging from 2 to 11.9 and from 3 to 22.3 $\mu g/m^3$, respectively) are considerably higher than what has been observed even for urban environments, findings from this study may have particular relevance for urban communities built in close proximity to high-traffic arterials as exist in Baltimore. In comparison, the most recent data from the California Air Resource Board[41] indicate annual median 1,3-butadiene levels of 0.60 $\mu g/m^3$ (0.18–2.06) and 0.13 $\mu g/m^3$ (0.04–0.84) for urban and suburban locations, respectively. The corresponding annual median (range) benzene levels are 3.5 $\mu g/m^3$ (1.27–9.54) and 0.95 $\mu g/m^3$ (0.32–4.13). The annual average (range) urban and suburban 1,3-butadiene levels reported for Maryland in 1999 were 0.35 $\mu g/m^3$ (0.07–1.23) and 0.04 $\mu g/m^3$ (0–0.15), respectively. The corresponding values for benzene were 2.2 $\mu g/m^3$ (0.8–5.8) and 0.7 $\mu g/m^3$ (0.3–1.5), respectively.[42] Similar model-based estimates are given by Rosenbaum et al.[24] for all U.S. census tracts showing median annual average benzene and 1,3-butadiene levels of 1.6 and 0.18 $\mu g/m^3$, respectively. Therefore, the high-end tollbooth 1,3-butadiene and benzene levels typically exceed average urban ambient levels by approximately an order of magnitude and by 20–30-fold for the two pollutants, respectively. The observed higher tollbooth levels are caused by the proximity and intensity of the source (i.e., ~70,000 vehicles/day) and provide a valuable laboratory for examining the real-world impact of mobile sources on air quality.

The differences between particle-bound PAH levels previously measured in the urban environment relative to the current tollbooth study are less dramatic than for 1,3-butadiene and benzene. The lowest and highest median concentrations of 9.3 ng/m^3 (IQR = 10.7) and 199.3 ng/m^3 (IQR = 241.3) were observed during 9 p.m.–12 a.m. and 6 a.m.–9 a.m. intervals, respectively. Indoor median concentrations measured in homes without smokers in the Boston region using an Ecochem PAS monitor ranged from 8 to 19 to 31 ng/m^3 at suburban, semiurban, and urban locations, respectively.[43] In the same city during the summer of 1998, Dunbar et al.[44] reported median curbside concentrations over five days that ranged from 10 to 20 ng/m^3 (assuming 1 fA/ng/m^3). Based on integrated sampling and laboratory analysis methods, Naumova et al.[45] report outdoor median particle-phase ΣPAH levels ranging from 1 to 4 ng/m^3 for homes in Los Angeles, Houston, and Elizabeth.

Traffic volume was found to be a strong determinant for curbside concentrations of 1,3-butadiene, benzene, and PAH, explaining 62, 77, and 85%, respectively, of the air pollution levels, indicating that of the three pollutants, PAH is most strongly associated with traffic. The observed R^2 for 1,3-butadiene and benzene are consistent with EPA estimates of 56 and 60% of total 1,3-butadiene and benzene emissions attributable to on-road mobile sources.[16] In a recent study where the same model EcoChem instrument was used at a busy Boston intersection, Dunbar et al.[44] attributed 46% of the total particle-bound

Table 4. Multivariate analysis incorporating different VOCs and vehicle types.

Response Vehicle	Covariates	Reg. Coeff.	R^2	*P* value
Outdoor 1,3-butadiene (*n* = 56)	Model		0.62	<0.001
	2-axle	0.00032		0.02
	>2-axle	0.01039		<0.01
	Wind speed	−1.25576		0.08
	Temp	0.24694		0.1
	Intercept	−3.97692		0.27
Outdoor benzene (*n* = 56)	Model		0.77	<0.001
	2-axle	0.00103		<0.01
	>2-axle	0.0095		0.01
	Wind speed	−3.43332		<0.01
	Temp	0.88081		<0.01
	Intercept	−18.8696		<0.01
Outdoor PAH (*n* = 14)	Model		0.85	<0.001
	2-axle	0.00451		0.21
	>2-axle	0.27109		0.02
	Wind speed	40.2165		0.04
	Temp	−14.0235		0.48
	Intercept	370.828		0.04

Meteorological measurements over the 56 3-hr intervals are presented in Table 2. Temperature and humidity ranged from 21.8 to 31.6 °C and from 38.5 to 76%, respectively. Wind speeds ranged from 0.3 to 2.1 m/sec and were in no predominant direction. The association between traffic volume and curbside concentrations of 1,3-butadiene, benzene, and PAH is illustrated by a scatter plot (Figure 4). Simple linear regression of ambient 1,3-butadiene, benzene, and PAH on total traffic volume indicates that 40, 69, and 49% of the pollutant variability is explained by traffic volume.

Table 3 presents a matrix of correlation coefficients for the various pollutant measurements and traffic count and meteorological explanatory variables. As suggested in the concentration profile plots (Figures 2 and 3), 1,3-butadiene and benzene are significantly correlated ($p \leq 0.05$). The meteorological variables humidity and temperature are similarly significantly correlated ($p \leq 0.05$). PAH and 1,3-butadiene showed a stronger correlation with >2-axle vehicles than with 2-axle vehicles, whereas benzene was more strongly correlated with 2-axle vehicles.

The simple linear models were further refined using multivariate analysis that simultaneously took into account vehicle class and meteorological conditions, including temperature, wind speed, and direction. The results of the multivariate analysis are presented in Table 4. In this more complete analysis, traffic volume classified as 2-axle and >2-axle vehicles was significant ($p \leq 0.05$) for both 1,3-butadiene and benzene. In contrast, for PAH, only >2-axle traffic volume was significant. The multivariate models are a significant improvement over the univariate models, as indicated by the increased explained variability in pollutant concentrations: 62, 77, and 85% for 1,3-butadiene, benzene, and PAH, respectively. It is likely that some of the unexplained variability is attributable to spatial differences in wind speed and direction between the toll plaza and the location of the measurements in East Baltimore.

Table 2. Meteorological results (median and range) by sampling interval.

Interval	Temperature (°C)	Relative Humidity (%)	Wind Speed (m/sec)	Dominant Wind Direction
12 a.m.–3 a.m.	23.4 (21.7–26.8)	72.0 (64.2–82.2)	0.3 (0.2–1.2)	NE
3 a.m.–6 a.m.	21.8 (20.2–25.5)	76.0 (70.7–84.7)	0.5 (0.3–1.0)	NNW
6 a.m.–9 a.m.	24.4 (22.7–26.9)	65.5 (60.7–77.0)	0.9 (0.7–1.3)	SE
9 a.m.–12 p.m.	29.3 (26.1–31.3)	45.7 (39.8–58.7)	1.7 (1.1–1.9)	SSE
12 p.m.–3 p.m.	31.6 (27.8–33.5)	38.5 (33.8–53.5)	1.4 (1.2–2.7)	N
3 p.m.–6 p.m.	30.5 (28.3–33.7)	46.3 (41.2–56.8)	2.1 (1.1–3.2)	N
6 p.m.–9 p.m.	27.8 (27.1–31.5)	53.5 (44.2–61.8)	1.9 (0.7–2.8)	E
9 p.m.–12 a.m.	25.5 (22.6–29.1)	58.5 (53.7–80.0)	0.9 (0.1–1.8)	ENE

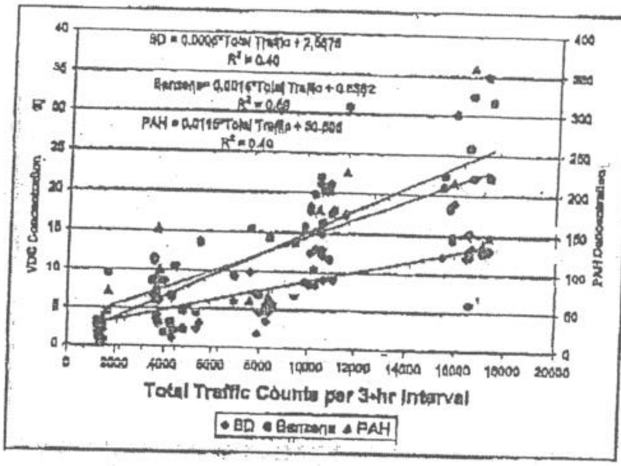


Figure 4. Scatter plot with simple linear regression of 1,3-butadiene, benzene, and PAH vs. total traffic counts per 3-hr interval. PAH concentration in ng/m³.

The traffic volume regression coefficient is indicative of mobile source effect (ng/m³/vehicle) based on 3-hr integrated measurements. Accordingly, a unit increase in 2-axle vehicle increases the curbside concentration of 1,3-butadiene, benzene, and PAH by 0.32, 1, and 4.5 ng/m³, respectively. The >2-axle vehicle mobile source effect of 10.4, 9.5, and 271 ng/m³/vehicle for 1,3-butadiene, benzene, and PAH exceeds that of 2-axle vehicles by factors of 32, 9, and 60, respectively. However, the difference in mobile source effect is partially offset by the traffic volume in each class, with 2-axle vehicles outnumbering >2-axle vehicles by a factor of 29. Therefore, taking both the mobile source effect and vehicle counts into account, the >2-axle vehicle contribution exceeds that of 2-axle vehicles by factors of 1.1 and 2.1 for 1,3-butadiene and PAH, respectively. For benzene, the inverse is true, with the 2-axle vehicle contribution exceeding the >2-axle vehicle contribution by a factor of 3.2.

DISCUSSION

The current study is designed to inform the source to effect continuum for mobile sources and cancer risk by elucidating the association between traffic volume and curbside levels of mobile source-related air pollution. Benzene, 1,3-butadiene, and PAH are of particular concern as environmental carcinogens. Although emission data are available from dynamometer testing[37] and tunnel tests[38,39] and annual ambient estimates have been modeled,[24,40] the current study represents some of the first time-resolved measurements quantifying the association between outdoor curbside pollutant levels and traffic volume and class. An advantage of the current study approach is that it provides actual in situ measurements that the tollbooth are varied, with vehicles decelerating and braking upon approach, idling and traveling slowly to the tollbooth attendant, and then accelerating onto the highway. Total vehicle counts (north- and southbound) per 3-hr interval over the seven-weekday sampling period are shown in Figure 1. The diurnal distribution is bimodal, with modes associated with the morning and evening rush hours, as expected. There is an approximate 8-fold difference between minimum counts occurring during the nighttime hours to the maximum recorded during the rush hour. The total morning rush hour traffic exceeds the midafternoon traffic by a factor of approximately 1.5. However, there is a distinct difference in traffic volume patterns between vehicles with 2 axles relative to vehicles with >2 axles. The morning rush hour is caused by an increase in both 2-axle and >2-axle vehicles, whereas >2-axle vehicle counts remain elevated into the early afternoon hours, while the commuting 2-axle vehicles drop precipitously between the morning and afternoon rush hours. Although the number of >2-axle vehicles continues to increase even after rush hour, the overall traffic count goes down after rush hour because >2-axle vehicles account for only 2–9% of the total vehicle counts. Therefore, the overall decrease in total traffic counts during the afternoon is caused by drastic decreases in commuters on the highways during afternoon hours.

The distributions of 1,3-butadiene and benzene 3-hr integrated outdoor measurements made over the 7-day period are shown in Figures 2 and 3. The concentration profiles of 1,3-butadiene and benzene tracked one another and followed a similar bimodal pattern to the traffic counts, with the lowest levels occurring in the early morning hours and peak levels occurring during morning and afternoon rush hours. The lowest 1,3-butadiene levels (median = 2 μg/m^3; range = 0.8–4.5 μg/m^3) were

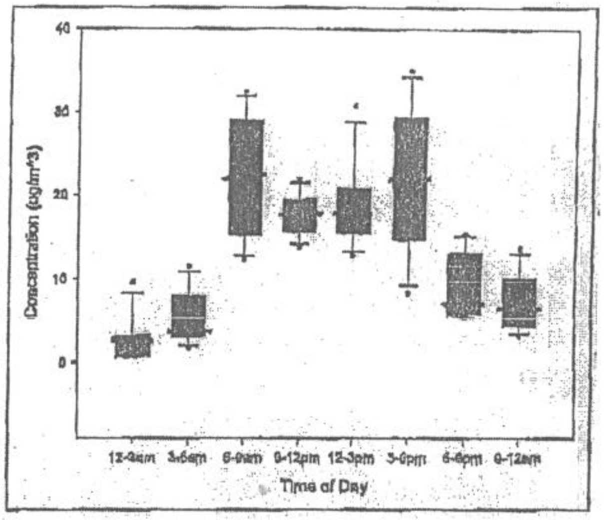


Figure 2. Distribution (n = 7) of outdoor benzene by time of day. The boxes represent 25th and 75th percentiles, whiskers represent 5th and 95th percentiles, and the horizontal bars represent the median value. Individual outliers are represented by the dots.

recorded during the interval 12 a.m.–3 a.m., whereas maximum levels (median = 13.5 μg/m^3; range = 6–19 μg/m^3) were recorded during the interval 6 a.m.–9 a.m. The corresponding benzene concentrations were 2.7 μg/m^3 (0.7–9.6 μg/m^3) and 22.3 μg/m^3 (12.5–32.5 μg/m^3), respectively. PAH levels followed a slightly different pattern, with minimum values observed during the evening interval 9 p.m.–12 a.m. (median = 9.3 ng/m^3; interquartile range [IQR] = 10) and maximum levels observed during the 6 a.m.–9 a.m. interval (median = 199 ng/m^3; IQR = 241). IQRs are reported for the PAH measurements because of the large variability in the 1-min measurements.

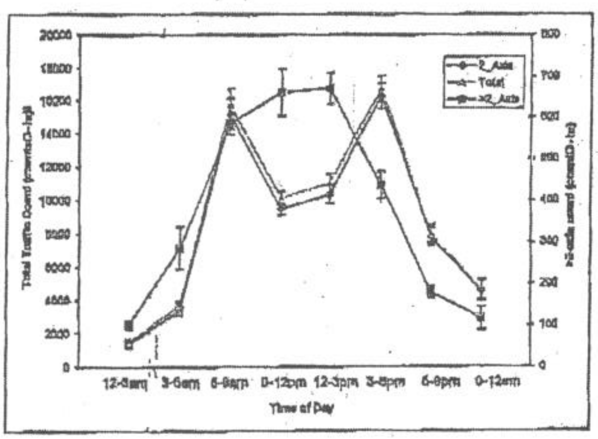


Figure 1. Distribution of 3-hr traffic counts for different vehicle types as a function of time. The mean is plotted with error bars representing the SD.

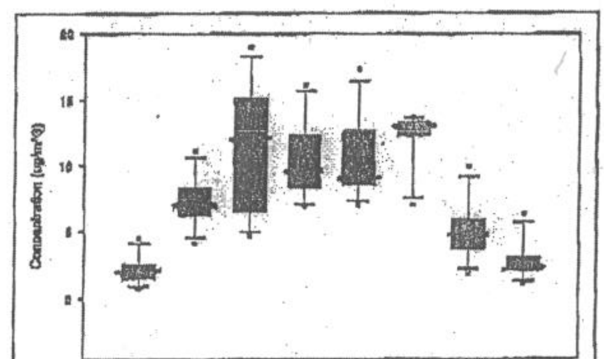


Figure 3. Distribution (n = 7) of outdoor 1,3-butadiene by time of day. The boxes represent 25th and 75th percentiles, whiskers represent 5th and 95th percentiles, and the horizontal bars represent the median value. Individual outliers are represented by the dots.

0438

concentrations corresponding to the traffic count intervals.

Hourly traffic count data for both northbound and southbound traffic were obtained from the MDTA (Tollbooth Administration at Baltimore Harbor Tunnel), which maintains an hourly record of total vehicle counts passing through each tollbooth, classified by the number of axles on each vehicle. The axle-based classification was compared with the Federal Highway Administration (FHWA) classification system (Table 1).[35] This table indicates that 2-axle vehicles primarily represent passenger cars, minivans, pickups, and single-unit trucks, whereas >2-axle vehicles are primarily buses, large trucks, and trailers.

Meteorological measurements including temperature, relative humidity, rain, wind speed, and direction were made using a Davis meteorological station (Davis Instrument Corp.). The meteorological station was located in East Baltimore approximately 4 mi due north of the toll plaza near the Johns Hopkins Bloomberg School of Public Health. Field (n = 7) and laboratory (n = 10) blanks were included in all sampling and analytical runs. Reported concentrations have been corrected for mean field blank levels. All samples were analyzed on the same day that they were returned from the field. Measurement precision was determined from a single measurement made in triplicate using side-by-side sampling. Recovery was determined by spiking air toxic tubes (n = 7) with 15 ng of 1,3-butadiene and 5 ng of benzene. Tubes were cleaned for reuse by conditioning in the ATD 400 at 350 °C for 15 min. Conditioned tubes were randomly selected and analyzed to verify that there was no carryover of residual analytes from one sample to the other.

Table 1. Comparison of FHWA vehicle class and the number of axle, with examples.

FHWA Vehicle Class	Average No. of Axles per Vehicle	Vehicle Types
1	2	Motorcycles
2	2	Passenger cars
3	2	Pickups, vans, campers, minibus
4	2.2	Buses
5	2	Six-tire, single-unit trucks, including motor homes
6	3	Three-axle single-unit trucks
7	4	Four-axle single-unit trucks on single frame
8	4	Four or fewer axles consisting of two units
9	5	All five axles consisting of two units
10	6	Vehicles with six or more axles with two units
11	5	Five or fewer axles consisting of three units
12	6	All six-axle vehicles with three or more units
13	7	All vehicles with seven or more axles

Data Analysis

The hourly traffic data were summed in a 3-hr interval corresponding to the 3-hr integrated sampling period. A composite traffic volume for a given day was calculated by adding up the vehicle counts for all 14 tollbooths per 3-hr interval. The traffic volume data were grouped into two classes for analysis: 2-axle and >2-axle vehicles. Meteorological data and PAH data were similarly averaged over the same 3-hr sampling interval. All measured concentrations were corrected for recovery and blanks. Multivariate regression model (eq 1) was used to investigate the relationship between curbside pollution levels, traffic volume, and meteorological conditions using Intercooled Stata, version 7 for Windows (Stata Corp.).

$$C_i = \beta_{0i} + \beta_{1i}2\text{-}axle + \beta_{2i} > 2\text{-}axle + \beta_{3i}Temp + \beta_{4i}Wind\ Speed + \varepsilon_i \tag{1}$$

In this model, C_i is the curbside concentration of pollutant i for the 3-hr sampling interval. The regression coefficient β_{11} represents an average increase in the curbside concentration of pollutant i (ng/m^3) for a unit increase in 2-axle vehicle number, adjusted for the number of >2-axle vehicles, temperature, and wind speed. Similarly, β_{21} represents an average increase in the curbside concentration of pollutant i (ng/m^3) for a unit increase in >2-axle vehicle number, adjusted for the number of 2-axle vehicles, temperature, and wind speed. These coefficients have units of ng/m^3/vehicle and provide an indication of the mobile source effect on the curbside pollutant concentration. Hereafter, this effect will be referred to as "the mobile source effect." The method detection limit was calculated following the Code of Federal Regulations (40CFR136 Appendix B) as discussed in EPA Compendium Method TO-17.[36] The limit of detection was obtained by multiplying the SD of the seven spiked samples by the Student's t value associated with the 99% confidence interval and 6° of freedom.

RESULTS

The recovery for 1,3-butadiene and benzene (± SD) averaged 85 ± 12% and 97 ± 8%, respectively, for the seven recovery spike samples analyzed. The analysis of a single sample collected in triplicate yielded a coefficient of variation of 2 and 6% for 1,3-butadiene and benzene, respectively. The limit of detection was determined as 0.46 and 0.58 µg/m^3 for the two respective analytes.

Results from this study relate to traffic levels, vehicle class, and operating conditions at a specific tollbooth facility. The vehicle operating conditions associated with

0439

sources contribute 63, 59, and 63% to total ambient benzene, 1,3-butadiene, and polycyclic organic matter (POM), respectively. (POM is the more comprehensive family of organics that subsumes the carbon and hydrogen-only containing PAHs.) Taking into account point and area sources in addition to mobile sources, for the 60,803 census blocks in the contiguous United States, Rosenbaum et al. estimate median ambient levels of 1.6, 0.099, and 0.18 $\mu g/m^3$ for the three pollutants, respectively. These modeling results are further substantiated by studies indicating large pollution differences between weekends and weekdays attributable to varying traffic levels. In a series of studies, Vukovich[25] identified 27–42% higher VOC levels in the Northeast and in Texas on weekdays relative to weekends. Ilgen et al.[26] reported geometric mean benzene levels of 3.1 and 1.8 $\mu g/m^3$ in German homes located on high- and low-traffic streets, respectively.

Both indoor and outdoor sources factor into human exposure and risk. There are several known indoor sources of benzene and PAHs, such as cleaning products, paints, glues, and tobacco smoke for benzene, and wood burning, cooking, and tobacco smoke for PAHs.[27–30] For 1,3-butadiene, the only known indoor source is tobacco smoke, which can elevate indoor 1,3-butadiene concentrations significantly.[31]

Although there is a growing body of literature identifying a substantial mobile source contribution to ambient pollution, these estimates largely rely on dynamometer emissions testing coupled with estimates of vehicle miles driven. The current study is unique in examining the actual measured association between vehicle volume and class and the resulting curbside ambient pollutant concentration, providing a real-world basis by which to validate models and estimate exposure. The study was conducted at a tollbooth facility where traffic count and type were carefully quantified, providing a basis for a real-world estimate of the mobile source effect on curbside concentration for 1,3-butadiene, benzene, and PAH.

METHODS

Study Site and Sampling

This study was conducted at the Maryland Transportation Authority (MDTA)–operated Baltimore Harbor Tunnel tollbooth facility. This facility has 14 tollbooths evenly divided between northbound and southbound traffic. Sampling was conducted at a single northbound tollbooth (number 3). It was selected because it is open and operator-occupied 24 hr/day. Samplers were placed immediately outside the tollbooth on the south side (vehicles approaching) approximately 3 ft above ground. Sampling was conducted over seven weekdays during the period from June 18 to June 28, 2001.

Three-hour integrated 1,3-butadiene and benzene samples were collected using a Perkin-Elmer STS-25 sequential sampler. Samples were collected sequentially onto stainless-steel Perkin-Elmer Air Toxic Tubes packed with a solid sorbent (Supelco, catalog no. 25051), using an SKC 210 pocket pump (SKC, Inc.) set at a nominal flow rate of 25 mL/min. Pumps were calibrated upon initiation of sampling using a DryCal DC-2 primary standard (BIOS International Corp.). Sample flows were checked after sampling to account for any drift during sampling.

Every 24 hr, the sampled air toxic tubes were removed from the sequential sampler and returned to the laboratory for analysis. Samples were thermally desorbed (Perkin-Elmer ATD-400), separated by gas chromatography (GC), and detected with mass spectrometry (MS) using a Shimadzu GC-17A gas chromatograph and QP-5000 mass spectrometer (Shimadzu Biotech). The conditions used for the ATD-400, GC, and MS were adapted from Kim et al.[32] Chromatographic separation was obtained using Restek Rtx-624 column, 60 m × 0.25 mm ID with 1.4 μm thickness (Restek Corp., catalog no. 10969).

Calibration standards were prepared at six levels by diluting 2 mg/mL 1,3-butadiene stock solution (Accustandard, catalog no. S-406A-10x) and 2 mg/mL custom VOC mix (Accustandard, catalog no. S-2081-R10–10x) in methanol. One-μL injections were made into clean sampling tubes using a modified GC injector port (50 °C, He flow of 80 mL/min for 10 min). The final amount on sampling tubes ranged from 1 to 25 ng and from 1 to 50 ng for benzene and 1,3-butadiene, respectively.

Particle-bound PAH was measured using an Ecochem PAS 2000 PAH Ambient Analyzer (Ecochem Technologies). This is a direct-reading instrument that measures PAH on particles by photoionization. Particles entering the instrument are irradiated with UV light at 222 nm (6.7 eV). Particles containing PAH with photoelectric threshold less than 6.7 eV will loose an outer-shell electron and become positively charged. The charge particles are collected onto a filter, resulting in an electrical current proportional to the ions collected. Therefore, all particles with a photoelectric threshold less than 6.7 eV will be ionized and measured as PAH.[33] Air is sampled at a flow rate of 2 L/min. The inlet is not configured to provide a size-specific classification; however, electrons emitted from larger particles are more likely to be recaptured. Therefore, ionization and instrument response is most effective for particles containing PAH in the size range <1–2 μm in diameter.[34] The Echochem PAS 2000 was placed side-by-side with the STS-25 sequential samplers, and samples were collected continuously for 2 days during the study period. Measurements were logged in 1-min intervals. These data were combined to give 3-hr average

TECHNICAL PAPER

ISSN 1047-3289 *J. Air & Waste Manage. Assoc.* 53:740–748

The Mobile Source Effect on Curbside 1,3-Butadiene, Benzene, and Particle-Bound Polycyclic Aromatic Hydrocarbons Assessed at a Tollbooth

Amir Sapkota and Timothy J. Buckley
Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

ABSTRACT

On-road mobile sources contribute substantially to ambient air concentrations of the carcinogens 1,3-butadiene, benzene, and polycyclic aromatic hydrocarbons (PAHs). The current study measured benzene and 1,3-butadiene at the Baltimore Harbor Tunnel tollbooth over 3-hr intervals on seven weekdays ($n = 56$). Particle-bound PAH was measured on a subset of three days. The 3-hr outdoor 1,3-butadiene levels varied according to time of day and traffic volume. The minimum occurred at night (12 a.m.–3 a.m.) with a mean of 2 μg/m^3 (SD = 1.3, $n = 7$), while the maximum occurred during the morning rush hour (6 a.m.–9 a.m.) with a mean of 11.9 μg/m^3 (SD = 4.6, $n = 7$). The corresponding traffic counts were 1413 (SD = 144) and 16,893 (SD = 692), respectively. During the same intervals, mean benzene concentration varied from 3 μg/m^3 (SD = 3.1, $n = 7$) to 22.3 μg/m^3 (SD = 7.6, $n = 7$). Median PAH concentrations ranged from 9 to 199 ng/m^3. Using multivariate regression, a significant association ($p < 0.001$) between traffic and curbside concentration was observed. Much of the pollutant variability (1,3-butadiene 62%, benzene 77%, and PAH 85%) was explained by traffic volume, class, and meteorology. Results suggest >2-axle vehicles emit 60, 32, and 9 times more PAH, 1,3-butadiene, and benzene, respectively, than do 2-axle vehicles. This study provides a model for estimating curbside pollution levels associated with traffic that may be relevant to exposures in the urban environment.

IMPLICATIONS

Mobile source emissions present a unique public health threat because of toxic emissions and exposure potential resulting from their proximity and integration into U.S. communities. Urban communities are especially susceptible because of population density and dense commuting traffic. The current study provides a quantitative assessment of the relationship between traffic volume and class and the curbside concentration of key environmental carcinogens. This assessment defines an experimental approach and estimate of the mobile source effect on the curbside pollutant concentration under real-world meteorological conditions. The resulting models may be useful for evaluating ambient exposure, risk, and control strategies.

INTRODUCTION

Benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons (PAHs) are listed by the U.S. Environmental Protection Agency (EPA) among 31 priority mobile source air toxins.[1] Recently, 1,3-butadiene was reclassified as a "known human carcinogen"[2] based on epidemiologic and mechanistic information. Exposure to 1,3-butadiene is associated with lymphosarcoma[3,4] and leukemia[5–8] in occupationally exposed workers. Benzene also has been long established as a known human carcinogen.[9–11] Exposure to benzene is associated with acute nonlymphocytic leukemia and chronic lymphocytic leukemia.[12–19]

Emissions of chemicals such as 1,3-butadiene, benzene, and PAH into the environment by mobile sources are of great public health concern because of their carcinogenicity and heightened exposure potential that results from their proximity and integration into U.S. society at all levels (urban, suburban, and rural). Several epidemiologic studies have observed higher cancer rates among urban compared with suburban populations.[20–23] Air pollution, including benzene, 1,3-butadiene, and PAHs, is believed to be a contributing risk factor.[20]

The potential for exposure to automobile exhaust containing these carcinogenic chemicals is most pronounced in urban locations where heavily commuted roadways transect densely populated communities. Human exposure to these mobile source emissions can be substantial because of increasing (1) traffic volume and congestion, (2) vehicle miles driven, and (3) numbers of heavier, less efficient sport utility vehicles. Increased emissions may be only partially offset by technological gains in emissions control. Based on modeling results from the Assessment System for Population Exposure Nationwide for 1990, Rosenbaum et al.[24] estimate mobile

0441

0445

0446

from the MONICA-Augsburg Study. *Eur. Heart J.* 22(14):1198–1204.

Pope, C. A. 3rd, Burnett, R. T., Thurston, G. D., Thun, M. J., Calle, E. E., Krewski, D., Godleski, J. J. 2004. Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. *Circulation.* 109(1):71–77.

Romieu, I., Meneses, F., Ruiz, S., Sienra, J. J., Huerta, J., White, M. C., and Etzel, R. A. 1996. Effects of air pollution on the respiratory health of asthmatic children living in Mexico City. *Am. J. Respir. Crit. Care Med.* 154:300–307.

Rundell, K. W. 2003. High levels of airborne ultrafine and fine particulate matter in indoor ice arenas. *Inhal. Toxicol.* 15(3):237–250.

Rundell, K. W. 2004. Pulmonary function decay in women ice hockey players: Is there a relationship to ice rink air quality? *Inhal. Toxicol.*16(3):117–123.

Rundell, K. W., Spiering, B. A., Baumann, J. M., and Evans, T. M. 2005. Bronchoconstriction provoked by exercise in a high-particulate-matter environment is attenuated by montelukast. *Inhal. Toxicol.* 17(2):99–105.

Schwartz, J. 2004. Air pollution and children's health. *Pediatrics* 113:1037–1043.

Schwartz, J., and Morris, R. 1995. Air pollution and hospital admissions for cardiovascular disease in Detroit, Michigan. *Am. J. Epidemiol.* 142(1):23–35.

Voelkel, K., Krug, H. F., and Diabate, S. 2003. Formation of reactive oxygen species in rat epithelial cells upon stimulation with fly ash. *J. Biosci.* 28(1):51–55.

Ware, J. H. 2000. Particulate air pollution and mortality-clearing the air. *N. Engl. J. Med.* 348:1798–1799.

Werz, O., Szellas, D., and Steinhilber, D. 2000. Reactive oxygen species released from granulocytes stimulate 5-lipoxygenase activity in a B-lymphocytic cell line. *Eur. J. Biochem.* 267(5):1263–1209.

Woo, C. H., Lee, Z. W., Kim, B. C., Ha, K. S., and Kim, J. H. 2000. Involvement of cytosolic phospholipase A2, and the subsequent release of arachidonic acid, in signalling by rac for the generation of intracellular reactive oxygen species in rat-2 fibroblasts. *Biochem. J.* 348:525–530.

Zanobetti, A., and Schwartz, J. 2001. Are diabetics more susceptible to the health effects of airborne particles? *Am. J. Respir. Crit. Care Med.* 164(5):831–833.

Zhu, Y., Hinds, W. C., Seongheon, K., and Sioutas, C. 2002. Concentration and size distribution of ultrafine particles near a major highway. *Air Waste Manage. Assoc.* 52:1032–1042.

lung function, and respiratory symptoms at levels below those identified in the present study. Ambient ozone is formed from the photochemical reaction of nitrogen oxides found in traffic related pollutants and tends to be highest in the late afternoon. Several studies have shown a causal relationship between O_3 exposure and respiratory-tract symptoms, decreased lung function, and asthma exacerbations (Gent et al., 2003; Kinney et al., 1996). Exposure to O_3 levels below 60 ppb has been shown to affect lung function in amateur cyclists, and it has been speculated that childhood exposure may have detrimental effects on lung function later in life (Galizia & Kinney, 1999).

Although the current study is descriptive in nature, numerous epidemiological studies have identified robust relationships between ambient particle exposure and respiratory conditions. The consequence of daily recess play and athletic activities by school children and young athletes in high ambient [PM_1] conditions has not yet been clearly defined. This study is a critical component in evaluating functional effects of chronic exposure to internal combustion derived particulate matter on exercising school children and young adults. Future studies should examine threshold limits and mechanistic actions of real-world particle exposure.

REFERENCES

Atkinson, R. W., Anderson, H. R., Sunyer, J., Ayres, J., Baccini, M., Vonk, J. M., Boumghar, A., Forastiere, F., Forsberg, B., Touloumi, G., Schwartz, J., and Katsouyanni, K. 2001. Acute effects of particulate air pollution on respiratory admissions: results from APHEA 2 project. Air Pollution and Health: A European Approach. *Am. J. Respir. Crit. Care Med.* 164(10 Pt 1):1860–1866.

Brook, R. D., Brook, J. R., Urch, B., Vincent, R., Rajagopalan, S., and Silverman, F. 2002. Inhalation of fine particulate air pollution and ozone causes acute arterial vasoconstriction in healthy adults. *Circulation* 105:1534–1536.

Burnett, R. T., Dales, R. E., Krewski, D., Vincent, R., Dann, T., and Brook, J. R. 1995. Associations between ambient particulate sulfate and admissions to Ontario hospitals for cardiac and respiratory diseases. *Am. J. Epidemiol.* 142:15–22.

Chalupa, D. C., Morrow, P. E., Oberdorster, G., Utell, M. J., and Frampton, M. W. 2004. Ultrafine particle deposition in subjects with asthma. *Environ. Health Perspect.* 112(8):879–882.

Daigle, C. C., Chalupa, D. C., Gibb, F. R., Morrow, P. E., Oberdorster, G., Utell, M. J., and Frampton, M. W. 2003. Ultrafine particle deposition in humans during rest and exercise. *Inhal. Toxicol.* 15(6):539–552.

Dockery, D. W. 2001. Epidemiologic evidence of cardiovascular effects of particulate air pollution. *Environ. Health Perspect.* 109(suppl. 4):483–486.

Galizia, A., and Kinney, P. L. 1999. Long-term residence in areas of high ozone: associations with respiratory health in a nationwide sample of nonsmoking young adults. *Environ. Health Perspect.* 107(8):675–679.

Gauderman, W. J., Avol, E., Gilliland, F., Vora, H., Thomas, D., Berhane, K., McConnell, R., Kuenzli, N., Lurmann, F., Rappaport, E., Margolis, H., Bates, D., and Peters, J. 2004. The effect of air pollution on lung development from 10 to 18 years of age. *N. Engl. J. Med.* 351(11):1057–1067.

Gent, J. F., Triche, E. W., Holford, T. R., Belanger, K., Bracken, M. B., Beckett, W. S., and Leaderer, B. P. 2003. Association of low-level ozone and fine particles with respiratory symptoms in children with asthma. *J. Am. Med. Assoc.* 290(14):1859–1867.

Glovsky, M. M., Miguel, A. G., and Cass, G. R. 1997. Particulate air pollution: Possible relevance in asthma. *Allergy Asthma Proc.* 18:163–166.

International Committee on Radiological Protection. 1994. *Human respiratory tract model for radiological protection. A report of Committee 2 of the ICRP*. Oxford: Pergamon Press.

Kim, J. J., Smorodinsky, S., Lipsett, M., Singer, B. C., Hodgson, A. T., and Ostro, B. 2004. Traffic-related air pollution near busy roads: The East Bay Children's Respiratory Health Study. *Am. J. Respir. Crit. Care Med.* 170(5):520–526.

Kim, S., Shen, S., and Sioutas, C. 2002. Size distribution and diurnal and seasonal trends of ultrafine particles in source and receptor sites of the Los Angeles basin. *J. Air Waste Manage. Assoc.* 52:297–307.

Kinney, P. L., Thurston, G. D., and Raizenne, M. 1996. The effects of ambient ozone on lung function in children: A reanalysis of six summer camp studies. *Environ. Health Perspect.* 104(2):170–174.

Kittelson, D. B., Watts, W. F., Johnson, J. P., Remerowki, M. L., Ische, E. E., Oberdorster, G., Gelein, R. M., Elder, A., Hopke, P. K., Kim, E., Zhao, W., Zhou, L., and Jeong, C. H. 2004. On-road exposure to highway aerosols. 1. Aerosol and gas measurements. *Inhal. Toxicol.* 16(suppl. 1):31–39.

Li, N, Sioutas, C., Froines, J. R., Cho, A., Misra C., and Nel, A. 2003. Ultrafine particulate pollutants induce oxidative stress and mitochondrial damage. *Environ. Health Perspect.* 111(4):455–460.

Lin, S., Kielb, C., Chen, Z., and Hwang, S. A. 2005. Childhood asthma hospitalization rates, childhood asthma prevalence, and their relationships in Erie County, New York. *J. Asthma* 42(8):653–658.

McConnell, R., Berhane, K., Gilliland, F., Molitor, J., Thomas, D., Lurmann, F., Avol, E., Gauderman, W. J., and Peters, J. M. 2003. Prospective study of air pollution and bronchitic symptoms in children with asthma. *Am. J. Respir. Crit. Care Med.* 168(7):790–797.

Nurkiewicz, T. R., Porter, D. W., Barger, M., Castranova, V., and Boegehold, M. A. 2004. Particulate matter exposure impairs systemic microvascular endothelium-dependent dilation. *Environ. Health Perspect.* 112:1299–1306.

Oberdorster, G. 1996. Significance of particle parameters in the evaluation of exposure-dose-response relationships of inhaled particles. *Inhal. Toxicol.* 8(suppl.):73–89.

Oberdorster, G., Ferin, J., Gelein, R., Soderholm, S. C., and Finkelstein, J. 1992. Role of the alveolar macrophage in lung injury: Studies with ultrafine particles. *Environ. Health Perspect.* 97:193–199.

Oberdorster, G., Gelein, R. M., Ferin, J., and Weiss, B. 1995. Association of particulate air pollution and acute mortality: Involvement of ultrafine particles? *Inhal. Toxicol.* 7(1):111–124.

Peters, A., Frohlich, M., Doring, A., Immervoll, T., Wichmann, H. E., Hutchinson, W. L., Pepys, M. B., and Koenig, W. 2001. Particulate air pollution is associated with an acute phase response in men; Results

0448

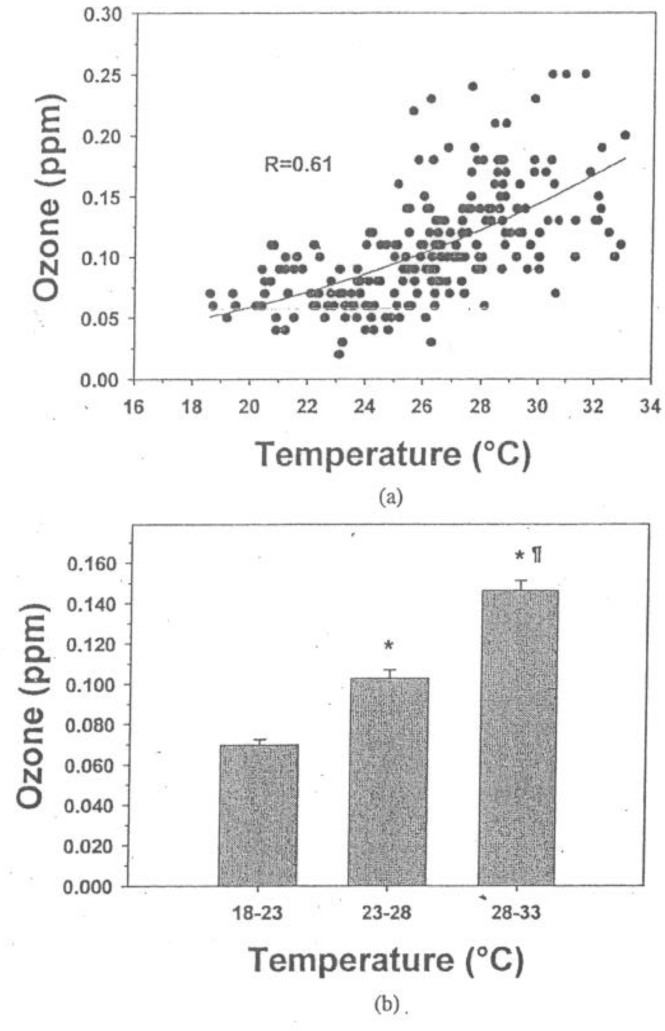


FIG. 6. (A) Significant positive relationship between O_3 and temperature, with more than half of the O_3 measurements greater than 100 ppb. (B) O_3 levels (ppb) grouped according to 5°C temperature categories. Asterisk indicates significantly greater [O_3] than 18–23°C group, $p < .05$; ¶ indicates significantly greater [O_3] than 18–23°C and 23–28°C groups, $p < .05$.

A second-order logarithmic decline in [PM_1] ($R = -.99$) showed that particle number counts at 80 m from a major highway were ~3-fold lower than number counts 30 m from the highway. Particle counts were highly dependent on wind direction in relation to the high-traffic particle source and measurement sites; highest particle counts were measured when the wind direction was from the highway or on days with no measurable wind. This finding was consistent with the exponential decay of ultrafine particles with distance away from a major CA freeway (Zhu et al., 2002).

Of particular importance to the present study is the potential effect of ambient air pollution on exercising children and college athletes. Reduced lung development in children exposed to high levels of ambient air pollution has been found (Gauderman et al., 2004). We have previously shown a significant decline in FEV_1 in women ice hockey players after 3 yr of training in an ice rink with high ice resurfacer emission [PM_1]; the largest decrease in lung function occurred after only 3 mo of daily exposure (Rundell, 2004). Kim et al. (2004) found strong correlations between black carbon concentrations and bronchitis ($R = .76$) and asthma prevalence ($R = .83$) in a school-based cross-sectional study using a parental questionnaire. Another study (McConnell et al., 2003) lasting over a 3-yr period identified yearly variability of ambient organic carbon as having the strongest association to bronchial symptoms (odds ratio 1.41/$\mu g/m^3$; 95% confidence interval 1.12–1.78). Particulate air pollution has been associated with hospital admissions for asthma (Atkinson et al., 2001; Pope et al., 1991) and decline in peak expiratory flow rates (Romieu et al., 1996). Recently, Lin et al. (2005) identified a relationship between relatively low levels of ambient particulate matter on hospitalization for respiratory infections in children, with the strongest associations to coarse particulate matter.

Total respiratory number deposition fraction during exercise has been found to increase approximately 32% over resting values and to exceed predicted values for exercise by approximately 22% for 26-nm particles (Daigle et al., 2003). Prediction models of particle deposition indicate that particles in the 30-nm size range are predominately deposited in airway generations 19–22 during exercise. Considering that greater than 90% of auto and truck emission particle number is found in the 3–30 nm size range and most of the particle mass is found in the 30–500 nm size range, particle deposition in the alveolar region is most likely high for individuals exercising in high auto emission conditions (ICRP, 1994).

Increased oxidative stress from PM_1 inhalation is likely, as the formation of reactive oxygen species (ROS) has been associated with PM exposure and has been shown to influence mediator release (Ware, 2000; Werz et al., 2000). Li et al. (2003) found that ultrafine particles ($PM_{0.1}$) were more potent than coarse (PM_{10}) or fine ($PM_{2.5}$) particles toward generation of ROS and in depleting intracellular glutathione in lung macrophage and epithelial cells in vitro. Voelkel et al. (2003) demonstrated that ROS and exhaled nitric oxide (eNO) increased from $PM_{0.1}$ exposure. It is likely that PM-initiated ROS increases lipid peroxidation and leukotriene production, since recent reports support 5-lipoxygenase activation by ROS, and contributes to a three- to fourfold increase in leukotriene synthesis in vitro (Werz et al., 2000; Woo et al., 2000).

Additionally, measured ozone levels were positively related to temperature ($R = .61$) with a mean value of 106 ± 47 ppb for 221 measurements. Late-afternoon ozone levels at a temperature range of 28–33°C (146 ± 44 ppb; 63 measurements) exceeded Nation Ambient Air Quality Standards for Criteria Air Pollutants of 120 ppb O_3 for 1-h average, and were significantly higher than morning and early-afternoon measurements at lower temperatures (cf. Figure 6). Ozone is a strong oxidant and has been shown to cause airway inflammation, abnormal

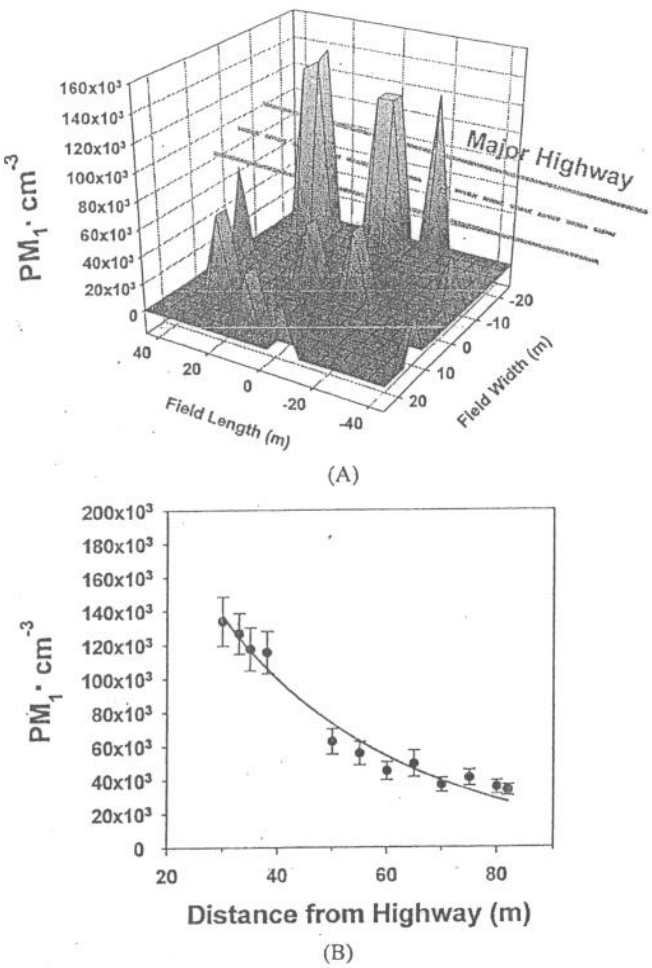


FIG. 3. (A) Three dimensional depiction of 62-day [PM_1] mean measurements taken at 12 different locations at a university soccer field located next to a major interstate highway. (B) Rate of [PM_1] decay (using 62-day mean values at soccer field measurement sites) in relation to distance from the interstate ($R = -.999$; values are presented as mean ± SE).

DISCUSSION

This study demonstrated strong relationships between ambient [PM_1] and distance from high traffic roads. We documented higher mean ambient [PM_1] at elementary school playground/athletic fields adjacent to high-traffic roads than those in low traffic rural settings. The measured [PM_1] levels at the high traffic study sites were severalfold higher than [PM_1] levels measured in rural areas. Likewise, we documented a mean 62-day PM_1 count of 71,000 ± 51,000 particles cm^{-3} (range: 6500–203,000) for a near-highway university soccer field; mean values were obtained from 3 averaged 10-s [PM_1] recordings at 12 locations distributed across the field. Almost 50% of 62 count-days at the university soccer field had 12-site mean PM_1 counts over 60,000 particles cm^{-3} and 29% of the measurement days had mean counts greater than 100,000 particles cm^{-3}.

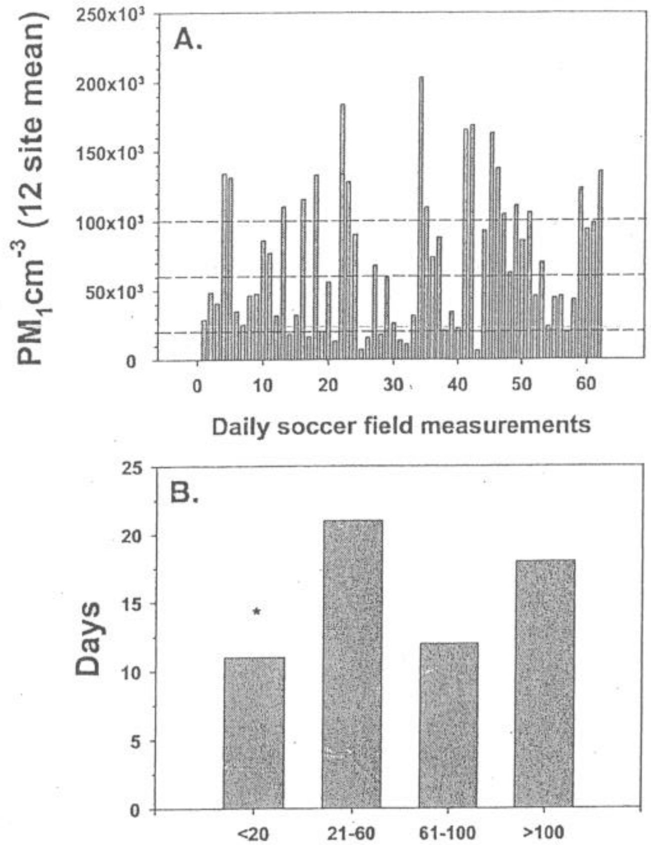


FIG. 4. (A) Daily mean [PM_1] values of 12 measurement sites on the university soccer field. (B) Number of days with mean PM_1 counts below 20,000 particles·cm^{-3} was significantly less than days >20,000 000 particles·cm^{-3}.

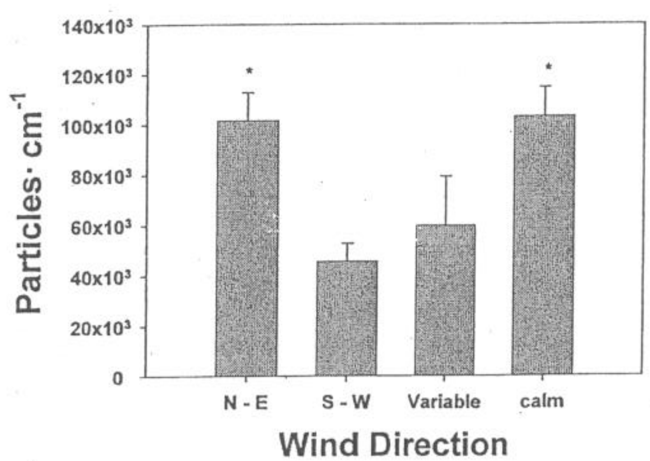


FIG. 5. Particle counts were categorized according to wind direction; northeast wind and calm winds demonstrated significantly higher [PM_1] than southwest winds. Refer to map in Figure 1 (A). Asterisk indicates significantly different than from southwest (S-W), $p < .05$.

0450

particle counts were done at early/mid morning. The P-Trak CPC sensitivity size range is 0.02–1.0 μm diameter; this range includes ultrafine and fine PM, defined as PM_1 in this study. PM_1 has been shown to account for >90% of total particle count and >95% of particle surface area ($\mu m^2/cm^3$) for unit density mass concentration of combustion derived air samples (Oberdorster et al., 1992, 1995). Two hundred and twenty-five measurements of NO_2, CO, and O_3, and temperature (as 10-s mean values) with corresponding PM_1 counts and temperatures were taken at the university soccer field during early morning to midafternoon hours (GrayWolf Direct Sense TOX, Trumbull CT).

Statistical Analysis

Mean values for all measured variables were calculated. Correlations between variables were determined using Pearson product moment correlations. Analysis of variance was used to determine significant differences between elementary school PM_1 counts. Nonlinear regression analysis was used to determine PM_1 decay across the university soccer field from close to far proximity to the major highway. A value of $p < .05$ was considered significant.

RESULTS

High-traffic school 1 demonstrated an approximate four-fold greater 17-day mean [PM_1] than moderate-traffic school 2 and low-traffic rural schools 3 and 4 ($p < .05$), while moderate-traffic school 2 had a significantly greater 17-day mean [PM_1] than low-traffic school 4 (48,890 ± 34,260, 16,730 ± 10,550, 11,960 ± 6680, 10,030 ± 6280, respective mean counts; Figure 2A, $p < .05$). Figure 2B depicts high and low [PM_1] for all four school athletic fields; the high [PM_1] measurement for school 1 was 5.3-, 9.1-, and 8.4-fold higher than that measured at schools 2, 3, and 4, respectively.

Figure 3A depicts [PM_1] at 12 different measurement locations on the university soccer field. Particle concentrations were highest at the 4 measurement sites closest to the highway with mean PM_1 values ranging between 115,000 and 134,000 particles·cm^{-3}. The lowest mean values were recorded at the measurement sites furthest from the highway with PM_1 values of ~34,000 particles·cm^{-3}. Soccer field particle concentrations followed a second order logarithmic decay ($R^2 = .999$) with distance away from the highway (Figure 3B).

Figure 4A presents daily particle counts as mean values of the 12 measurement sites) for the university soccer field; Figure 4B depicts the number of days for categorized particle counts. No significant difference between the number of days in each particle count category was found; however, 18 (29%) of the 62 days had mean particle counts over 100,000 particles cm^{-3} and almost half (30 days) of the 62 days (48%) had mean counts over 60,000 particles cm^{-3}. Only 11 days (18%) had mean counts below 20,000 particles cm^{-3}; this was significantly less than the number of days above 20,000 particles cm^{-3} ($p < .05$).

Wind direction was a critical variable in particle count values. Mean particle counts over 100,000 particles ·cm^{-3} were recorded when the wind direction was from the north and east (101,610 ± 50,370) or calm (103,070 ± 28,590). Lowest mean particle counts were recorded when wind direction was from the south and west (45,590 ± 37,850) and variable (59790 ± 55,300) (Figure 5).

Mean NO_2, and SO_2 levels were below 100 ppb, mean CO was 0.33 ± 1.87 ppm, and mean O_3 was 106 ± 47 ppb. Ozone increased with rising temperature and was highest in the warmer afternoon hours ($R = .61$, Figure 6A). When O_3 levels were grouped according to 5°C temperature increments from 18 to 33°C, the highest temperature group was significantly different than the lower two temperature groups; the middle temperature group was significantly higher than the lower temperature group (Figure 6B).

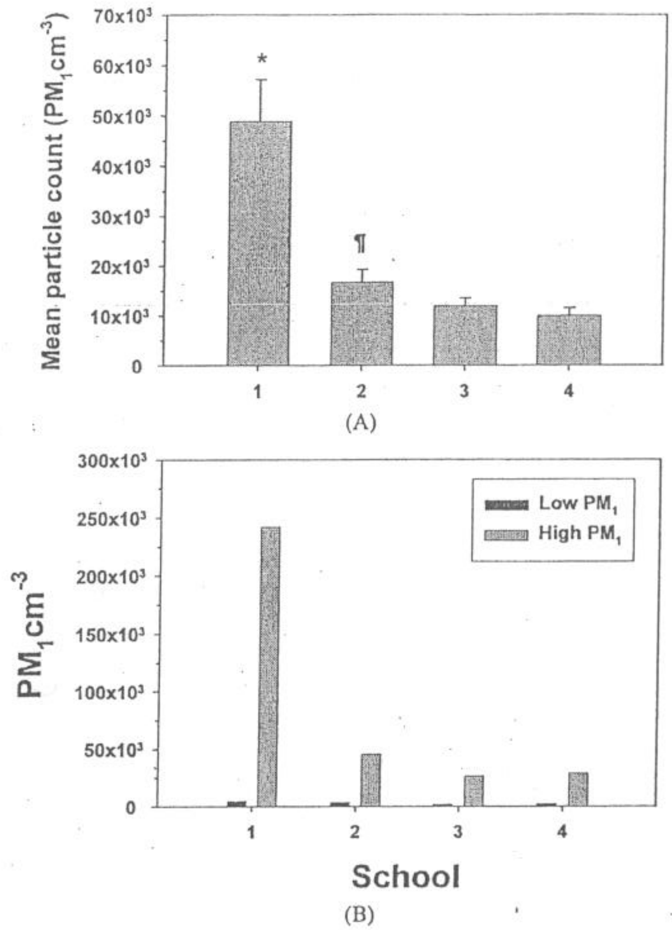


FIG. 2. (A) Elementary school playground 1 (asterisk) demonstrates significantly ($p < .05$) higher 17-day mean [PM_1] than elementary school playgrounds 2, 3, and 4; elementary school playground 2 had significantly higher 17-day mean [PM_1] than elementary school playground 4 (¶ indicates, $p < .05$). Values are presented as mean ± SE). (B) Daily high and low [PM_1] values.

0451

especially vulnerable to adverse consequences of particle inhalation (Schwartz, 2004). Children may also have higher exposure to air pollutants than adults because of high outdoor physical activity and the resultant increase in minute ventilation. Exercise in high ambient particle conditions may increase risk of lung and vascular damage, since total particle deposition increases in proportion to minute ventilation and deposition fraction nearly doubles from rest to intense exercise (Daigle et al., 2003; Chalupa et al., 2004).

The purpose of this study was to document daily PM number concentrations in recreation and athletic field areas proximal to high automobile and truck traffic. This descriptive study is a first step in characterizing the potential health risk to children and young adults participating in organized and unorganized physical activities in high ambient air pollution.

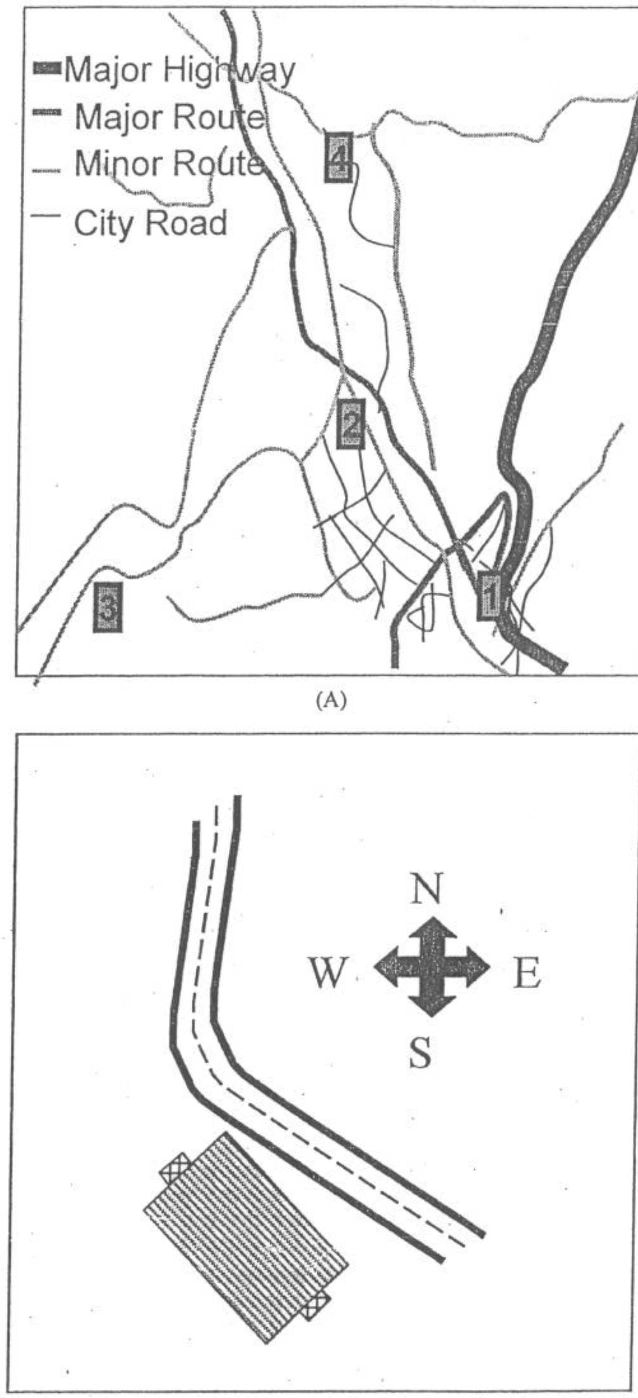
METHODS

Study Design

Number counts of particles in the size range of 0.02–1.0 μm aerodynamic diameter (PM_1) were taken serially at 4 elementary school athletic/playground fields and at 1 university soccer field. Nitrogen dioxide (NO_2), carbon monoxide (CO), and ozone (O_3) were measured at the university soccer field. PM_1 measurements at elementary school sites were taken over 17 days in spring 2005; measurements at the university soccer field were taken over 62 days through spring and summer 2005. PM_1 measurements were taken at early to mid morning during weekdays. Figure 1A depicts the proximity of elementary schools to traffic corridors. Four elementary schools were situated near high-traffic (school 1), moderate–high-traffic (school 2), and low-traffic areas (schools 3 and 4). School 1 was directly adjacent to and east of a major route and approximately 100 m west of a major highway; both roads were characterized by high diesel-fueled truck traffic. School 2 was adjacent to a major village road with moderate truck and automobile traffic. Schools 3 and 4 were located in rural areas characterized by low truck and automobile traffic. All four schools were in the same school district. The university soccer field was situated such that the northeastern sideline was as close as 20 m from a major interstate highway characterized by heavy truck traffic (Figure 1B). Daily air quality measurements were taken at 12 sites spaced across the university soccer field.

Air Quality Measurements

Particulate matter (PM_1) was determined at each study site as previously done (Rundell, 2003). Measurements were made at 1.5 m height using a calibrated condensation particle counter (CPC, P-Trak ultrafine particle counter, model 8525,TSI, Inc., St. Paul MN) at a sampling frequency of 1 Hz and recorded as 10-s means of PM_1 cm^{-3}. Four 10-s readings were taken for each measurement and averaged to provide the most representative particle count for a specific measurement site. Particle counts at elementary schools and the 62-day university soccer field



(B)

FIG. 1. (A) Location proximity of four elementary schools to automobile and truck traffic roadways. School 1 is located between a major interstate highway and a heavily traveled state route, school 2 is located proximal to a moderately traveled main road, and schools 3 and 4 are located in rural low traffic settings. (B) Relative location of the university soccer field in relation to a heavily traveled major interstate highway.

0452

Inhalation Toxicology, 18:541–547, 2006

ISSN: 0895-8378 print / 1091-7691 online
DOI: 10.1080/08958370600685640

Taylor & Francis
Taylor & Francis Group

Vehicular Air Pollution, Playgrounds, and Youth Athletic Fields

Kenneth W. Rundell, Renee Caviston, Amanda M. Hollenbach, and Kerri Murphy
Human Performance Laboratory, Keith J. O'Neill Center for Healthy Families, Marywood University, Scranton, Pennsylvania, USA

In spite of epidemiological evidence concerning vehicular air pollution and adverse respiratory/cardiovascular health, many athletic fields and school playgrounds are adjacent to high traffic roadways and could present long-term health risks for exercising children and young adults. Particulate matter (PM_1,0.02–1.0 μm diameter) number counts were taken serially at four elementary school athletic/playground fields and at one university soccer field. Elementary school PM_1 measurements were taken over 17 days; measurements at the university soccer field were taken over 62 days. The high-traffic-location elementary school field demonstrated higher 17-day [PM_1] than the moderate and 2 low traffic elementary school fields (48,890 $\pm$ 34,260, 16,730 $\pm$ 10,550, 11,960 $\pm$ 6680, 10,030 $\pm$ 6280, respective mean counts; $p < .05$). The 62-day mean PM_1 values at the university soccer field ranged from 115,000 to 134,000 particles cm^{-3}. Lowest mean values were recorded at measurement sites furthest from the highway (~34,000 particles cm^{-3}) and followed a second-order logarithmic decay ($R^2 = .999$) with distance away from the highway. Mean NO_2 and SO_2 levels were below 100 ppb, mean CO was 0.33 $\pm$ 1.87 ppm, and mean O_3 was 106 $\pm$ 47 ppb. Ozone increased with rising temperature and was highest in the warmer afternoon hours ($R = .61$). Although the consequence of daily recess play and athletic activities by school children and young athletes in high ambient [PM_1] conditions has not yet been clearly defined, this study is a critical component to evaluating functional effects of chronic combustion-derived PM exposure on these exercising schoolchildren and young adults. Future studies should examine threshold limits and mechanistic actions of real-world particle exposure.

The link between air pollution and adverse respiratory and cardiovascular health is substantial (Dockery, 2001; Kim et al., 2004; Lin et al., 2005; McConnell et al., 2003; Peters et al., 2001; Pope et al., 1991; Romieu et al., 1996). Acute pulmonary responses to short-term particulate matter (PM) exposure (Atkinson et al., 2001; Oberdorster et al., 1995) as well as decrements in resting lung function associated with chronic PM exposure have been reported (Gauderman et al., 2004; Rundell, 2004). Likewise, increased cardiac mortality and morbidity have been related to short-term elevations in air pollution (Dockery, 2001). Most recently, abnormal vascular function after acute PM exposure has been shown in animals (Nurkiewicz et al., 2004) and humans (Brook et al., 2002).

Most studies documenting adverse health effects in relation to outdoor air pollutants have relied on measured concentrations from central monitoring stations, metrics of proximity to roads, or traffic volume estimates. However, Kim et al. (2002) measured ultrafine particles in urban Los Angeles, CA, and found that the major source was diesel and automotive exhaust. Additionally, Li et al. (2003) found that ultrafine particles contain the largest fraction of polycyclic aromatic hydrocarbons, with the highest concentration related to traffic density (Glovsky et al., 1997).

Current investigations suggest that PM toxicity is highly influenced by number concentration and/or particle surface area (Oberdorster, 1996), while ambient particulate matter with median aerodynamic diameter less than 2.5 μm ($PM_{2.5}$) has been associated with lung damage (Gauderman et al., 2004; Kim et al., 2004; McConnell et al., 2003) and cardiovascular events (Burnett et al., 1995; Peters et al., 2001; Ware, 2000). The most common source of $PM_{2.5}$ is found in combustion emissions of fossil-fueled automobiles and diesel-powered trucks, with over 90% of the particle count from diesel aerosol having an aerodynamic diameter of <30 nm (Kittelson et al., 2004).

Although individuals with cardiovascular disease (Burnett et al., 1995) and type 2 diabetes (Zanobetti & Schwartz, 2001) appear to be more sensitive to ambient particle exposure than healthy adults, the developing lung of children may be

Received 6 January 2006; accepted 16 February 2006.
Address correspondence to Kenneth W. Rundell, PhD, Professor of Health Science, Human Performance Laboratory, Keith J. O'Neill Center for Healthy Families, Marywood University, 2300 Adams Avenue, Scranton, PA 18509, USA. E-mail:rundell@marywood.edu

Indoor/Outdoor School Air Monitoring Pilot Project

Project Manager
Melinda Treadwell (NESCAUM/Keene State College)

Principle Contributors (NESCAUM)
Susan Green
Katherine M. Nightingale
Carrie Pistenmaa
Melinda Treadwell

Primary Editor
Jennifer Weeks

Northeast States for Coordinated Air Use Management
Indoor/Outdoor School Air Monitoring Pilot Project

September 13, 2002

Childhood Asthma and Exposure to Traffic and Nitrogen Dioxide

W. James Gauderman, Edward Avol,* Fred Lurmann,† Nino Kuenzli,* Frank Gilliland,* John Peters,* and Rob McConnell**

Background: Evidence for a causal relationship between traffic-related air pollution and asthma has not been consistent across studies, and comparisons among studies have been difficult because of the use of different indicators of exposure.

Methods: We examined the association between traffic-related pollution and childhood asthma in 208 children from 10 southern California communities using multiple indicators of exposure. Study subjects were randomly selected from participants in the Children's Health Study. Outdoor nitrogen dioxide (NO_2) was measured in summer and winter outside the home of each child. We also determined residential distance to the nearest freeway, traffic volumes on roadways within 150 meters, and model-based estimates of pollution from nearby roadways.

Results: Lifetime history of doctor-diagnosed asthma was associated with outdoor NO_2; the odds ratio (OR) was 1.83 (95% confidence interval = 1.04–3.22) per increase of 1 interquartile range (IQR = 5.7 ppb) in exposure. We also observed increased asthma associated with closer residential distance to a freeway (2.22 per IQR; 1.36–3.63) and with model-based estimates of outdoor pollution from a freeway (1.89 per IQR; 1.19–3.02). These 2 indicators of freeway exposure and measured NO_2 concentrations were also associated with wheezing and use of asthma medication. Asthma was not associated with traffic volumes on roadways within 150 meters of homes or with model-based estimates of pollution from nonfreeway roads.

Conclusions: These results indicate that respiratory health in children is adversely affected by local exposures to outdoor NO_2 or other freeway-related pollutants.

(*Epidemiology* 2005;16: 000–000)

Submitted 12 October 2004; accepted 7 February 2005.

From the *Department of Preventive Medicine, University of Southern California Keck School of Medicine, Los Angeles, California; and †Sonoma Technology, Inc., Petaluma, California.

Supported in part by the California Air Resources Board (Contract A033-186), the National Institute of Environmental Health Sciences (5P30ES07048 and 1P01ES11627), the Southern California Particle Center and Supersite, the Environmental Protection Agency (grant R 82670801), and the Hastings Foundation.

Supplemental material for this article is available with the online version of the journal at www.epidem.com; click on "Article Plus."

Correspondence: W. James Gauderman, Department of Preventive Medicine, University of Southern California, 1540 Alcazar St., Suite 220, Los Angeles, CA 90089. E-mail: jimg@usc.edu.

ISSN: 1044-3983/05/1606-0001
DOI: 10.1097/01.ede.0000181308.51440.75

Previous studies have demonstrated a link between outdoor air pollution and the occurrence of symptoms in children already diagnosed with asthma.[1] However, results are not consistent with respect to whether air pollution causes asthma. Most studies have found little evidence to support an association between community-average exposures to air pollution and community asthma prevalence.[2] These study designs failed to account for the variability in exposure resulting from vehicular traffic in urban areas. Asthma has been associated with local variation in traffic patterns within communities in many,[3–7] but not all,[8–11] studies that have examined the impact of local traffic. One possible reason for the inconsistency in these recent studies is the use of different indicators of traffic-related pollution. Some have measured pollutant exposure at home, some have estimated traffic volume near the home, and some have estimated exposure to traffic-related pollutants at home based on dispersion models. Little work has been done to validate estimates of traffic exposure against measured pollution concentrations. Most studies have been conducted in European cities, which differ from U.S. cities in the layout of streets and homes, and also in the relative proportion of diesel- to gasoline-powered vehicles.

We evaluated several commonly available indicators of traffic exposure and compared them with nitrogen dioxide (NO_2) levels measured at the homes of subjects participating in the Children's Health Study. The Children's Health Study was initiated in 1993 with a cohort of school-aged children from 12 southern California communities representing a wide range in air quality. To date, this study has reported associations between air pollution and several outcomes, including lung function,[12–15] respiratory symptoms in asthmatics,[16,17] and asthma incidence.[18] These analyses have relied on com-

0458

parisons of average health across communities in relation to the pollution levels measured at a central site monitor in each community. In 2000, we conducted a study to measure NO_2 levels at a random sample of children's homes within each of the study communities. We examine how local variation in NO_2 and indicators of exposure to traffic-related pollutants are related to each other, and whether they are associated with lifetime prevalence of asthma and asthma-related outcomes.

METHODS

Study Subjects

In calendar year 2000, we measured outdoor NO_2 levels at the homes of randomly selected participants in the Children's Health Study. Eligible children included those who were originally enrolled as fourth graders (average age = 10 years) in 1993 (cohort 1) or 1996 (cohort 2), with the additional criteria that in 2000, they were still actively participating in the study and had lived in the same home since study enrollment. We excluded 2 of the 12 study communities (Lompoc and Lake Arrowhead) from this study, because neither has any major sources of traffic. From the pool of 890 eligible subjects, we randomly sampled 229 children for NO_2 monitoring. Samplers were deployed outside each home for 2-week periods in the summer and fall of 2000. Valid measurements in both seasons were obtained at 208 (91%) of the homes. Reasons for invalid measurements included lost samplers, subjects who moved, and difficulties with field access or deployment. The study protocol was approved by the Institutional Review Board for Human Studies at the University of Southern California, and informed consent was provided by a parent or legal guardian for all study subjects.

Nitrogen Dioxide Sampling

Ambient NO_2 was sampled with Palmes tubes.[19] These diffusion-based samplers have been widely used in several microenvironmental and personal air quality studies.[20–22] We deployed samplers outside the homes of study subjects, thus avoiding previously identified confounders such as indoor nitrous acid formation, gas stoves, or wall heaters. Samplers were attached at the roofline eaves, signposts, or rain gutters at an approximate height of 2 meters above the ground, oriented in a downward position and protected by an oversized paper cup. Duplicate samplers and field travel blanks were randomly assigned to approximately 10% of the subjects' homes. Samplers were deployed for 2-week periods in both summer (mid-August) and fall (mid-November) in all communities. Deployment across communities was accomplished over a 4-day period at the start of the summer and fall field sampling periods. Within any 1 community, samplers at all locations were deployed within a 4-hour period, and 2 weeks later the samplers were retrieved within a 4-hour period. Samplers were transported to and from the field in cooled portable ice chests. The samplers were prepared for field use and analyzed at the Harvard School of Public Health.

Traffic Exposures

We characterized exposure of each study participant to traffic-related pollutants by 3 metrics: (1) proximity of the residence to the nearest freeway; (2) average number of vehicles traveling within 150 meters of the residence each day, including vehicles on freeways, arterials, major collector roads, and (where available) on minor collector roads; and (3) model-based estimates of traffic-related air pollution at the residence, derived from dispersion models that incorporate distance to roadways, vehicle counts, vehicle emission rates, and meteorologic conditions. Methods used to estimate each of these exposure factors are described subsequently.

Residence addresses were standardized and their locations geocoded using the TeleAtlas database and software (Tele Atlas Inc., Menlo Park, CA, www.na.teleatlas.com). We used the TeleAtlas MultiNet USA database, a comprehensive geo-positioning-satellite-accurate database of roadways, for all analyses because it is more accurate than the standard files available from the U.S. Census. To estimate distance to the nearest freeway, we used ERSI ArcGIS Version 8.3 (ESRI, Redland, CA, www.esri.com) software tools to calculate the distance from each residence to the nearest interstate freeway, U.S. highway, or limited access highway. In these calculations, each direction of travel was represented as a separate roadway, and the "distance to nearest freeway" was the shortest distance from the residence to the middle of the nearest set of lanes of the freeway.

To estimate vehicle counts near homes, annual average daily traffic volumes were obtained from the California Department of Transportation (CALTRANS) Highway Performance Monitoring System for the year 2000. The traffic volumes were transferred from the CALTRANS roadway network to the TeleAtlas networks using previously described methods.[23] The hourly traffic volumes on weekdays and weekend days were estimated from the annual average daily traffic volumes and the average diurnal and day-of-week freeway and nonfreeway traffic variations observed in Southern California. These data were used to calculate the daily average number of vehicles traveling within 150 meters of each residence, weighted by inverse distance from the home to each road. This local traffic density was expressed as traffic volume per square meter.

To obtain model-based estimates of traffic-related pollution exposure, we used the CALINE4 line-source air-quality dispersion model.[24] Principal model inputs included roadway link geometry, link traffic volumes, meteorologic conditions (wind speed and direction, atmospheric stability, and mixing heights), and vehicle emission rates. The 5-year

0459

For the full sample, associations were observed between both asthma in the past 12 months and bronchitis symptoms in the past 12 months and the pollutants, especially NO_X, NO, and BC. The effect estimates for $PM_{2.5}$ and PM_{10} were smaller, which may have been due in part to the smaller concentration ranges among the 10 sites for these pollutants. No multi-pollutant models were evaluated because of the high inter-pollutant correlations. Restricting the analysis based on duration of residence (i.e., at least one year at current residence) tended to increase the effect estimates slightly in relation to asthma, especially when the sample was restricted to girls. Stratification by duration of residence or gender did not change the results for bronchitis. Results were similar when non-normalized pollution values were used (data not shown).

We conducted additional sensitivity analyses, including: (1) dropping the one school that was an outlier with respect to the proportion of Hispanic students (89% versus 21% -53% at other schools); (2) using a different definition for current asthma; and (3) stratifying bronchitis by a reported history of asthma. When the "outlier" school was dropped, the magnitude of the odds ratios for bronchitis did not change much, but the confidence intervals were wider. In the asthma analyses, dropping the outlier school resulted in similar or slightly greater effect estimates. Applying different questionnaire-based asthma definitions showed little change but slightly larger confidence intervals. After stratifying students by whether they also "ever" had asthma, the results suggested that those with a history of asthma were driving the results for bronchitis, but the sample size became too small to make clear inferences.

Figures 2 and 3 depict the associations between BC and bronchitis and asthma.

Discussion

To our knowledge, this is the first epidemiological study in the United States to evaluate relationships between measured traffic-related pollutants and respiratory symptoms. For children residing at their current address for at least one year, we found modest but significant increases in the odds of bronchitis symptoms and physician-diagnosed asthma in neighborhoods with higher concentrations of traffic pollutants. These results are consistent with previous reports of positive associations between proximity to traffic and various respiratory outcomes. (4-10) (11).(7,10-12) Furthermore, our findings were observed in a region with relatively clean air (low concentrations of ozone and particulate matter). (See online supplement for details) Although previous epidemiological studies in the United States exploring chronic respiratory effects of air pollution in children have shown inconsistent results, this might be due in part to exposure misclassification as these studies used air quality measurements conducted at single fixed-site monitors in each city. (17,18,22,23)

Our findings were robust to multiple sensitivity analyses using different questionnaire-based definitions of current asthma and wheezing in the past 12 months. The slight increase in effect estimates for associations between asthma after restricting the analysis to those with longer duration at current residence may be due to a reduction in exposure measurement error. Our study population was very mobile (23% had moved in the preceding 12 months, only 32% had lived at the same address since before age

0367

two).

We considered whether there might be bias due to non-response or self-reporting. We saw no significant difference in proportions of questionnaires returned in Spanish versus English by school, but there was a modest inverse correlation between pollution concentrations measured at each school and response rate. However, the response rate for individual classrooms within each school varied as well and appeared to depend on the willingness of teachers to encourage participation. Dropping the school closest to a freeway (which also had the highest measured pollutant concentrations , a high percentage of Hispanic students, and the lowest response rate) did not change the effect estimates for bronchitis and increased the estimates for asthma. This would suggest that knowledge of potential high traffic exposure probably did not affect parental reporting of the children's respiratory histories. This study was not undertaken in response to public concerns about traffic, nor, at the time the study was conducted, was there much local interest in potential health hazards of proximity to traffic. Therefore, reporting and non-response biases were unlikely to have unduly influenced our results.

We found increased association with asthma (but not bronchitis) with exposure to traffic air pollutants for girls who had lived at their current addresses at least one year compared with boys (Table 3). Several investigators have also reported greater traffic-associated effect estimates for girls versus boys.(7,8,10,24,25) Previous air pollution studies examining the gender-specific effects of air pollution on lung function and lung function growth have been mixed (26,27) The reasons for the observations in our study are unclear and deserve attention in future studies.

Exposures

We found spatial variability in exposure due specifically to roads with heavy traffic within a relatively small geographic area for BC, NO_X, NO, and to a lesser extent, NO_2. There was less variation in $PM_{2.5}$ across schools; this is consistent with previous observations that $PM_{2.5}$ is more likely to reflect regional air quality. (2) The higher effect estimates with BC, NO_X, and NO compared with NO_2 and $PM_{2.5}$, suggest that primary or fresh traffic emissions may play an etiologic role in these relationships. While NO_X, NO, and BC may serve as indicators of exposure to traffic-related pollutant mixtures, they may also act as etiologic agents themselves.(28)

We found that downwind direction was an important determinant of increased exposure to traffic pollutants, and that a simple traffic indicator (school location downwind and <300m from a major road) gave estimates of odds ratios similar to or greater than pollutant measurements in preliminary analyses using a one-stage model (data not shown). Within a geographic area with flat terrain and low-rise buildings, the direction of wind in relation to the traffic source is the most important weather parameter. Other parameters important in air dispersion of traffic pollutants (e.g., atmospheric stability, wind speed, and surface topography) would be relatively similar at the different school sites.

A simple single-stage logistic model using pollutant measurements also yielded positive associations between pollutants and symptoms with a much larger effect estimate and smaller confidence intervals.

We assumed that traffic-related pollutants measured at the neighborhood schools would be a good proxy for the children's overall exposure to such pollutants. Children attending the schools in this study generally lived within walking distance and did not use school buses. Therefore, pollutant concentrations in the children's neighborhoods probably tracked those at their schools. The most plausible exposure error in an urban setting would be that subjects who attend schools with very high traffic cxposures from a nearby freeway would tend to have similar or lower home exposures whereas children with low school exposures would tend to live in homes with similar or only slightly higher traffic exposures. This pattern of measurement error would tend to underestimate the association between exposure and outcome. (29)

Alternatively, repeated daily exposures for 6-8 hours during the school year may themselves represent biologically important influences on some children's respiratory health, analogous to occupational exposures for susceptible adults. In a recent study of proximity to traffic and respiratory health, Janssen et al. found that effect estimates using based on the school-to-highway distance were comparable or greater than those based on residence-to-highway distance. (11)

The average measurements at each school were used to estimate long-term average traffic air pollutant concentrations. We measured pollutants at each of the 10 sites concurrently (to avoid concerns of week-to week variability) in two different periods that reflect the major seasonal wind patterns for the area. We found that the rank order (relative values) of the schools did not vary from week to week or season to season, supporting the validity of this approach. Additionally, the NO_x and NO_2 concentrations at schools upwind or further from high traffic roads were similar to NO_X and NO_2 concentrations measured at the closest fixed-site monitor (21). Although there may have been some changes in the absolute traffic volume on major roads in recent years, the principal traffic patterns in the area have not changed. Thus, the relative values (rank order) of the site-specific pollutant concentrations measured in our study are likely to be representative of those in recent years.

The cross-sectional nature of our study design is a further limitation on causal inference, but we observed the same or modest increase in effect estimates for current asthma and bronchitis when we restricted our analysis to those who had lived at their present address for at least a year. Most studies on proximity to traffic and respiratory symptoms have been cross-sectional, and further longitudinal studies are needed to elucidate the role of traffic-related air pollution in the development and exacerbation of asthma and other respiratory symptoms.

Another limitation was that the exposures were assigned at the group level (n=10); however, the multi-level analysis allows adjustment for individual confounders in the first stage of analysis. Moreover, in this respect this study is comparable with other epidemiological investigations (e.g., the Harvard Six Cities Study and the Children's Health Study in Southern California (n=12 communities). Another recent cross-sectional study of traffic-related air pollution and respiratory symptoms included 13 schools.(22)

(18,23)

We also lacked information on indoor measurements of traffic-related pollutants. However, recent studies have found high correlations between personal exposures to NO_2 and traffic parameters. (30) Others have found that indoor concentrations and exposure to soot (particulate matter from diesel exhaust) is highly correlated with outdoor levels.(2)

Other covariates.

Maternal asthma, household mold/moisture, pests, and chest illness before age two were important explanatory variables in the final model for current asthma, consistent with previous studies (31).(32,33) We explored whether current levels of traffic pollution could modify the risk of current asthma symptoms depending on past history of chest illness; however, there was not sufficient power to explore interactions based on early medical history. Race/ethnicity and indicators of socioeconomic status were not important predictors of health outcomes in our study. This may be due, in part, to our study design (i.e., the schools were selected to have relatively similar measures of SES).

We did not find associations between exposure to environmental tobacco smoke and current asthma; the results of previous cross-sectional studies in school-aged children have been mixed. (34) The prevalence of current household smokers in our study was small, however, limiting study power. It is possible that there is some under-reporting of household smoking (7 % in our study vs. 19% statewide).(35) Alternatively, a substantial portion of our study population were less acculturated Hispanics (30% of parents responded in Spanish), and only 3.6% of Hispanic households reported a history of maternal smoking. Other investigators have also observed very low smoking rates (less than 5%) among less acculturated Hispanics (B. Eskenazi, personal communication).(36) If under-reporting does exist, it is possible that residual confounding might have affected our estimates of pollutant/respiratory health outcome relationships. However, the addition to the regression model of variables correlated with exposure to environmental tobacco smoke (ETS) (e.g., SES and race-ethnicity) did not change the pollutant effect estimates, suggesting that significant confounding by ETS was not likely.

In summary, we found associations between traffic-related pollutants and asthma and bronchitis symptoms in the past 12 months in a highly urbanized region of the United States with good regional air quality, where local air pollution is dominated by vehicular sources. Although the cross-sectional study design, exposure assignment at the group level, small geographic area, and possible unmeasured covariates, may limit the generalizability of the study, our findings are consistent with previous investigations in Europe and the United States. (11,14,37) In addition, our results underscore the limitations of using central air monitoring stations for assigning population exposures. Concentrations of air toxics such as diesel exhaust particles or surrogates such as BC or soot should be more widely monitored. Measurement of personal exposures to traffic pollutants is not feasible in large population-based studies; the use of geographic modeling approaches to estimate exposures for individuals may be a good alternative.(38) Future studies that can better characterize exposures to traffic pollutants and their sources (i.e., diesel vs. gasoline engines) will be important to better understand the public health impacts of motor vehicle emissions.

Acknowledgements:

We thank Jackie Hayes and Donna Eisenhower, Survey Research Center, University of California, Berkeley, for coordinating the survey, Toshifumi Hotchi, Lawrence Berkeley National Laboratories, for work on the air monitoring study, and Bob McLaughlin, California Department of Health Services, for GIS work. Shelley Green, Rob McConnell, Ed Avol, Patricia van Vliet, Bob Gunier, and Paul English provided helpful discussions. We also thank the school administrators and teachers for their support and acknowledge study participants and their families.

0375

References

1. Brunekreef B, Holgate ST. Air pollution and health. Lancet 2002;360:1233-42.

2. Fischer P, Hoek G, van Reeuwijk H, Briggs D, Lebret E, van Wijnen J, Kingham S, and Elliott P. Traffic-related differences in outdoor and indoor concentrations of particles and volatile organic compounds in Amsterdam. Atmospheric Environment 2000;34:3713-22.

3. Roorda-Knape MC, Janssen N, de Hartog J, van Vliet P, Harssema H, and Brunekreef B. Air pollution from traffic in city districts near major motorways. Atmospheric Environment 1998;32(11):1921-30.

4. Wjst M, Reitmeir P, Dold S, Wulff A, Nicolai T, von Loeffelholz-Colberg EF, and von Mutius E. Road traffic and adverse effects on respiratory health in children [see comments]. BMJ 1993;307(6904):596-600.

5. Weiland SK, Mundt KA, Ruckmann A, and Keil U. Self-reported wheezing and allergic rhinitis in children and traffic density on street of residence. Ann Epidemiol 1994;4(3):243-7.

6. Ciccone G, Forastiere F, Agabiti N, Biggeri A, Bisanti L, Chellini E, Corbo G, Dell'Orco V, Dalmasso P, Volante TF et al. Road traffic and adverse respiratory effects in children. SIDRIA Collaborative Group. Occup Environ Med 1998;55(11):771-8.

7. van Vliet P, Knape M, de Hartog J, Janssen N, Harssema H, and Brunekreef B. Motor vehicle exhaust and chronic respiratory symptoms in children living near freeways. Environ Res 1997;74(2):122-32.

8. English P, Neutra R, Scalf R, Sullivan M, Waller L, and Zhu L. Examining associations between childhood asthma and traffic flow using a geographic information system. Environ Health Perspect 1999;107(9):761-7.

9. Edwards J, Walters S, and Griffiths RK. Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. Arch Environ Health 1994;49(4):223-7.10. Brunekreef B, Janssen NA, de Hartog J, Harssema H, Knape M, and van Vliet P. Air pollution from truck traffic and lung function in children living near motorways. Epidemiology 1997;8(3):298-303.11. Janssen NA, Brunekreef B, van Vliet P, Aarts F, Meliefste K, Harssema H, Fischer P. The relationship between air pollution from heavy traffic and allergic sensitization, bronchial hyperresponsiveness, and respiratory symptoms in Dutch schoolchildren. Environ Health Perspect 2003;111(12):1512-8.

12. Kramer U, Koch T, Ranft U, Ring J, Behrendt H. Traffic-related air pollution is associated with atopy in children living in urban areas. Epidemiology 2000;11(1):64-70.

13. Hoek G, Brunekreef B, Goldbohm S, Fischer P, van den Brandt PA. Association between mortality and indicators of traffic-related air pollution in the

Netherlands: a cohort study. Lancet 2002;360(9341):1203-9.

14. Lin S, Munsie JP, Hwang SA, Fitzgerald E, Cayo MR. Childhood asthma hospitalization and residential exposure to state route traffic. Environ Res 2002;88(2):73-81.

15. Kim J, Smorodinsky S, Lipsett M, et al. Traffic-Related Air Pollution and Respiratory Health: The East Bay Children's Respiratory Health Study. [Abstract] Epidemiology 2002;13:(4 Supplement)S100

16. Ware JH, Ferris BG Jr, Dockery DW, Spengler JD, Stram DO, Speizer FE. Effects of ambient sulfur oxides and suspended particles on respiratory health of preadolescent children. Am Rev Respir Dis 1986;133(5):834-42.

17. Dockery DW, Cunningham J, Damokosh AI, Neas LM, Spengler JD, Koutrakis P, Ware JH, Raizenne M, Speizer FE. Health effects of acid aerosols on North American children: respiratory symptoms. Environ Health Perspect 1996;104(5):500-5.

18. Peters JM, Avol E, Navidi W, London SJ, Gauderman WJ, Lurmann F, Linn WS, Margolis H, Rappaport E, Gong H, et al. A study of twelve Southern California communities with differing levels and types of air pollution. I. Prevalence of respiratory morbidity. Am J Respir Crit Care Med 1999;159(3):760-7.

19. Gundel L, Dod R, Rosen H, and Novakov T. The relationship between optical

attenuation and black carbon concentration for ambient and source particles. The Science of the Total Environment 1984;36:197-202.

20. Edwards J, Ogren J, Weiss R, and Charlson R. Particulate air pollutants: a comparison of British "Smoke" with optical absorption coefficient and elemental carbon analysis. Atmospheric Environment 1983;17(11):2337-41.

21. Singer BC, Hodgson AT, Hotchi T., and Kim JJ. Passive measurement of nitrogen oxides to assess traffic-related pollutant exposure for the East Bay Children's Respiratory Health Study. Atmos Environ 2004;38(3):393-403
.

22. Dockery DW, Speizer FE, Stram DO, Ware JH, Spengler JD, Ferris BG Jr. Effects of inhalable particles on respiratory health of children. Am Rev Respir Dis 1989;139(3):587-94.

23. McConnell R, Berhane K, Gilliland F, London SJ, Vora H, Avol E, Gauderman WJ, Margolis HG, Lurmann F, Thomas DC, et al. Air pollution and bronchitic symptoms in Southern California children with asthma. Environ Health Perspect 1999;107(9):757-60.

24. Oosterlee A, Drijver M, Lebret E, and Brunekreef B. Chronic respiratory symptoms in children and adults living along streets with high traffic density. Occup Environ Med 1996;53(4):241-7.

0379

25. Pershagen G, Rylander E, Norberg S, Eriksson M, and Nordvall SL. Air pollution involving nitrogen dioxide exposure and wheezing bronchitis in children. Int J Epidemiol 1995;24(6):1147-53.

26. Peters JM, Avol E, Gauderman WJ, Linn WS, Navidi W, London SJ, Margolis H, Rappaport E, Vora H, Gong H Jr, et al. A study of twelve Southern California communities with differing levels and types of air pollution. II. Effects on pulmonary function. Am J Respir Crit Care Med 1999;159(3):768-75.

27. Gauderman WJ, Gilliland GF, Vora H, Avol E, Stram D, McConnell R, Thomas D, Lurmann F, Margolis HG, Rappaport EB, et al. Association between air pollution and lung function growth in southern California children: results from a second cohort. Am J Respir Crit Care Med 2002;166(1):76-84.

28. Delfino RJ, Gong H Jr, Linn WS, Pellizzari ED, Hu Y. Asthma symptoms in Hispanic children and daily ambient exposures to toxic and criteria air pollutants. Environ Health Perspect 2003;111(4):647-56.

29. Wyler C, Braun-Fahrlander C, Kunzli N, Schindler C, Ackermann-Liebrich U, Perruchoud AP, Leuenberger P, Wuthrich B. Exposure to motor vehicle traffic and allergic sensitization. The Swiss Study on Air Pollution and Lung Diseases in Adults (SAPALDIA) Team. Epidemiology 2000;11(4):450-6. Comment in: Epidemiology 2001; 12(1) 137-8.

30. Rijnders E, Janssen NA, van Vliet PH, Brunekreef B. Personal and outdoor nitrogen dioxide concentrations in relation to degree of urbanization and traffic density. Environ Health Perspect 2001;109 Suppl 3:411-7.

31. Bornehag CG, Blomquist G, Gyntelberg F, Jarvholm B, Malmberg P, Nordvall L, Nielsen A, Pershagen G, Sundell J. Dampness in buildings and health. Nordic interdisciplinary review of the scientific evidence on associations between exposure to "dampness" in buildings and health effects (NORDDAMP). Indoor Air 2001;11(2):72-86.

32. Martinez FD. Maternal risk factors in asthma. Ciba Found Symp 1997;206:233-9.

33. Martinez F. Viral infections and the development of asthma. Am J Respir Crit Care Med 1995;151:1644-8.

34. Cook DG, Strachan DP. Health effects of passive smoking. 3. Parental smoking and prevalence of respiratory symptoms and asthma in school age children. Thorax 1997;52(12):1081-94.

35. California Department of Health Services. Tobacco Control Section. California Tobacco Control Update . November 2002. Available at URL: http://www.dhs.ca.gov/tobacco/documents/TCSupdate.PDF .

36. Klinnert MD, Price MR, Liu AH, Robinson JL. Unraveling the ecology of risks for

early childhood asthma among ethnically diverse families in the southwest. . Am J Public Health 2002;92:792-8.

37. Delfino RJ. Epidemiologic evidence for asthma and exposure to air toxics: linkages between occupational, indoor, and community air pollution research. Environ Health Perspect 2002;110 Suppl 4:573-89.

38. Brauer M, Hoek G, van Vliet P, Meliefste K, Fischer P, Gehring U, Heinrich J, Cyrys J, Bellander T, Lewne M, et al. Estimating long-term average particulate air pollution concentrations: application of traffic indicators and geographic information systems. Epidemiology 2003;14(2):228-39.

39. Texas Transportation Insititute. 2002 Urban Mobility Report. Available http://mobility.tamu.edu/ums/.

40. Rodes CE and Holland DM. Variations of NO, NO_2 and O_3 concentrations downwind of a Los Angeles freeway. Atmospheric Environment 1981;15: 243-50.

41. Zhu Y, Hinds WC, Kim S, Sioutas C. Concentration and size distribution of ultrafine particles near a major highway. J Air Waste Manag Assoc 2002;52(9):1032-42.

0382

Figure Legends.

Figure 1: East Bay Children's Respiratory Health Study area. The study region is to the east and across the bay from the city of San Francisco.

Figure 2. Adjusted School-Specific Bronchitis Prevalence Rates Versus Black Carbon, Long-term Residents

Figure 3. Adjusted School-Specific Asthma Prevalence Rates Versus Black Carbon, Long Term Residents

Table1. Demographic, family, and home characteristics of the East Bay Children's Respiratory Health Study respondents.

Characteristics	All subjects (N = 1109) %	Subjects attending schools: Near and Downwind of major roads (4 schools, N =402) %	Subjects attending schools: Far or Upwind of major roads (6 schools, N = 707) %
Gender			
Female	52.6	51.8	53.1
Race/Ethnicity			
White	12.6	11.0	13.5
Black, African American	11.1	7.0	13.4
Hispanic	43.5	47.6	41.2
Asian	14.0	15.5	13.1
Other/Multiracial	18.9	18.8	18.9
SES indicators			
Household at/below Federal poverty level	31.3	31.8	31.0
Parent's education: high school or less *	48.7	51.4	47.1

0384

Family history			
Biological mother with asthma	12.2	9.5	13.7
Maternal smoking during pregnancy	10.3	7.8	11.7
Home indoor environment			
Smoker in the household, since child's birth	17.9	13.1	20.6
Smoker in the household, current	7.2	3.2	9.5
Furry pet	37.3	36.0	38.1
Pests, past 12 months	63.1	65.4	61.8
Gas stove	63.1	63.6	62.9
Indicator of mold/mildew presence, past 12 months	44.6	43.5	45.3
Health outcomes			
Chest illness before age 2	23.3	18.8	25.9
Asthma, past 12 months	14.0	13.9	14.1
Bronchitis, past 12 months	12.1	13.2	11.5

*Parent responding to the questionnaire

Table 2: Nearby traffic sources and average pollutant concentrations at ten schools*

School	Major Traffic Source[†]	AADT (#/day)	Distance[‡] (m)	<300 m downwind	PM_{10} μg/m^3	$PM_{2.5}$ μg/m	BC (μg/m^3)	NO_X ppb	NO_2 ppb	NO[§] ppb
1	No				30	12	0.7	42	22	19
2	Yes	90,000	230	Yes	29	13	0.9	55	24	31
3	Yes	210,000	360	No	32	12	0.8	49	21	29
4	No				30	12	0.8	41	19	22
5	Yes	210,000	130	Yes	30	12	0.9	62	26	36
6	No				30	12	0.7	39	21	17
7	No				29	11	0.7	33	20	11
8	Yes	130,000	350	No	29	12	0.7	45	23	21
9	Yes	210,000	200	Yes	30	12	0.9	57	26	31
10[11]	Yes	190,000	60	Yes	32	15	1.1	69	31	38
Study average					30	12	0.8	49	23	25

0386

*Estimated average pollutant concentration at each school based on normalized concentrations (see text). Monitoring was conducted for 11 weeks in the spring (March - June) and eight weeks in the fall (September-November) 2001). The number of weeks underlying our estimates of chronic exposure varied for each measured pollutant: NOx (18), NO_2 (19), BC (11), $PM_{2.5}$ (10) and PM_{10} (9).

†Includes roads with annual average daily traffic (AADT) above 50,000 vehicles per day located within 1000 m of school. AADT estimate provided by CA Dept of Transportation (Cal Trans).

‡ Distances were estimated using geographic information systems. Latitude and longitude of the monitors were determined using a global-positioning system (GPS) device (Garmin GPS II). In some cases, distances were estimated using aerial photographs or measured using a distance wheel.

§NO = NO_X-NO_2

[11]There are also a shopping center and parking lot abutting the school grounds to the south and a freeway off ramp <50 m to the northwest.

0387

Table 3. Odds ratios (95% Confidence Interval) of respiratory illness by school-based ambient air pollutant concentrations using two-stage model.

	Exposure	All subjects (N=1109) OR	CI	LTR subjects[‡] (N=871) OR	CI	LTR-Females[‡] (N=462) OR	CI	LTR-Males[‡] (N=403) OR	CI
Bronchitis*		N=93/797		N=79/635		N=38/341		N=41/291	
	NO_X	1.05	(1.01, 1.08)	1.06	(1.03, 1.09)	1.07	(1.03, 1.11)	1.03	(0.98, 1.09)
	NO_2	1.02	(0.99, 1.06)	1.03	(1.00, 1.06)	1.04	(1.01, 1.08)	1.02	(0.98, 1.06)
	NO	1.05	(1.02, 1.09)	1.06	(1.03, 1.09)	1.07	(1.03, 1.11)	1.04	(0.98, 1.10)
	PM_{10}	1.03	(0.99, 1.07)	1.02	(0.98, 1.07)	1.04	(1.01, 1.09)	1.01	(0.95,1.06)
	$PM_{2.5}$	1.02	(1.00, 1.05)	1.03	(1.01, 1.05)	1.04	(1.02, 1.05)	1.02	(0.99, 1.05)
	BC	1.04	(1.00, 1.08)	1.05	(1.01, 1.08)	1.06	(1.02, 1.10)	1.03	(0.98, 1.08)
Asthma[†]		N=101/705		N=78/562		N=42/297		N=36/263	
	NO_X	1.04	(0.97, 1.11)	1.07	(1.00, 1.14)	1.17	(1.06, 1.29)	1.02	(0.93, 1.11)
	NO_2	1.02	(0.97, 1.07)	1.04	(0.98, 1.10)	1.09	(1.03, 1.15)	1.00	(0.94, 1.07)
	NO	1.05	(0.98, 1.12)	1.08	(1.00, 1.15)	1.19	(1.03, 1.36)	1.02	(0.94, 1.12)
	PM_{10}	1.02	(0.96, 1.09)	1.04	(0.97, 1.12)	1.09	(0.92, 1.29)	1.02	(0.94, 1.10)

	$PM_{2.5}$	1.00	(0.97, 1.04)	1.01	(0.97, 1.06)	1.06	(0.99, 1.15)	0.99	(0.95, 1.04)
	BC	1.02	(0.96, 1.09)	1.05	(0.99, 1.13)	1.12	(0.95, 1.33)	1.00	(0.93, 1.09)
Asthma (no outlier, school 5) †		N=96/641		N = 73/507		N = 38/271		N = 35/233	
	NOx	1.08	(1.00, 1.17)	1.10	(1.00, 1.20)	1.14	(1.02, 1.28)	1.07	(0.96, 1.19)
	NO_2	1.06	(0.99, 1.13)	1.07	(0.98, 1.17)	1.09	(0.97, 1.22)	1.05	(0.96, 1.16)
	NO	1.08	(1.00, 1.17)	1.09	(1.00, 1.19)	1.14	(1.03, 1.26)	1.07	(0.96, 1.18)
	PM_{10}	1.06	(0.97, 1.16)	1.08	(0.98, 1.19)	1.09	(0.96, 1.24)	1.08	(0.97, 1.19)
	$PM_{2.5}$	1.04	(0.96, 1.12)	1.03	(0.94, 1.13)	1.03	(0.91, 1.17)	1.03	(0.94, 1.14)
	BC	1.07	(0.98, 1.17)	1.09	(0.99, 1.19)	1.14	(1.02, 1.27)	1.06	(0.95, 1.18)

* First stage model adjusted for: child's respiratory illness before age 2; pests; indicator of mold presence

†First stage model adjusted for: child's respiratory illness before age 2; pests; indicator of mold presence; maternal history of asthma

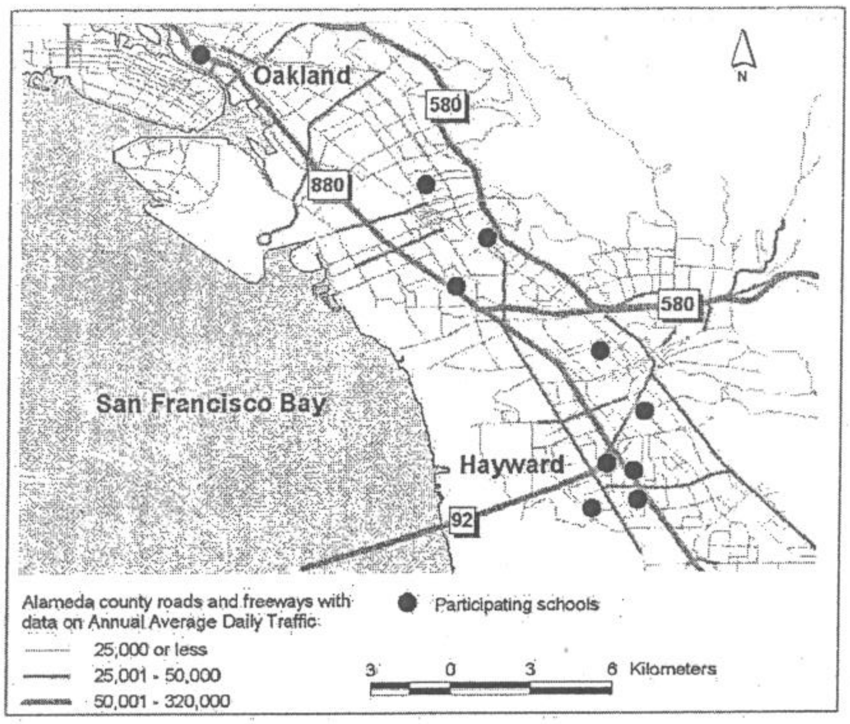
‡LTR = long term resident (current address for 1 year or more)

Odds ratios are calculated per interquartile range (IQR) of average pollutant concentration as follows:

NOx = 14.9 ppb, NO2 = 3.6 ppb, NO = 11.6 ppb, PM10 = 1.4 μg/m3, PM2.5 = 0.7 μg/m3, BC = 0.15 μg/m3

0389

Figure 1.



Oakland
580
880
580
San Francisco Bay
Hayward
92
N
Alameda county roads and freeways with data on Annual Average Daily Traffic:
25,000 or less
25,001 - 50,000
50,001 - 320,000
Participating schools
3 0 3 6 Kilometers

Figure 2

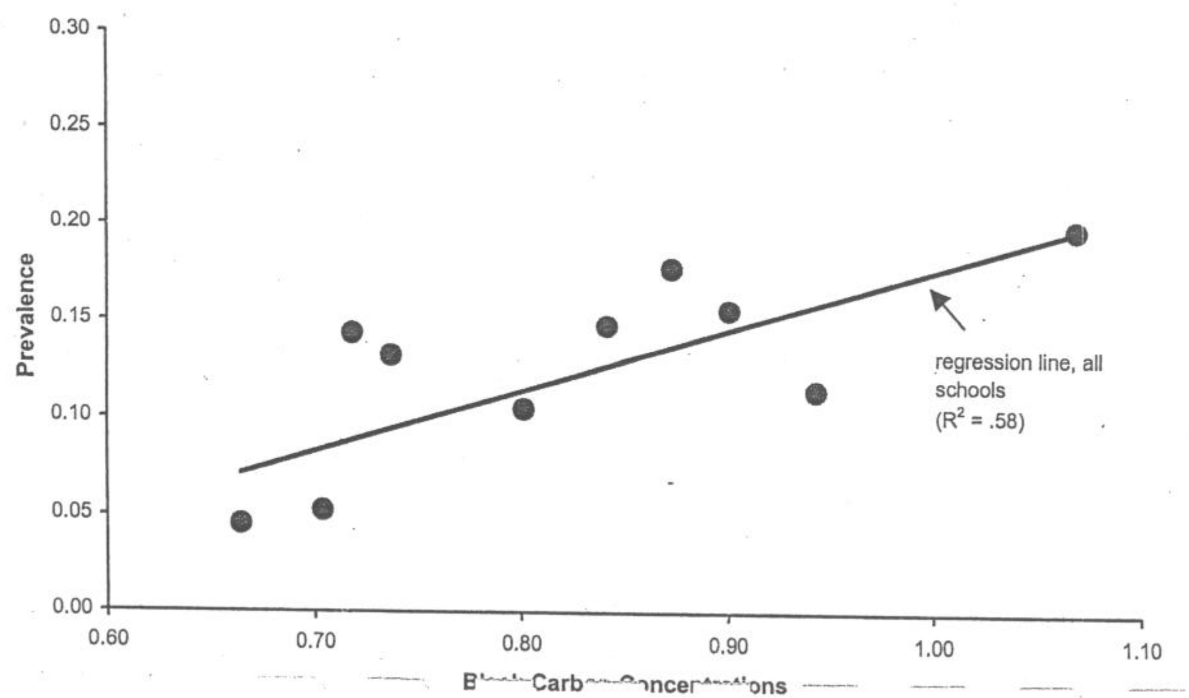
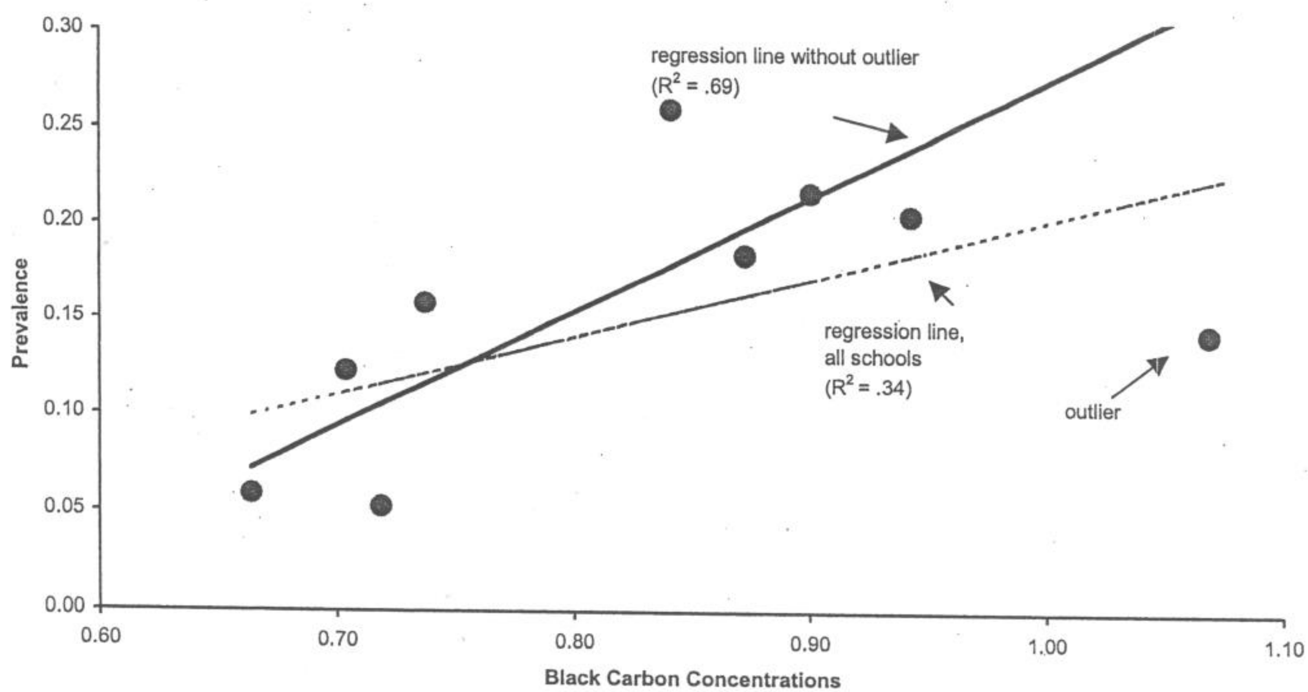

0.30
0.25
0.20
0.15
0.10
0.05
0.00
Prevalence
0.60
0.70
0.80
0.90
1.00
1.10
regression line, all schools (R^2 = .58)

Figure 3.



0392

Title: Traffic-related air pollution near busy roads: the East Bay Children's Respiratory Health Study

Authors

Janice J. Kim , Svetlana Smorodinsky , Michael Lipsett , Brett C. Singer , Alfred T. Hodgson , Bart Ostro

Online Data Supplement

Methods :

Study design and study location

The study area (approximately 21 km x 5 km) is across the bay from San Francisco, and includes 10 neighborhood elementary schools that span a busy traffic corridor. The topography is relatively flat and the urban landscape consists primarily of widely spaced, low-level buildings. Traffic congestion in the San Francisco-Oakland area ranks second in the United States,(39) but regional air quality is generally good due to ocean breezes from the southwest or west. At the nearby air quality monitoring station (Fremont), 15 km southeast of the study area, ozone concentrations rarely exceed the national or state standards (0-1days/ year above federal ozone standards for past 3 years). Annual-average concentrations of PM_{10} and $PM_{2.5}$ at the Fremont station were 23.4 and 12.2 $\mu g/m^3$, respectively in 2001. These values are below the PM_{10} and $PM_{2.5}$ National Ambient Air Quality Standards (50 $\mu g/m^3$ and 15 $\mu g/m^3$, respectively) and just above the more stringent California standards (20 $\mu g/m^3$ and 12 $\mu g/m^3$, respectively) .

School site selection

We used a public school database from the California Department of Education (CDE) containing statewide information on school locations, enrollment, and demographics (URL: http://www.cde.ca.gov). A traffic database was obtained from the California Department of Transportation (CalTrans) Highway Performance Monitoring System (HPMS, 1997). Traffic files included statewide freeway and major road network geography and counts of the annual average daily traffic (AADT) on those roadways. We utilized Geographic Information Systems (GIS) software to integrate, display, and analyze data from these disparate data sources (ArcView 3.2, ESRI, Redlands, CA).

We selected elementary schools for possible recruitment such that the school locations would represent a range of distances upwind and downwind from major roads. Because concentrations of traffic pollutants decrease to background levels within 300 m downwind (40,41) and because several European studies have found adverse health effects in children residing or attending schools in close proximity to roads with AADT of 25,000 or more vehicles (4,9), we used these parameters to guide our selection process.

Briefly, to identify possible school sites for recruitment, school addresses were geo-coded and overlaid with the CalTrans road network. Candidate schools "near" a major road were identified based on a geo-coded location less than 350 m from any road with AADT $\geq$ 90,000 vehicles. Schools "farther" from local or heavy traffic were also identified using GIS (no local road with AADT $\geq$ 20,000 vehicles/day within 300 m and no major highway or freeway within 750 m). We identified eight schools that were "near" freeways and twenty-one schools that were "farther" from local or heavy traffic in the proposed study area. From this list, we sought to recruit schools that were demographically similar and that were likely to have a range of exposure to traffic pollutants based on proximity to major roads and prevailing wind directions.

Ten schools that reflected locations with a range of distances upwind and downwind from major roads were selected. There were no major non-roadway sources of air pollution in the neighborhoods (CA Air Resources Board, private communication).

Population:

In Spring, 2001, we invited all children in grades 3-5 in participating classes (n=64) to join the study. Packets containing a health questionnaire in English or Spanish, an informed consent form, and study information were distributed in the classroom, completed by parents, and returned to the teacher. An option was available to complete the questionnaire by telephone with trained research staff. Up to three reminder notices were sent to non-responders. We gave a donation towards educational materials to classrooms and provided nominal compensation to parents completing the questionnaire. The study protocol was approved by the Committee for the Protection of Human Subjects, California Health and Human Services Agency.

Health Assessment:

Questions on respiratory symptoms and illnesses were modeled after those used in previous studies on air pollution and children's health.(16) (17,18) Subjects were defined as having current asthma if their parents selected asthma in response to the question, "During the previous 12 months, did a doctor say that your child had any of the following chest illnesses?" (Choices were pneumonia, asthma, reactive airway disease, and other chest illness.) Current bronchitis was defined as: (1) a positive response to the question: "During the past 12 months, did your child have bronchitis?" or (2) a report of cough and chest congestion or phlegm lasting at least three consecutive months of the past 12.

We also asked about personal factors potentially associated with asthma or bronchitis, including demographic variables (race/ethnicity and measures of socioeconomic status (SES) (e.g., parents' education, income, health insurance)); host factors (age, gender, chest illness before age two, maternal smoking during pregnancy, maternal or paternal history of asthma, premature birth, breastfeeding); home environmental factors (current smoker in the home, gas stove, evidence of mold, pets, problem with pests in the past year, carpet in the bedroom; and activity factors (sports participation, commute patterns to school). Pests included cockroaches, mice, rats, termites, spiders, or ants. Those with "chest illness before the age of two" were reported to have seen a doctor before age two for asthma, bronchiolitis, RSV, croup, reactive airway disease, or pneumonia.

Indicator of "mold" was a Yes to any of the following: history of residential water damage, visible mold/yildew, water condensation, or mold/musty smell in the past 12 months. In sensitivity analyses we used a slightly different definition of asthma (physician-diagnosed ever, and asthma symptoms, including wheezing, in the past 12 months), and duration of residence (at least one year at current address Yes/No).

Air Pollution from Traffic:

To estimate the children's overall exposure to traffic pollution, we measured concentrations of traffic-related pollutants at the schools. We also used school location with respect to prevailing winds and proximity to busy roads as a separate exposure metric.

(1) Traffic-related pollutant measurements: We determined PM_{10} and $PM_{2.5}$ mass

concentrations from weeklong filter samples (Pallflex fiberfilm, Pall/Gelman) collected with small sampling pumps (Airchek 2000, SKC, Inc) and size-selective inlets (PEM, MSP Corp). BC concentrations were determined on the PM_{10} filter samples using an established light attenuation method that we validated for the fiberfilm filters.(19) (20) Concentrations of NO_X and NO_2 were determined with passive diffusion samplers (Ogawa, Inc., USA) deployed over a one-week sampling period. The NO concentration was estimated as the difference between NO_X and NO_2. Additional details of the monitoring protocol are described elsewhere.(21)

We estimated chronic exposures to traffic pollutants by measuring pollutant concentrations simultaneously at all schools over several month. Specifically, monitoring was conducted for 11 weeks in the spring (March - June) and eight weeks in the fall (September-November) 2001). NO_X and NO_2 were sampled during all periods at each school.(21) PM_{10} and $PM_{2.5}$ were not measured every week.

Study-averaged air pollution concentrations were calculated at each school by first normalizing the data to account for occasional missing data as follows: Because of missing samples and week-to-week variability at each site, we obtained average site-specific pollutant concentrations as follows: For each week and pollutant, we calculated the ratio of each school's measured pollutant level relative to the mean across all schools sampled that week. Then, for each school, the mean ratio over the entire study period was calculated. The mean ratios are normalized concentrations and represent the relative exposures across school locations. To obtain an estimate of the average pollutant concentration at each school, we multiplied the mean of the school-specific normalized concentration by the study-average pollutant concentration (averaged across all study sites over the entire study period). This normalization process allowed for an aggregation of data for all sampling periods, including those with an incomplete data set. Only weeks with valid data from at least six schools were included in this process.

(2) Additional traffic metric: Schools were assigned a category for wind direction (upwind or downwind of a freeway) and a category for proximity to traffic (<300 m or >300 m from a major traffic source) as well as the combination of the two (i.e., downwind and close versus all others).

Data Analysis

To explore the extent to which additional covariates would have an effect on the pollutant estimate, we added pollutant values or school location indicators to the model, one at a time and then examined the effect of removing each covariate on the pollutant coefficient(s); if removal of a covariate from the model changed the magnitude of the pollutant coefficient by less than 10%, the covariate was dropped.

In a separate sensitivity analysis, we also initially included variables found to be predictive of respiratory symptoms in other studies even if they did not satisfy the p-value criterion. Other several sensitivity analyses included examining the model using other definitions of asthma and after stratifying the outcome of current bronchitis by asthma status. We also restricted the sample to the subgroup of children who had lived at the given address for more than one year (long-term residents) and performed stratified analysis by gender, both for the full sample and long-term residents. Additionally, we re-ran the models after dropping one school that was an outlier in terms of race/ethnicity distribution.

Adjusted odds ratio(s) (ORs) were calculated for an interquartile range (IQR) of measured pollutant concentrations (i.e., the odds ratio for a given health outcome given a pollutant concentration at the 75 percentile of the distribution relative to that at the 25th percentile). All analyses were conducted using SAS version 8.2 for Windows and STATA version 8.

0400

References, Online Supplement

E1. Texas Transportation Insititute. 2002 Urban Mobility Report. Available http://mobility.tamu.edu/ums/.

E2. Rodes CE and Holland DM. Variations of NO, NO_2 and O_3 concentrations downwind of a Los Angeles freeway. Atmospheric Environment 1981;15:243-50.

E3. Zhu Y, Hinds WC, Kim S, Sioutas C. Concentration and size distribution of ultrafine particles near a major highway. J Air Waste Manag Assoc 2002;52(9):1032-42.

E4. Wjst M, Reitmeir P, Dold S, Wulff A, Nicolai T, von Loeffelholz-Colberg EF, and von Mutius E. Road traffic and adverse effects on respiratory health in children [see comments]. BMJ 1993;307(6904):596-600.

E5. Edwards J, Walters S, and Griffiths RK. Hospital admissions for asthma in preschool children: relationship to major roads in Birmingham, United Kingdom. Arch Environ Health 1994;49(4):223-7.

E6. Ware JH, Ferris BG Jr, Dockery DW, Spengler JD, Stram DO, Speizer FE. Effects of ambient sulfur oxides and suspended particles on respiratory health of preadolescent children. Am Rev Respir Dis 1986;133(5):834-42.

0401

E7. Dockery DW, Cunningham J, Damokosh AI, Neas LM, Spengler JD, Koutrakis P, Ware JH, Raizenne M, Speizer FE. Health effects of acid aerosols on North American children: respiratory symptoms. Environ Health Perspect 1996;104(5):500-5.

E8. Peters JM, Avol E, Navidi W, London SJ, Gauderman WJ, Lurmann F, Linn WS, Margolis H, Rappaport E, Gong H, et al. A study of twelve Southern California communitics with differing levels and types of air pollution. I. Prevalence of respiratory morbidity. Am J Respir Crit Care Med 1999;159(3):760-7.

E9. Gundel L, Dod R, Rosen H, and Novakov T. The relationship between optical attenuation and black carbon concentration for ambient and source particles. The Science of the Total Environment 1984;36:197-202.

E10. Edwards J, Ogren J, Weiss R, and Charlson R. Particulate air pollutants: a comparison of British "Smoke" with optical absorption coefficient and elemental carbon analysis. Atmospheric Environment 1983;17(11):2337-41.

E11. Singer BC, Hodgson AT, Hotchi T., and Kim JJ. Passive measurement of nitrogen oxides to assess traffic-related pollutant exposure for the East Bay Children's Respiratory Health Study. Atmos Environ 2004;38(3):393-403

0402

0403

0405

Ambient Air Pollution: Health Hazards to Children

Committee on Environmental Health
Pediatrics 2004;114;1699-1707
DOI: 10.1542/peds.2004-2166

This information is current as of September 13, 2006

0406

0407

Zahavi, Y., Ryan, J.M., 1980. Stability of travel components over time. Transportation Research Record 750, 19–26.
Zahavi, Y., Talvitie, A., 1980. Regularities in travel time and money expenditures. Transportation Research Record 750, 13–19.

Johnston, J., DiNardo, j., 1997. Econometric Methods, fourth ed. McGraw-Hill, New York.
Johnston, R., Ceerla, R., 1996a. The effects of new high-occupancy vehicle lanes on travel and emissions. Transportation Research A 30 (1), 35–50.
Johnston, R., Ceerla, R., 1996b. Travel modelling with and without feedback to trip distribution. Journal of Transportation Engineering 122 (1), 83–86.
Jorgensen, R.E., 1947. Influence of expressways in diverting traffic from alternate routes and in generating new traffic. HRB Proceedings 27, 322–330.
Litman, T., 2001. Generated traffic: implications for transport planning. ITE Journal 71 (4), 38–47.
Lynch, J.T., 1955, Traffic diversion to toll roads. In: Proceedings 702. American Society of Civil Engineers, Washington, DC, June, pp. 1–27.
Mills, E.S., Hamilton, B.W., 1994. Urban Economics, fifth ed. HarperCollins College Publishers, New York.
Mogridge, M.J.H., Holden, D.J., Bird, J., Terzis, G.C., 1987. The Downs/Thomson paradox and the transportation planning process. International Journal of Transport Economics 14 (3), 283–311.
Nadiri, I., Mamuneas, T.P., 1998. Contribution of highway capital to output and productivity growth in the US economy and industries. Report prepared for the Federal Highway Administration, Office of Transportation Policy Studies, http://www.fhwa.dot.gov/policy/gro98cvr.htm.
Nellthorp, J., Mackie, P.J., 2000. The UK roads review – a hedonic model of decision making. Transport Policy 7, 127–138.
Noland, R.B., 2001. Relationships between highway capacity and induced vehicle travel. Transportation Research A 35 (1), 47–72.
Noland, R.B., Cowart, W.A., 2000. Analysis of metropolitan highway capacity and the growth in vehicle miles of travel. Transportation 27 (4), 363–390.
Parsons Brinckerhoff Quade and Douglas Inc., 1999. Report 423A, Land use impacts of transportation: a guidebook. National Cooperative Highway Research Program. Transportation Research Board, National Research Council, National Academy Press, Washington, DC.
Pells, S.R., 1989. User response to new road capacity: a review of published evidence. Working Paper 283. Institute for Transport Studies Leeds University.
Price, A., 1999. The new approach to appraisal of road projects in England. Journal of Transport Economics and Policy 33(2), 221–226.
Rodier, C.J., Abraham, J.E., Johnston, R.A., 2001. Anatomy of induced travel: using an integrated land use and transportation model, Paper no. 01-2582. Presented at the 80th Annual Meeting of the Transportation Research Board.
Rodier, C.J., Johnston, R.A., 2001. Uncertain socioeconomic projections used in travel and emissions models: could plausible errors result in air quality nonconformity? Paper no. 01-2575. Presented at the 80th Annual Meeting of the Transportation Research Board.
Schrank, D.L., Lomax, T.J., 1997. Urban roadway congestion – 1982–1994, Vol. 2: Methodology and urbanized area data. Research Report 1131-9, Texas Transportation Institute, College Station, TX.
Small, K.A., 1982. The scheduling of consumer activities: Work trips. American Economic Review 72, 467–479.
Small, K.A., 1992. Urban Transportation Economics. Harwood Academic Publishers, Chur, Switzerland.
Standing Advisory Committee on Trunk Road Assessment, 1994. Trunk roads and the generation of traffic. Department of Transport, Standing Advisory Committee on Trunk Road Assessment, London.
Strathman, J.G., Dueker, K.J., Sanchez, T., Zhang, J., Riis, A.-E., 2000. Analysis of induced travel in the 1995 NPTS. Final Techical Report to the US Environmental Protection Agency, Office of Transportation and Air Quality.
Tatom, J.A., 1991. Public capital and private sector performance. St. Louis Federal Reserve Bank Review 73, 3–15.
Transportation Research Board, 1995. Expanding metropolitan highways: implications for air quality and energy use. Special Report 245, National Research Council, National Academy Press, Washington, DC.
US Department of Transportation, 1999. 1999 Status of the Nation's Highways, Bridges and Transit: Conditions and Performance. Report to Congress.

Boarnet, M.G., Chalermpong, S., 2001. New highways, urban development, and induced travel, Paper No. 01-2996. Presented at the 80th Annual Meeting of the Transportation Research Board.
Downs, A., 1992. Stuck in Traffic: Coping with Peak-Hour Traffic Congestion. The Brookings Institution, Washington, DC.
Cairns, S., Hass-Klau, C., Goodwin, P., 1998. Traffic Impact of Highway Capacity Reductions: Assessment of the Evidence. Landor Publishing, London.
Cervero, R., Hansen, M., 2001. Road supply–demand relationships: sorting out causal linkages. Paper No. 01-2527 Paper presented at the 80th Annual Meeting of the Transportation Research Board.
Chandra, A., Thompson, E., 2000. Does public infrastructure affect economic activity? Evidence from the rural interstate highway system. Regional Science and Urban Economics 30, 457–490.
Chu, X., 2000. Highway capacity and areawide congestion, Paper no. 00-1506. Presented at the 79th Annual Meeting of the Transportation Research Board.
Council on Environmental Quality, 1987. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. 40 CFR parts 1500–1508.
Department of the Environment, 1994. Planning Policy Guidance: Transport. PPG 13, HMSO, London.
Department of Environment, Transport and the Regions, 1994. Guidance on Induced Traffic. Guidance Note 1/95, HETA Division, 14th December 1994.
Department of Environment, Transport and the Regions, 1998a. A New Deal for Transport: Better for Everyone. TSO, London.
Department of Environment, Transport and the Regions, 1998b. A New Deal for Trunk Roads in England: Understanding the New Approach to Appraisal. TSO, London.
Department of Environment, Transport and the Regions, 1998c. A New Deal for Trunk Roads in England. TSO, London.
Department of Environment, Transport and the Regions, 2000. Transport 2010: The 10-Year Plan, TSO, London (www.detr.gov.uk/trans2010/index.htm).
Downing, D., Noland, R.B., 1998. Environmental consequences of reducing the federal role in transportation: legal framework. Transportation Research Record 1626, 3–10.
Energy and Environmental Analysis Inc., 1999. Measuring induced travel demand from roadway capacity expansion: an empirical analysis of the US mid-Atlantic region. Final Report, US Environmental Protection Agency, Washington, DC.
Fulton, L.M., Noland, R.B., Meszler, D.J., Thomas, J.V., 2000. A statistical analysis of induced travel effects in the US mid-Atlantic region. Journal of Transportation and Statistics 3 (1), 1–14.
Goodwin, P.B., 1992. A review of demand elasticities with special reference to short and long run effects of price changes. Journal of Transport Economics and Policy 26 (2), 155–169.
Goodwin, P.B., 1996. Empirical evidence on induced traffic, a review and synthesis. Transportation 23, 35–54.
Goodwin, P., 1999. Transformation of transport policy in Great Britain. Transportation Research A 33, 655–669.
Gordon, P., Richardson, H.W., 1994. Congestion trends in metropolitan areas. In: Curbing gridlock: Peak-Period Fees to Relieve Traffic Congestion, Vol. 2. National Research Council, Washington, DC, National Academy Press, pp. 1–31.
Hansen, M., Gillen, D., Dobbins, A., Huang, Y., Puvathingal, M., 1993. The air quality impacts of urban highway capacity expansion: traffic generation and land use change. Institute of Transportation Studies, University of California, Berkeley, ISSN 0192 4095.
Hansen, M., Huang, Y., 1997. Road supply and traffic in California urban areas. Transportation Research A 31, 205–218.
Heanue, K., 1998. Highway capacity and induced travel: issues, evidence and implications. Transportation Research Circular No. 481, Transportation Research Board, National Research Council.
Highways Agency, 1997. Design manual for roads and bridges, Vol. 12, Section 2, Part 2: induced traffic appraisal. (http://www.official-documents.co.uk/document/ha/dmrb/index.htm).
Hills, P.J., 1996. What is induced traffic? Transportation 23, 5–16.

(329)

5. Conclusions

The research evidence on induced travel effects clearly shows that behavioural responses are real and can have significant impacts on the congestion reduction benefits of capacity expansion projects. Regardless of the specific impact on congestion, VMT growth is likely to be larger with more highway capacity relative to less highway capacity. Both in the US and the UK research efforts are underway to improve modelling and assessment tools to measure the impacts of these effects.

Transport policy is also gradually changing in both countries. UK policy appears to have been more influenced by this research, primarily through the abandonment of forecasting based on a predict and provide philosophy, though the recently released 10-year Transport Plan appears to be a step backward. In the US, national policy has aimed to be more inter-modal in perspective, but in practice funding incentives and political inertia have made major change difficult. Much of the change in US policy is actually beginning to occur due to more detailed analysis at the project level of induced travel and induced development impacts. In both countries, these changes are being driven by environmental concerns. In the US environmental statutes are enabling much of the change at the project assessment level rather than from directives specified by the Federal government.

Overall, the new knowledge being developed of how infrastructure affects travel behaviour and land use patterns will hopefully lead to actual implementation of improved policies and project selection allowing greater choices for individuals using the transport network while minimizing environmental impacts.

Acknowledgements

We would like to thank those many individuals who have contributed to the debate on these issues and the insights they have provided. In particular we would like to thank Robert Johnston, Todd Litman, Phil Goodwin, Lewis Fulton and Stuart Porter for providing helpful suggestions for improving this paper. The authors take full responsibility for any errors or omissions. The conclusions and opinions expressed in this paper do not necessarily represent the views of the US EPA or the US government.

References

Arnott, R., Small, K., 1994. The economics of traffic congestion. American Scientist 82, 446–455.

Aschauer, D.A., 1989. Is public expenditure productive?. Journal of Monetary Economics 23, 177–200.

Barr, L.C., 2000. Testing for the significance of induced highway travel demand in metropolitan areas. Transportation Research Record 1706, 1–8.

Boarnet, M., 1997. Highways and economic productivity, interpreting recent evidence. Journal of Planning Literature 11, 476–486.

Boarnet, M., 1998. Spillovers and the locational effect of public infrastructure. Journal of Regional Science 38 (3), 381–400.

Boarnet, M.G., Haughwot, A.F., 2000. Do Highways Matter? Evidence and Policy Implications of Highways' Influence on Metropolitan Development. The Brookings Institution Center on Urban and Metropolitan Policy, Washington, DC.

The DOT is also incorporating measures of induced travel demand into their Highway Economics Requirement System (HERS) which attempts to determine total financial needs for the US highway system using a cost benefit analysis approach (US Department of Transportation, 1999). This model includes travel demand elasticities of 1.0 in the short run and 1.6 in the long run with respect to total user costs. These are used as elasticities for individual links on the highway network and therefore include route shifts that may not represent induced VMT effects.

The inclusion of these user cost elasticities in the HERS model allows estimated VMT growth to respond to changes in recommended investment levels. For example, average annual VMT growth (over 20 years) for large urbanized areas is estimated to be 1.66% if annual average investments are $46.3 Billion while an investment level of $94.0 Billion could result in VMT growth of 2.06% annually. It is unclear, however, how this analysis actually influences the allocation of investment from the Federal government. While TEA-21 authorized spending levels for transportation, subsequent annual appropriations of funds have been linked to annual gasoline tax revenues with no consideration of how investment levels may affect VMT growth. In fact, US Department of Transportation (1999) suggests that investment needed to maintain current conditions, estimated using the HERS model, is generally higher than actual investment by both the Federal and State governments.

Therefore, while the theoretical basis of induced travel effects appears to be acknowledged by the US DOT, the actual investment of Federal dollars is still largely driven by political imperatives (such as demands for congestion reduction) and the levels of revenue collected by the Federal gasoline tax. US DOT does not make decisions on specific projects since these are made by state Departments of Transportation and sometimes by local Metropolitan Planning Organizations. However, the availability of funding and the incentives this provides to state governments by providing an 80% match to local funding can certainly bias decision making.

Boarnet and Haughwot (2000) suggest that radical reform of the Federal role in highway funding might be an effective policy for changing urban development patterns. They suggest that if local metropolitan areas spent local money (rather than Federal or even state money), that cost benefit analysis would be conducted and that ultimately local decision-makers would choose better projects.

Even without this type of radical reform, the science and economics of induced travel effects are being recognized at the project level through the requirements of NEPA and the CAAA conformity requirements. These statutory and legal requirements are beginning to have an impact on policy for certain specific projects. While Federal money may currently distort decision-making, Federal regulations may be able to improve decision- making (Downing and Noland, 1998).

The US debate on these issues is fundamentally tied to issues of community livability and sprawl development. Suburban congestion has been linked to sprawl development patterns by those promoting "livability". It is clear from much of the induced travel research that increasing road capacity tends to encourage sprawl development while also being ineffective at solving congestion problems. Despite this clear linkage, TEA-21 still authorizes tremendous resources to new highway construction, potentially undermining other efforts to achieve livability goals.

ronmental Impact Statements for highway projects currently do not conduct a high quality analysis of cumulative effects (i.e., the land development impacts that are induced by the project). In addition, many highway projects are analysed in segments, rather than as an entire corridor which would tend to underestimate the potential cumulative effects in the long run.

Long run development impacts from capacity expansion suggest that project goals should be defined exclusively with regard to land development objectives, not congestion reduction. This type of justification is normally avoided by transportation agencies. An assessment of transportation projects based upon their land development impacts obviously creates more political tension in the promotion of transportation projects. The business community and developers are generally very active in promoting projects that increase access to undeveloped land and resulting economic development on that land. A more detailed analysis of how transportation projects interact with land development is essential information that is needed to improve decision-making and the environmental outcomes of specific projects.

If congestion relief is not the stated goal of a project this would also imply that alternatives to capacity expansion might be more appropriate. For example, if broad economic development and sustainability goals are stated as goals within a corridor EIS, then the possible range of solutions may expand well beyond the analysis of highway options or even beyond other transportation options.

As mentioned previously, the CAAA requires transportation plans to be in conformity with State Implementation Plans for meeting the National Ambient Air Quality Standards (NAAQS). What this means is that states and metropolitan planning organizations must forecast the impact of transportation plans (i.e., a collection of many different projects) on total emissions of criteria pollutants (nitrogen oxides, hydrocarbons, carbon monoxide, and particulate matter).

Regional transportation planning agencies (or the states) generally maintain a system of models to forecast and evaluate the impact of transportation projects and plans. These models are usually deficient in accurately forecasting emissions (Transportation Research Board, 1995) partly because they do not adequately account for both short run and long run induced travel effects. This can be partly corrected by building feedback mechanisms into the models to at least account for some of the short-run impacts (Johnston and Ceerla, 1996a). Air quality regulations already require this step for conformity analysis, though actual practice has generally not kept pace with the regulatory requirement.

Some EPA regions are working with metropolitan planning organizations to improve the state of the practice in the modelling of transportation impacts, in particular the impacts on land development. Various modelling packages (none of which are ideal) are available to provide estimates of land development changes induced by transportation and accessibility changes. [14] Improved modelling of these impacts would provide decision makers with far better information on the short-run and long-run emissions impact of alternative transportation plans and are critical for developing State Implementation Plans that will actually help bring a region into attainment of the NAAQS. Project selection criteria would also be vastly improved, as shown by Johnston and Ceerla (1996a,b) and Rodier et al. (2001).

[14] A good review of these models is contained in Parsons Brinckerhoff Quade and Douglas (1999).

improve air quality. In addition, the Clean Air Act Amendments (CAAA) of 1990 strengthened the requirement that metropolitan transportation investment programs "conform" with state implementation plans for achieving the National Ambient Air Quality Standards. This requires that the mobile source emissions "budget" cannot be made worse by the planned transportation system. Naturally this involves forecasting and modelling of transportation systems and has spurred much research into developing models that can actually measure and estimate these effects.

More recently the TEA-21 of 1998 has continued both the CMAQ program and the transportation air quality conformity requirements. In addition this legislation required the US Department of Transportation (DOT) to institute a "streamlined" process for transportation project facilitation and delivery. The DOT has interpreted these "streamlining" provisions as a means to encourage earlier consideration of environmental issues in the transportation planning and project development process.

Review of the environmental impact of Federal projects is one of the Environmental Protection Agency's (EPA) major roles as specified by the National Environmental Policy Act (NEPA) of 1970. Environmental Impact Statements (EIS) for Federal projects are developed by the lead agency (the Federal Highway Administration in the case of highway projects) but reviewed by EPA (as well as the general public). The role of the EIS is to provide information to decision-makers and the public about the environmental impact of projects and possible alternatives. The alternatives analysed are generally minor (e.g. changes in routing or alternative mitigation strategies). Major decisions on project scope have already been pre-determined at earlier phases of the transportation planning process, often without undergoing significant environmental review. Projects are often delayed due to the inadequacy of early stages of decision making that preclude the consideration of a broad range of alternatives. This is the element that the streamlining provisions are aimed at correcting.

An EIS will generally specify and define the goal for the specific project being evaluated. [13] The goal of many transportation projects is to reduce congestion; however, the studies cited above strongly suggest that adding highway capacity will not be an effective solution for achieving long- term congestion reduction goals. Alternative approaches may be far more effective than merely adding more capacity. For example, a more realistic approach to actually controlling congestion would be to propose congestion pricing on existing road capacity (as an alternative to new capacity construction). Provision of public transport services and redevelopment of existing land (e.g. brownfields and infill development) may also lead to less regional congestion, while also serving the needs of economic development (albeit on different parcels of land).

The research reviewed above suggests that adding highway capacity will facilitate development either on previously undeveloped land or more intensive development near the proposed project. The linkage of development impacts to specific transportation projects requires an analysis of the cumulative and secondary impacts of the project. Regulations promulgated by the Council on Environmental Quality (CEQ)(1987) require the assessment of cumulative impacts. Many Envi-

[13] EIS terminology defines project goals under the "purpose and need" of an EIS.

impacts would then be limited to changes in the number of trips, routes, destinations, and modes. Some relocation of activities could still occur, but one would not expect major new sprawl development to occur (unless this is part of the land use plan). In theory, one could argue that effective land use planning would allow capacity enhancements to capture travel time reduction benefits more effectively. As shown previously, Rodier et al. (2001) estimate that 50% of induced travel effects occur if land use does not change in reaction to expanded capacity.

In July 2000 the UK government released a 10-year transport plan (Department of Environment, Transport and the Regions, 2000) following up on many of the policy documents issued in recent years. The plan outlines the proposed investment strategy for surface transport over the next 10 years. While the text of the document is generally consistent with the integrated transport policy of the original White Paper, an analysis of the actual expenditure plan is not quite consistent with the White Paper's policy. Of about £121 Billion of public expenditure proposed over the 10-year period, over 45% is devoted to trunk and local roads and slightly more devoted to rail and public transport (Annex 1 of Department of Environment, Transport and the Regions, 2000). While not all of the road spending is devoted to new capacity, there is an explicit target of widening 5% of the trunk road network, construction of 30 bypasses, and 80 major schemes to reduce congestion. The Transport Plan acknowledges that construction of new road capacity is not the solution to congestion problems, but the overall investment focus appears to disregard potential induced travel effects (including stating that congestion reduction is a specific goal).

Despite this major increase in spending on road projects, the Transport Plan also includes increases in rail and public transport expenditures. Local Authorities will also be required to develop integrated Local Transport Plans to improve planning focused around specific schemes. In addition, these Plans provide a mechanism for using transport funding to help address the needs of Air Quality Improvement Plans also required of Local Authorities.

The Transport Plan also allows Local Authorities to plan and implement congestion charging and/or workplace parking schemes. The Greater London Authority has also been empowered to implement a congestion charging scheme for which active planning is currently in progress. These ideas are consistent with a recognition of the need to price demand to relieve congestion without inducing new travel.

Overall the 10-year Transport Plan attempts to distribute substantial increases in public spending to many beneficiaries. While increases in road spending are significant, public transport and rail systems also are receiving substantial increases. Other than the potential for various congestion charging schemes, the overall plan does not appear to fully integrate much of the knowledge of induced travel effects developed in recent years.

4.2. Transportation and environmental policy in the US

Within the last decade, the general trend in policies of the US Federal government has been to better integrate transportation policy with environmental policy. This trend began with passage of the ISTEA in 1991. Perhaps the two most significant examples of the integration of transportation and environmental policy has been the establishment of the Congestion Mitigation and Air Quality program which dedicates specific funding from the Highway Trust Fund for projects that have been used in the UK since the 1970s. The cost benefit approach embodied by the COBA model measures travel time savings, changes in vehicle operating costs, and changes in accident rates. A review of planned trunk road schemes was carried out using the new appraisal methods. Of 68 schemes considered for the Targeted Program of Improvements for trunk roads laid out in Department of Environment, Transport and the Regions (1998c), 37 were withdrawn or deferred for further analysis after the new appraisal methods were applied. Nellthorp and Mackie (2000) analysed how various appraisal factors affected the decision of whether to withdraw a scheme or not. They concluded that many of the environmental factors (excluding air quality) were influential while the cost benefit assessment (from COBA) was not significant in the decisions taken.

The Standing Advisory Committee on Trunk Road Assessment (1994) reported recommended new procedures of cost benefit analysis of road projects to account for induced travel effects. Interim guidance on this was published simultaneously with the SACTRA report (Department of Environment, Transport and the Regions, 1994). These procedures were updated in 1997 with an updated section of the UK Design Manual for Roads and Bridges (Highways Agency, 1997). This provided interim elasticity methods to account for induced travel effects; DETR continues to do research on updating four step modelling procedures for more complex schemes. [11]

Some analysis has been conducted on the differences in cost benefit results with and without the inclusion of induced travel effects. Small induced travel effects of 5–10% have been found to reduce the benefits of a scheme by anywhere from 20% to nearly 40%. [12] It is not clear whether any specific road schemes have either been abandoned or undergone major design changes in response to changes in the appraisal methods. However, the overall policy approach of abandoning a "wish list" of projects and announcement of a Targetted Programme of Improvements outlined in Department of Environment, Transport and the Regions (1998c) undoubtedly are in response to new qualitative knowledge on induced travel effects.

In the area of land use policy the UK has historically been able to better preserve land and avoid the sprawl development patterns of the US (though there are certainly examples of US style sprawl in the UK). Planning Policy Guidance 13 on Transport (Department of the Environment, 1994) was instituted to provide Local Authorities with guidance on better coordinating land use and transport planning. The aim is to reduce reliance on private vehicles, encourage modes with less environmental impact, and reduce both the number and length of motorized journeys. The promotion of development in centralized and accessible areas (by modes other than private cars) is explicitly stated as a goal. These sort of policies are certainly consistent with the goals of the White Paper.

Interestingly, if land use policy were completely effective one would expect capacity enhancements to result in less induced travel. This assumes that land use planning can effectively disconnect the response of developers to changes in the transport network. Induced travel

[11] In the US the National Cooperative Highway Research Program (project number 25-21) is conducting similar research geared at looking at the air quality impacts of changes in traffic flow. The proposed methodologies are quite comprehensive and will be equivalent to updating four step travel demand models and integrating them with land use and modal emissions models to account for induced travel effects and changes in vehicle dynamics.

[12] Parliamentary Record of the House of Commons, Hansard column 808 – 6 December 1996, HMSO: London.

The theory of induced travel, whether by immediate behavioural travel adjustments or longer term land use impacts, appears to be clearly justified. Transportation planners have been reluctant to accept this conclusion that essentially challenges the notion that transportation projects can substantially reduce traffic congestion. However, the implication should not be that transportation projects have no benefit. It merely implies that the benefits cannot be attributed to changes in travel time. Going back to basic urban economic theory, induced travel effects imply that the changes in behaviour are translated through changes in land price valuation (i.e., the bid-rent curves of urban economics, see for example, Mills and Hamilton, 1994). This conclusion changes the context of transportation policy from congestion reduction to one of directing the growth of urbanized areas. We turn to a discussion of these issues and transportation policy in both the UK and the US.

4. Induced travel and changes in transportation and environmental policy

4.1. Transportation and environmental policy in the UK

In 1998 the UK Department of Environment, Transport and the Regions (DETR) established a new direction for UK transportation policy with the publication of the government's White Paper, *A New Deal for Transport: Better for Everyone* (Department of Environment, Transport and the Regions, 1998a). One of the key directives of this policy was that the government would no longer attempt to accommodate traffic growth through a strategy of "predict and provide." That is, road construction would not continue to meet forecast traffic growth. The level of forecast infrastructure needed to meet an unconstrained growth assumption was seen as unsustainable both environmentally and financially.

Goodwin (1999) states that this enabled alternative options, such as increased public transport and non-motorized modes, to be seriously considered. Integration of all modes of transportation was seen as a key goal while simultaneously reducing the need for motorized single-occupant vehicles. An emphasis on maintaining existing road infrastructure, rather than increasing its capacity, was another key element. The recognition that some road pricing options would be desirable, both for moderating demand, and for raising revenue for alternatives was another key conclusion.

Goodwin (1999) outlines much of the historical context and incremental changes that preceded the publication of the White Paper. Growing concerns about the environmental impact of road transportation were seen as a primary driver. These included concerns about the health costs of air pollutants, climate change impacts, acid rain and ecological impacts. The Standing Advisory Committee on Trunk Road Assessment (1994) report on induced traffic played a major role in changing the perspective on whether predict and provide was an economically sensible policy and has led to changes in the process of road appraisal in the UK.

The new appraisal process seeks to simplify the task for the decision maker by summarizing key information in a tabular format (Department of Environment, Transport and the Regions, 1998b). Price (1999) provides an overview of the new appraisal system, the purpose of which is to more clearly highlight environmental concerns (which tended to be lost in the volume of the detailed environmental impact assessments) against traditional cost benefit approaches which

Table 4
Summary of elasticity estimates

Citation	Travel time elasticity	Lane mile elasticity	Type of model	Data used
Goodwin (1996), SACTRA (1994)	−0.5–1.0			Derived from gasoline price elasticities
Hansen and Huang (1997)		0.3–0.7	Time-series cross-sectional fixed effects	California County-level data
		0.5–0.9		California Metropolitan-level data
Noland (2001)		0.3–0.6 (Short-run) 0.7–1.0 (Long-run)	Time-series cross-sectional fixed effects	State-level data
		0.5–0.8	Difference model with fixed effects	
Noland and Cowart (2000)		0.8–1.0 (Long-run)	Time-series cross-sectional fixed effects	Nationwide metropolitan-level data
		0.3	Two-stage least squares with weak instrument	
Fulton et al. (2000)		0.3–0.5	Two-stage least squares with good instrument	County level data from Maryland, Virginia, North Carolina, and DC
Cervero and Hansen (2001)		0.559	Two-stage least squares with good instrument	County level data from California
Rodier et al. (2001)		0.8–1.1	Disaggregate modelling study	Sacramento regional data and modelling system
Strathman et al. (2000)		0.29	Cross-sectional model	NPTS data, individual-level, nationwide
Barr (2000)	−0.3–0.4		Cross-sectional model	NPTS data, individual-level, nationwide

essence, these studies indicate that development is induced by new road infrastructure. Boarnet and Chalermpong (2001) relates changes in housing values, as an indicator of the increased demand for housing, to increased road infrastructure with the implication that this induces additional VMT. [10]

Boarnet (1997) attempts to reconcile the literature on development impacts from highway projects. He suggests that while from a regional perspective highway projects may have little if any growth inducing impacts, they may have significant impacts within specified corridors or subregional areas. The result is that highway projects may simply redistribute existing growth within a metropolitan area. To a large extent, this growth will be in ex-urban areas that are receiving gains in accessibility at the expense of downtown or older suburban areas.

[10] These studies are also consistent with studies that suggest that public investment (which is dominated by investment in transportation infrastructure) increases overall economic productivity (see, for example, Aschauer, 1989; Nadiri and Mamuneas, 1998; as well as critics such as (Tatom, 1991), who questions the methods used to come to this conclusion).

travel. In testing this hypothesis, he also uses data from the NPTS and estimates the following model:

$$\log(q/C) = \beta_0 + \beta_1 \log(X^k) + \beta_2 \log(C) + \beta_3(\log(C))^2 + \varepsilon, \tag{2}$$

where q is vehicle travel (VMT), C is a measure of capacity (lane miles), X^k refers to other variables included in the estimation, and ε is an error term. Using a cross-sectional database of metropolitan areas derived from the NPTS, Chu (2000) finds significant coefficients on both the β_2 and β_3 terms. He concludes that capacity does influence total traffic albeit with a diminishing effect as specified in his theoretical model.

Not all the studies cited have been able to show that induced travel is larger or more extensive when congestion is present. Chu's (2000) model provides the most convincing evidence of some correlated effects. While the empirical analysis is weak, theoretically we would generally expect more induced travel when congestion is higher and also more induced travel when land use and development controls are weak thereby allowing the market to respond to changes in the highway network. Standing Advisory Committee on Trunk Road Assessment (1994) came to the conclusion that when large changes in generalized travel costs occur, induced travel is likely to be significant, based largely on theoretical grounds.

Our conclusion from the relevant literature is that the theory of induced travel can certainly not be refuted and is largely confirmed. Table 4 summarizes the elasticity estimates from the studies discussed above. These coefficient values, while estimated with different data sets and different techniques, seem to suggest that lane mile elasticities are in the range 0.3–0.6 with larger elasticities for long run effects.

A major relevant question is how important is induced travel compared to other drivers of VMT growth, or as the SACTRA report asked, "does it matter?". Both Noland (2001) and Noland and Cowart (2000) estimate the relative contribution of induced travel to overall VMT growth. Noland (2001) applies the distributed lag model in Table 1 to forecast VMT growth out to 2001. He finds that if current trends in both lane mile increases and demographic variables continue, VMT will grow at about 2.65% annually. If lane mile growth is set to zero, this reduces VMT growth to about 1.9% annually. In other words, the induced travel effect accounts for about 28% of annualized growth in VMT. Noland and Cowart (2000) estimate this effect to average between 15% and 40% of annualized VMT growth (on interstates and arterials) for metropolitan areas. The lower range is probably more precise as this was derived from the better of the models that they estimated. Heanue (1998) uses data from Milwaukee, Wisconsin to estimate the contribution of induced travel to VMT growth. Using Goodwin (1996) and Hansen and Huang (1997) elasticity estimates, Heanue (1998) determines that between 6% and 22% of VMT growth is due to capacity additions. These results strongly suggest that forecasting VMT growth (and the environmental impacts of that growth) needs to include some measure of transportation infrastructure as a determining factor.

The modelling work of Rodier et al. (2001) shows that the long-term land use development effects can be a large additional source of increased VMT associated with highway expansion. Another stream of research has investigated the impact of road infrastructure on overall development. Amongst these are Boarnet (1998) and Chandra and Thompson (2000) who estimate models that demonstrate that the spatial allocation of development is affected by road infrastructure. In direct effect of roadway capacity on VMT, Strathman et al. (2000) also found an indirect effect, through residential density and employment density. The estimations showed that reduced residential density results in higher VMT while reduced employment density results in lower VMT. This latter result may appear counter-intuitive unless one considers that lower density employment locations may in some cases be closer to residential areas than higher density urban cores, though they would also tend to be less accessible by public transport. The net change of these two counteracting forces, was an estimated indirect elasticity of 0.033 between roadway capacity and VMT, which was about one-tenth of the magnitude of the direct effect.

Barr (2000) used disaggregate household data from the 1995 NPTS to examine induced travel effects. His study included 27,409 individuals from the NPTS. His key variable of interest was the amount of time spent traveling by each household. This was calculated by deriving the average travel speeds from the reported length of journeys and their reported duration. The inverse of the speed was used to derive the key variable of interest which was the average travel time. This study uses only a cross-sectional database and can only describe correlation and not causation. The use of reported measures of time and distance may also introduce potential inaccuracies in the data. However, some interesting observations can be drawn from Barr's study. Travel time elasticities ranged between −0.3 and −0.4. This is below the range suggested by Goodwin (1996). Barr (2000) also shows that elasticities are higher in urbanized areas compared to non-urbanized areas. This could be explained by higher congestion in these areas and greater access to alternative modes. While he states that urbanized areas have a higher elasticity (−0.36), it is really not much higher than for non- urbanized areas (−0.32). This may indicate no significant difference and his result that elasticities do not vary with metropolitan area size would tend to support the insignificance of the difference in these elasticities. He does show interesting elasticity differences for different family life cycles but suggests that much of this difference is due to higher income elasticities. Clearly, Barr's work shows that disaggregate analysis can offer additional information to policy makers on how capacity additions will impact various demographic groups.

A similar result on the effect of metropolitan area size was shown by Noland and Cowart (2000). They forecast the contribution of capacity additions to VMT growth for metropolitan areas of different size and areas with different congestion indexes as ranked by the Texas Transportation Institute (Schrank and Lomax, 1997). The forecasts showed that there was no difference in the contribution of capacity additions to new VMT between the different categories. Energy and Environmental Analysis (1999) analysed elasticity differences assuming that the ratio of VMT over lane miles was a good proxy for congestion levels (using the same data as Fulton et al., 2000). They could not show any significant difference in elasticity values for the different models. These results are quite interesting as one would expect more congested areas to have larger elasticities. It is possible that this could indicate that land use and development effects play a larger role than existing congestion in inducing new VMT. Noland and Cowart (2000) suggest that this may be the case by analysing the difference in the contribution of new capacity to forecast VMT growth between metropolitan areas. They conclude that areas with proportionally greater growth in lane miles can attribute more of their VMT growth to induced travel.

Chu (2000) developed a model to try to estimate elasticity changes for different levels of underlying congestion. In deriving his theoretical model of travel demand and highway supply he determines that incremental expansion in highway capacity will have smaller effects on vehicle

ABSTRACT

Associations have been found between long-term exposure to ambient air pollution and cardiovascular morbidity and mortality. The contribution of air pollution to atherosclerosis that underlies many cardiovascular diseases has not been investigated. Animal data suggest that ambient particulate matter (PM) may contribute to atherogenesis. We used data on 798 participants from two clinical trails to investigate the association between atherosclerosis and long-term exposure to ambient PM up to 2.5 μm in aerodynamic diameter ($PM_{2.5}$). Baseline data included assessment of the carotid intima-media thickness (CIMT), a measure of sub-clinical atherosclerosis. We geocoded subjects' residential areas to assign annual mean concentrations of ambient $PM_{2.5}$. Exposure values were assigned from a $PM_{2.5}$ surface derived from a geostatistical model. Individually assigned annual mean $PM_{2.5}$ concentrations ranged from 5.2 to 26.9 μg/m^3 (mean: 20.3). For a cross-sectional exposure contrast of 10 μg/m^3 $PM_{2.5}$, CIMT increased by 5.9% (95% CI: 1%-11%). Adjustment for age reduced the coefficients, but further adjustment for covariates indicated robust estimates in the range of 3.9% to 4.3% (p-values 0.05 to 0.1). Among older subjects (≥60), women, never smokers, and those reporting lipid-lowering treatment at baseline, the associations of $PM_{2.5}$ and CIMT were larger with the strongest associations in women ≥60 (15.7% ; 5.7% - 26.6%). These results represent the first evidence of an association between atherosclerosis and ambient air pollution. Given the leading role of cardiovascular disease as a cause of death and the large populations exposed to ambient $PM_{2.5}$, these findings may be important and need further confirmation.

0306

INTRODUCTION

A large body of epidemiological evidence suggests associations between ambient air pollution and cardiovascular mortality and morbidity (Peters and Pope 2002) (Pope et al. 2004). All of these studies focus on events occurring at a late stage of vascular disease processes. The impact of air pollution on the underlying preclinical conditions remains poorly understood. We hypothesize that current levels of ambient fine particles up to 2.5 μm in aerodynamic diameter ($PM_{2.5}$) may contribute to atherosclerosis, leading to subclinical anatomical changes that play a major role in cardiovascular morbidity and mortality later in life. Animal studies support our hypothesis by showing that inhalation of ambient particulate matter promotes oxidative lung damage, including alveolar and systemic inflammatory responses (Fujii et al. 2002; Goto et al. 2004; Soukup et al. 1995; Suwa et al. 2002; Tepper et al. 1994; van Eeden et al. 2001).

We investigated the association between residential ambient $PM_{2.5}$ and carotid artery intima-media thickness (CIMT) using pre-randomization baseline data from two recent clinical trials conducted in Los Angeles, California (Hodis et al. 2002). CIMT is a well-established quantitative measure of generalized atherosclerosis that correlates well with all of the major cardiovascular risk factors, with coronary artery atherosclerosis, and with clinical cardiovascular events (Mack et al. 2000). It is an established tool for investigating the contribution of long-term exposures such as smoking or passive smoking to sub-clinical stages of atherosclerosis at any given age (Diez-Roux et al. 1995; Howard et al. 1994; Howard et al. 1998). This is the first study to assess the association of atherosclerosis with air pollution.

METHODS

Population and Health Assessment

We used baseline health data from two randomized, double-blind, placebo-controlled clinical trials conducted at the USC Atherosclerosis Research Unit (Hodis et al. 2002). The

Vitamin E Atherosclerosis Progression Study (VEAPS) investigated the effects of vitamin E on the progression of atherosclerosis measured by carotid artery intima-media thickness (CIMT). The B-Vitamin Atherosclerosis Intervention Trial (BVAIT) focused on the effect of vitamin B supplements on the progression of atherosclerosis (trial in progress). Baseline assessment in both trials included CIMT measured between 1998 and 2003 using the same standardized methods (Hodis et al. 2002; Selzer et al. 1994; Selzer et al. 2001). Recruitment of volunteers occurred over the entire Los Angeles Basin, covering a geographic area of approximately 64,000 km^2.

Eligible subjects for the VEAPS trial (n=353) were men and women ≥40 years old with slightly increased LDL cholesterol (≥3.37 mmol/L), but with no clinical signs or symptoms of cardiovascular disease (CVD) (Hodis et al. 2002). Subjects with diabetes, diastolic blood pressure >100 mmHg, thyroid disease, serum creatinine >0.065 mmol/L, life-threatening diseases, or high alcohol intake were excluded.

The BVAIT trial (N=506) had a similar design to VEAPS. Men and women >40 years of age were prescreened to meet study criteria (fasting plasma homocysteine ≥8.5 μmol/L; postmenopausal for women; no evidence of diabetes, heart disease, stroke, or cancer). Subjects were excluded on the basis of any clinical signs or symptoms of CVD, diabetes or fasting serum glucose ≥ 140 mg/dL, triglyceride levels ≥ 150 mg/dL, serum creatinine > 1.6 mg/dL, high blood pressure, untreated thyroid disease, life threatening disease with prognosis < 5 years, or high alcohol intake.

Thus, our study included 'healthy' subjects with biomarkers (elevated LDL-cholesterol or homocysteine) that suggested an increased risk of future cardiovascular diseases (N= 859). Fifty-eight subjects were excluded in the exposure assignment process as they lived outside the area with $PM_{2.5}$ data. Three subjects had missing data in at least one of the covariates used in the models. Our total sample consisted of 798 participants.

0308

Health measures, including CIMT

Our main outcome of interest is the thickness of the carotid artery intima-media. In both trials, high-resolution B-mode ultrasound images of the right common carotid artery (CCA) were obtained prior to the intervention (base line) with a 7.5-mHz linear array transducer attached to an ATL Ultramark-4 Plus Ultrasound System. We used this baseline CIMT measurement as the outcome. Details of this highly reproducible method are published (Hodis et al. 2002; Selzer et al. 1994; Selzer et al. 2001). Blood pressure, height, and weight were measured with standard procedures.

The baseline questionnaires included an assessment of all major cardiovascular disease risk factors and covariates, including clinical events, diet, use of prescription medications, physical activity, current and past smoking and passive smoking, and vitamin supplements. Age, education, and other socio-demographic factors were available for each subject. Fasting blood samples were also drawn for lipid measurements. Data used in our analyses were collected with the same tools in both trials.

Exposure Assignment

To assess exposure we chose a novel approach derived from a Geographic Information System (GIS) and geostatistics. This method allows for assignment of long-term mean ambient concentrations of $PM_{2.5}$ to the zip code area of each subject's residential address (Künzli and Tager 2000). The resulting surface of $PM_{2.5}$ covered the entire Los Angeles metropolitan area. The surface is derived from a geostatistical model and data from 23 state and local district monitoring stations (year 2000). These monitors are located across the Los Angeles region to characterize urban levels of pollution. To assign exposure, $PM_{2.5}$ data were interpolated using a combination of a universal kriging model with a quadratic drift and a multiquadric radial basis function model (Bailey T and Gatrell 1995; Burrough P and McDonnell 1998). We averaged the two surfaces based on 25 meter grid cells. Examination of errors from the universal model showed that over 50% of the study area had assigned values within 15% of monitored concentrations, while 67% were within 20%. The larger errors were on the periphery of our study area, where the density of study participants was the lowest. We linked the zip code centroids of each subject with the exposure surface through a geocoding database (www.esri.com). The map (Figure 1) illustrates the $PM_{2.5}$ surface with the geo-located zip codes. Individually assigned $PM_{2.5}$ data had a range from 5.2 to 26.9 μg/m^3 (mean: 20.3), thus exceeding the range observed across 156 metropolitan areas used in the largest cohort study of air pollution and mortality (Pope et al. 2002b). All models were implemented with ArcScript from the Environmental Systems Research Institute (ESRI, Redlands, CA).

Statistical Analyses

We tested the univariate and multivariate associations between CIMT and ambient $PM_{2.5}$ using linear regression analyses. Extensive residual diagnostics indicated some heteroscedasticity, which was rectified with the natural log-transformed CIMT. We adjusted for factors that were statistically associated with both CIMT and ambient $PM_{2.5}$ (age, male sex, low education, and low income). Next, we expanded the models using covariates that were associated with either $PM_{2.5}$ or CIMT, including indicator variables for current second hand smoke exposure and current and former personal smoking. We then added covariates that play a role in atherosclerosis such as blood pressure, LDL-C, or proxy measures such as reporting treatment with antihypertensives or lipid-lowering medications at study entry. These factors may be on the pathophysiologic pathways linking air pollution exposure and atherosclerosis (Ross 1999); thus, such models may overadjust the coefficients. We chose this conservative approach to test the sensitivity of the effect estimates under a broad range of model assumptions.

0310

There is increasing evidence that host factors such as age, gender, or underlying disease and risk profiles may modify the effects of air pollution (Pope et al. 2002b; Zanobetti and Schwartz 2002). Furthermore, the finding of atherosclerosis in PM-exposed rabbits was based on a hyperlipidemic trait (Suwa et al. 2002). Therefore, we also stratified by gender, age (<60; ≥60 yrs), smoking status, and lipid-lowering drug therapy.

RESULTS

Table 1 summarizes the main characteristics of the study population and among main subgroups. Table 2 presents the percent change in CIMT in association with a 10 μg/m³ contrast in ambient $PM_{2.5}$ concentrations for three cross-sectional regression models. The unadjusted model indicates a 5.9% (95% CI: 1%-11%) increase in CIMT per 10 μg/m³ $PM_{2.5}$. For the observed contrast between lowest and highest exposure (20 μg/m³ $PM_{2.5}$), this corresponds to a 12.1% (2.0%-23.1%) increase in CIMT. The only covariate with a substantial effect on the point estimate was age, which reduced the effect from 5.9% to 4.3% (0.4%-9%) per 10 μg/m³ $PM_{2.5}$. This change agrees with the age-related effect modification (see below). Otherwise, effect estimates across the models remained robust, in the range of 3.9% to 4.3% with p-values from 0.05 to 0.1. To corroborate the exposure-response relationship, we also categorized $PM_{2.5}$ levels into quartiles. Figure 2 shows the adjusted mean CIMT across these four groups of equal sample size at the mean levels of the covariates (age, gender, education, and income). The trend across the exposure groups was statistically significant (p=0.041). The unadjusted means of CIMT among these quartiles of exposure were 734, 753, 758, and 774 μm, respectively.

The associations between CIMT and $PM_{2.5}$ were substantially stronger among 109 subjects reporting lipid-lowering medication at study entry, both in men and women (see Table 2 and Figure 3). The crude effect reached 15.8% (2%-31%) per 10 μg/m³ $PM_{2.5}$ with adjusted values ranging between 12% and 16%. Despite the small sample size, p-values of all models were mostly <0.1 and often <0.05.

Results also suggest significant age and gender interactions, with much larger effects in women and in the older age group (Figure 3). Effect estimates in women were statistically significant and typically in the range of 6% to 9% per 10 $\mu g/m^3$ $PM_{2.5}$. Associations were strongest among women ≥60 years of age (N=186), leading to crude estimates of 19.2% (9% - 31%). Adjusted coefficients ranged from 14% to 19%, being statistically significant in all models and sensitivity analyses.

Among never smokers (N=502), the effect estimate reached 6.6% (1.0% to 12.3%). As shown in Figure 3, the estimate was small and not significant in current (N=30) and former smokers (N=265).

DISCUSSION

Our study presents the first evidence for an association between CIMT and long-term exposure to ambient air pollution. As recently reviewed in a statement of the American Heart Association (Brook et al. 2004) substantial epidemiological and experimental evidence suggests a contribution of ambient air pollutants on cardiovascular mortality and morbidity. However, these studies focus on acute and sub-acute effects on cardiac autonomic function, inflammatory or thrombogenic markers, arrhythmia, myocardial infarction, cardiovascular hospital admission, and death. The only outcome considered in long-term air pollution studies has been mortality. The relative risk for acute effects on mortality have been substantially smaller than those observed for long-term associations (Pope et al. 2002a; Samet et al. 2000a). As shown by Künzli et al. cohort studies are capable of capturing acute and chronic effects of air pollution on the course of diseases that ultimately lead to premature death. In contrast, time-series and panel studies investigate only the associations of event occurrence with the most recent exposure (Künzli et al.

2001). Thus, if air pollution has both acute and cumulative long-term effects, one expects larger mortality coefficients in cohort studies. The thickness of the intima-media reflects long-term past exposure; thus, we provide the first evidence for chronic effects of air pollution on atherogenesis which may in part explain the above mentioned discrepancy between acute and long-term risk estimates (Pope et al. 2002b; Samet et al. 2000b).

There are several major aspects to be considered in the interpretation of this new finding, mainly the strength in the exposure assignment, the limited evidence for bias, the differences in effects within subgroups, and plausibility.

Exposure Assignment

The individual residence-based assignment of exposure represents a substantial improvement over most studies that have relied on central monitors or on binary road buffers combined with basic interpolation (Hoek et al. 2002; Pope et al. 2004). As a sensitivity analysis, we used weighted least squares models with the weights specified as the inverse of the standard errors from the universal kriging model to down-weight estimates with larger error. In addition, we implemented models based solely on the universal kriging estimate. In both instances results were robust and similar to what we found with our main model.

Time-activity studies show that people spend most of their time in or around home, and our restriction of exposure assessment on residential address captures the most relevant part of exposure (Leech et al. 2002). $PM_{2.5}$ generally displays spatially homogenous distributions across small areas such as neighborhoods and blocks, and as a result, the ambient conditions at the zip code centroid likely reflect the levels expected at home outdoors (Roosli et al. 2000). $PM_{2.5}$ of outdoor origin will also penetrate indoors, and correlations between long-term outdoor PM concentrations and indoor levels of PM from outdoor origin is high (Sarnat et al. 2000). Exposure to ambient air pollution while working and during commute are not included in our exposure term but are considered to be a relevant source of exposure (Riediker et al. 2003). Although most likely a random misclassification with biases toward the null, the errors may affect subgroups differently, thus explain part of the observed interactions (see below).

In Los Angeles, no clear trends have been observed in $PM_{2.5}$ concentrations over the past 5 to 10 years. The year 2000 surface characterizes the prevailing mean $PM_{2.5}$ concentrations across several years and can be considered a measure of long-term past exposure. This year also sits in the middle of the baseline recruitment period. Overall, the various limitations in our exposure assignment may add some random error, biasing results toward weaker associations (Thomas et al. 1993).

We also assigned ambient ozone to zip code centroids. Inclusion of ozone in the models had no impact on the $PM_{2.5}$ coefficients or the standard errors. Ozone and $PM_{2.5}$ were not correlated ($r = -0.17$) and the $PM_{2.5}$ estimates were not substantially different in low and high ozone regions. The estimates of association for ozone were positive but not statistically significant and much smaller than for $PM_{2.5}$. This finding must be put in context of the specific challenges in determining long-term exposure to ozone, which are substantially different than in the case of PM exposure. In contrast to $PM_{2.5}$ from outdoor origin, ambient ozone levels have lower correlations with personal exposure (Avol et al. 1998; Sarnat et al. 2000; Sarnat et al. 2002); therefore, the ability to detect effects of ozone will likely be reduced due to greater misclassification.

Biases

Our subjects were a nonrandom sample of 'healthy' volunteers with above average education, meeting strict inclusion criteria for the two clinical trials. Although we cannot exclude some systematic selection biases affecting the cross-sectional data, it is unlikely that subjects with preclinical signs of atherosclerosis would have been more likely to volunteer if they lived in more polluted areas. Although the selection of subjects limits the generalization to other populations, we do not expect this to lead to over or underestimating the cross-sectional associations. The two trials recruited subjects independently; thus the effects may be compared across trials to evaluate the potential influence of selecting volunteers. The populations differed with regard to age, smoking habits, baseline LDL and treatment, blood pressure, active and passive smoking, and other relevant factors; thus the PM2.5 coefficients were smaller and were not statistically significant in the VEAPS trial with its younger population. However, after taking these factors into account, the associations with ambient $PM_{2.5}$ were similar. For example, among elderly women of VEAPS (N=70) and BVAIT (N=116), the effect estimate was 18.1% (-0.1 to 36.3.%) and 13.6% (2.8 to 24.4.%), respectively. As discussed below, there is some evidence for larger effects in subjects with cardiovascular risk factors, indicated by prescriptions of lipid-lowering treatment. Our trials excluded subjects with clinically manifest cardiovascular diseases. Moreover, if air pollution amplifies systemic inflammation among those prone to atherosclerosis, exclusion of subjects with high LDL may be a source of bias. One may expect effect estimates in a less selected, less healthy population to be larger than those reported.

The wealth of baseline data from these clinical trials offered the opportunity to control for a broad array of covariates. Apart from the effect of age adjustment, estimates were robust to numerous combinations of covariates, including: income, education, active and passive tobacco smoke, cardiovascular prescriptions, vitamin intake and physical activity. Uncontrolled or residual confounding appears to be an unlikely explanation for these results. Among women, adjustment for hormone replacement therapies did not affect the $PM_{2.5}$ estimates.

In previous studies, we found that spatial autocorrelation in the residuals could affect the size and significance of pollution coefficients (Jerrett et al. 2003a). We investigated spatial autocorrelation of the unstandardized residuals. We assessed autocorrelation with a first-order, adjusted first-order, and second-order spatial weight matrices based on nearest neighbor contiguity, but we found no evidence of spatial autocorrelation. This supports the conclusion that the models supply efficient unbiased estimates (Jerrett et al. 2003b). As part of our sensitivity analyses, we also derived $PM_{2.5}$ surfaces using different interpolations and weighted least squares with weights equal to the inverse of the standard error of the exposure estimate. All approaches produced very similar results.

Evidence for Effect Modification

The data suggest substantial interactions with age, gender, smoking, and underlying cardiovascular risk factors. Given the reduced sample size among subgroups, the recruitment of volunteers, and the cross-sectional nature of the data, it is difficult to fully explore the causes of the observed modifications of associations and to establish susceptibility profiles. If the exposure misclassifications differed across subgroups, part of the interactions may be explained by differential exposure error. The gender and age difference could also be an artifact due to measurement error in the assigned exposure as time spent in commuting and location of work places may be different in men and women and in the young and elderly. Empirical studies on mobility suggest women have smaller activity spaces than men and younger groups, meaning they tend to spend more time in and around the home (Kwan MP and Lee 2003), and the same is probably true of the elderly compared to younger groups. Exposure measurement error may be reduced in those spending more time at home, leading to stronger effects (Thomas et al. 1993). Moreover, differences in statistical power may play a role as well; as shown at least for the age range 25-40 years, power to detect effects on CIMT is larger in women than in men (Stein et al. 2004)

The finding that those reporting prescriptions of lipid-lowering medications at baseline showed stronger associations of CIMT with $PM_{2.5}$ merits further investigation. This result agrees with the observed effects of PM on atherosclerosis in experiments conducted in hyperlipidemic rabbits (Goto et al. 2004; Suwa et al. 2002). The systemic inflammatory and atherogenic reaction in these rabbits was related to the amount of PM contained in the alveolar macrophages. In our study, being under lipid-lowering therapy is an indicator for risk profiles prone to atherogenesis. Those subjects were mostly men (64%), and, on average, older, more often active or passive smokers, and almost twice as likely to report antihypertensive treatment. The systemic response to ambient PM may amplify and expand the oxidation of LDL-C among these susceptible subjects, consequently contributing to injury in the artery wall (Goto et al. 2004; Ross 1999). Investigations of short-term effects of ambient air pollution on mortality also suggest that underlying risk profiles such as diabetes may amplify susceptibility to ambient PM (Zanobetti and Schwartz 2002), and similar findings have been shown with smoking and diabetes mellitus in association with CIMT (Karim et al. 2004). To clarify the relevance of lipid status, it would be interesting to investigate our hypothesis among cohorts with familial hypercholesteremia (Wiegman et al. 2004; Wittekoek et al. 1999).

As shown in Figure 3, the size of the point estimate was larger among the older subjects. Future research needs to clarify whether air pollution contributes to atherosclerosis only after a certain age or early on. Effects of air pollution on lung development have been observed during adolescence and may be a result of both pulmonary and chronic systemic inflammatory effects (Gauderman et al. 2002); thus, it is conceivable that atherogenic responses may occur early in life. The age-dependence of the effects may also be co-determined by genetic factors (Ross 1999) (Humphries and Morgan 2004).

We also observed larger effects in women. If other cardiovascular risk factors such as occupational exposures dominate atherosclerosis in men, we would expect a smaller effect signal and less precision in the estimates among men. We also hypothesize that interactions may reflect biological causes. If pre-menopausal women are protected against atherosclerosis by endogenous hormones, loss of hormonal protection would lead to increased vulnerability after menopause (Kannel et al. 1976). This could explain part of the interaction by both age and gender.

Active and passive smoking did not confound results in either the total sample or among subgroups. Adjustment for active tobacco smoke led to a slight increase in the effect estimate, thus residual confounding is unlikely to overestimate the effects. However, $PM_{2.5}$ associations were clearly stronger in never smokers as compared to smokers (data not shown). This gradient was also observed in all subgroups with significant $PM_{2.5}$ associations (Figure 3). Oxidative and inflammatory effects of smoking may dominate to such an extent that the additional exposure to ambient air pollutants may not further enhance effects along the same pathways. The difference in the effects of $PM_{2.5}$ in smokers and nonsmokers needs further investigation. The ACS cohort study does not reveal a clear pattern of a smoking interaction for the association of ambient air pollution and cardiovascular death (Krewski et al. 2004; Pope et al. 2004). In the SAPALDIA study, associations between air pollution and level of pulmonary function did not differ by smoking status (Ackermann-Liebrich et al. 1997).

Some U.S. studies indicate effect modification of air pollution by socioeconomic status with much stronger effects among the less educated (Pope et al. 2002b). The cause of this interaction pattern is not well understood. Socio-economic status was rather homogenous in these mostly well-educated volunteers providing little power to investigate interactions of pollution with socioeconomic status. If lower socioeconomic status (SES) also positively modifies effects of air pollution on atherosclerosis, our population would provide an underestimate of the health effects in the general population (O'Neill et al. 2003). Further research on samples representative of the population will be needed to assess whether the high SES in the clinical trials biases the effects toward the null.

Future research should focus on identifying factors that determine susceptibility to $PM_{2.5}$. We are initiating studies on subjects with inflammatory metabolic syndromes prone to accelerated atherosclerosis such as postmenopausal women, diabetics, obese or physically inactive people. To corroborate the cross-sectional findings, follow-up studies are ultimately needed to investigate the association of concurrent levels of air pollution exposure with the progression of CIMT.

Plausibility

From a biologic perspective, our results support the hypothesis that long-term exposure to ambient PM contributes to systemic inflammatory pathways, which are a relevant aspect of atherogenesis (Ross 1999). The findings indicate a biologically plausible link between the observed acute effects of ambient air pollution on systemic inflammation (Glantz 2002) and the long-term consequences of sustained vascular inflammation leading to increased atherosclerosis and, ultimately, cardiovascular death (Hoek et al. 2002; Pope et al. 2004). Among susceptible people, this may lead to artery wall lesions similar to those observed in the rabbit model (Fujii et al. 2002; Suwa et al. 2002). In these hyperlipidemic rabbits, four-week PM exposure was associated with the progression of atherosclerotic lesions, coupled with an enhanced release of bone marrow monocytes. These precursors of macrophages play an important role in the atherogenic inflammatory responses (Goto et al. 2004; Ross 1999; Suwa et al. 2002). Given the central role of oxidized LDL in the initiation and progression of atherogenesis, suggestions that the plasma of automotive workers with high exposure to traffic exhaust is more susceptible to oxidation is also of interest (Sharman et al. 2002).

As a quantitative plausibility check we compared the size of the $PM_{2.5}$ effects with effects of other risk factors on CIMT. Using smoking and environmental tobacco smoke (ETS) as a model for air pollution exposure, the size of our estimates appear plausible (Diez-Roux et al. 1995; Howard et al. 1994). Associations of ETS and current levels of air pollution with various respiratory outcomes are similar and support the notion of common underlying pathways (Künzli 2002). Smoking and ETS associate with stiffer and thicker artery walls, reflecting the systemic effect of these exposures (Howard et al. 1994; Mack et al. 2003). Exposure to ETS was associated with 2% to 3% thicker intima-media, which approximate the effects observed for a 10 $\mu g/m^3$ change in $PM_{2.5}$ (Diez-Roux et al. 1995; Howard et al. 1994). Using never smokers without ETS exposure as the referent group in our data, never smokers with ETS at home had 0.9% (-2.7 to 4.5%) thicker artery walls; former smokers' CIMT was on average 3.4% (0.7-6.3%) increased; and the 30 current smokers had 5% (-1.5 to 11.6%) thicker CIMT. The trend across these four categories of tobacco exposure was statistically significant. As shown in Table 1, smokers were underrepresented in these volunteers of well-educated participants.

The observed percent change in CIMT corresponds to an increase in the thickness of approximately 20-40 μm per 10 $\mu g/m^3$ contrast in $PM_{2.5}$. This difference in CIMT translates into some 3% to 6% increase in the long-term risk for myocardial infarction (O'Leary et al. 1999). Pope et al. reported that long-term exposure to $PM_{2.5}$ was associated with an 18% (14% - 23%) increase in ischemic heart disease (Pope et al. 2004). Effect sizes reported here concur with these findings, indicating that a fraction of the total effect of ambient PM on cardiovascular mortality may be mediated through sustained long-term effects of air pollution on atherosclerosis (Künzli et al. 2001). This is in line with the proposed model (Künzli et al. 2001) that part of the effects observed in cohort studies needs to reflect long-term contributions of air pollution to the underlying disease progression, whereas in other cases, air pollution contributes only to triggering of cardiovascular events or death (Bell et al. 2004; Künzli et al. 2001; Peters and Pope 2002).

From a biological and a policy perspective we emphasize that $PM_{2.5}$ probably serves as a surrogate for the mixture of urban air pollution and constituents of PM. It is premature to conclude that $PM_{2.5}$ and its constituents are the atherogenic culprit *per se*. Atherosclerosis results from complex processes that may include a combination of various urban pollutants, host factors, and pathways that ultimately lead to the findings of a CIMT-$PM_{2.5}$ association.

In conclusion, we have presented the first epidemiological evidence supporting the idea of a chronic vascular response to respiratory and systemic effects of PM exposure. Given the leading role of heart disease as a cause of death in most westernized countries and the growing contribution in developing countries, these findings may be of high public health relevance. Further investigations need to focus on susceptible groups and follow-up of cohorts to investigate the effect of air pollution on the progression of CIMT.

REFERENCES

Ackermann-Liebrich U, Leuenberger P, Schwartz J, Schindler C, Monn C, Bolognini G, et al. 1997. Lung function and long term exposure to air pollutants in Switzerland. Study on Air Pollution and Lung Diseases in Adults (SAPALDIA) Team. Am J Respir Crit Care Med 155(1):122-129.

Avol EL, Navidi WC, Colome SD. 1998. Modeling ozone levels in and around Southern California homes. Environ Sci Technol 32:463-468.

Bailey T , Gatrell A. 1995. Interactive Spatial Data Analysis. New York:Longman.

Bell ML, Samet JM, Dominici F. 2004. Time-Series Studies of Particulate Matter. Annu Rev Public Health 25:247-280.

Brook RD, Franklin B, Cascio W, Hong Y, Howard G, Lipsett M, et al. 2004. Air pollution and cardiovascular disease: a statement for healthcare professionals from the Expert Panel on Population and Prevention Science of the American Heart Association. Circulation 109(21):2655-2671.

Burrough P, McDonnell R. 1998. Principles of Geographical Information Systems. New York:Oxford University Press.

Diez-Roux AV, Nieto FJ, Comstock GW, Howard G, Szklo M. 1995. The relationship of active and passive smoking to carotid atherosclerosis 12-14 years later. Prev Med 24(1):48-55.

Fujii T, Hayashi S, Hogg JC, Mukae H, Suwa T, Goto Y, et al. 2002. Interaction of alveolar macrophages and airway epithelial cells following exposure to particulate matter produces mediators that stimulate the bone marrow. Am J Respir Cell Mol Biol 27(1):34-41.

0322

Gauderman WJ, Gilliland GF, Vora H, Avol E, Stram D, McConnell R, et al. 2002. Association between air pollution and lung function growth in southern California children: results from a second cohort. Am J Respir Crit Care Med 166(1):76-84.

Glantz SA. 2002. Air pollution as a cause of heart disease. Time for action. J Am Coll Cardiol 39(6):943-945.

Goto Y, Hogg J, Shih C, Ishii H, Vincent R, van Eeden S. 2004. Exposure to ambient particles accelerates monocyte release from the bone marrow in atherosclerotic rabbits. Am J Physiol Lung Cell Mol Physiol March: in press.

Hodis HN, Mack WJ, LaBree L, Mahrer PR, Sevanian A, Liu CR, et al. 2002. Alpha-tocopherol supplementation in healthy individuals reduces low-density lipoprotein oxidation but not atherosclerosis: the Vitamin E Atherosclerosis Prevention Study (VEAPS). Circulation 106(12):1453-1459.

Hoek G, Brunekreef B, Goldbohm S, Fischer P, van den Brandt PA. 2002. Association between mortality and indicators of traffic-related air pollution in the Netherlands: a cohort study. Lancet 360(9341):1203-1209.

Howard G, Burke GL, Szklo M, Tell GS, Eckfeldt J, Evans G, et al. 1994. Active and passive smoking are associated with increased carotid wall thickness. The Atherosclerosis Risk in Communities Study. Arch Intern Med 154(11):1277-1282.

Howard G, Wagenknecht LE, Burke GL, Diez-Roux A, Evans GW, McGovern P, et al. 1998. Cigarette smoking and progression of atherosclerosis: The Atherosclerosis Risk in Communities (ARIC) Study. Jama 279(2):119-124.

Humphries SE, Morgan L. 2004. Genetic risk factors for stroke and carotid atherosclerosis: insights into pathophysiology from candidate gene approaches. Lancet Neurol 3(4):227-235.

Jerrett M, Burnett R, Goldberg M, Sears M, Krewski D, Catalan R, et al. 2003a. Spatial analysis for environmental health research: concepts, methods, and examples. J Toxicol Environ Health A 66(16-19):1783-1810.

Jerrett M, Burnett RT, Willis A, Krewski D, Goldberg MS, DeLuca P, et al. 2003b. Spatial analysis of the air pollution-mortality relationship in the context of ecologic confounders. J Toxicol Environ Health A 66(16-19):1735-1777.

Kannel WB, Hjortland MC, McNamara PM, Gordon T. 1976. Menopause and risk of cardiovascular disease: the Framingham study. Ann Intern Med 85(4):447-452.

Karim R, Buchanan T, Hodis H, Li Y, Lee Z, Mack W. 2004. Active smoking and subclinical atherosclerosis in type 2 diabetes. Diab Med in press.

Krewski D, Burnett RT, Goldberg MS, Hoover K, Siemiatycki J, Abrahamowicz M, et al. 2004. Validation of the Harvard Six Cities Study of particulate air pollution and mortality. N Engl J Med 350(2):198-199.

Künzli N. 2002. The public health relevance of air pollution abatement. Eur Respir J 20(1):198-209.

Künzli N, Medina S, Kaiser R, Quenel P, Horak FJ, Studnicka M. 2001. Assessment of deaths attributable to air pollution: should we use risk estimates based on time series or on cohort studies? Am J Epidemiol 153(11):1050-1055.

0324

Künzli N, Tager I. 2000. Long-term health effects of particulate and other ambient air pollution: research can progress faster if we want it to. Environ Health Perspect 108(10):915-918.

Kwan MP, Lee J. 2004. Geovisualization of human activity patterns using 3D GIS: a time-geographic approach. In: Spatially Integrated Social Science: Examples in Best Practice. Chapter 3. (Goodchild MF, Janelle DG ed). Oxford: Oxford University Press.

Leech JA, Nelson WC, Burnett RT, Aaron S, Raizenne ME. 2002. It's about time: a comparison of Canadian and American time-activity patterns. J Expo Anal Environ Epidemiol 12(6):427-432.

Mack WJ, Islam T, Lee Z, Selzer RH, Hodis HN. 2003. Environmental tobacco smoke and carotid arterial stiffness. Prev Med 37(2):148-154.

Mack WJ, LaBree L, Liu C, Selzer RH, Hodis HN. 2000. Correlations between measures of atherosclerosis change using carotid ultrasonography and coronary angiography. Atherosclerosis 150(2):371-379.

O'Leary DH, Polak JF, Kronmal RA, Manolio TA, Burke GL, Wolfson SK, Jr. 1999. Carotid-artery intima and media thickness as a risk factor for myocardial infarction and stroke in older adults. Cardiovascular Health Study Collaborative Research Group. N Engl J Med 340(1):14-22.

O'Neill MS, Jerrett M, Kawachi I, Levy JI, Cohen AJ, Gouveia N, et al. 2003. Health, wealth, and air pollution: advancing theory and methods. Environ Health Perspect 111(16):1861-1870.

Peters A, Pope CA. 2002. Cardiopulmonary mortality and air pollution. Lancet 360(9341):1184-1185.

Pope CA, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, et al. 2002a. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. JAMA 287(9):1132-1141.

Pope CA, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, et al. 2002b. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. JAMA 287(9):1132-1141.

Pope CA, Burnett RT, Thurston GD, Thun MJ, Calle EE, Krewski D, et al. 2004. Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. Circulation 109(1):71-77.

Riediker M, Williams R, Devlin R, Griggs T, Bromberg P. 2003. Exposure to particulate matter, volatile organic compounds, and other air pollutants inside patrol cars. Environ Sci Technol 37(10):2084-2093.

Roosli M, Braun-Fahrlander C, Künzli N, Oglesby L, Theis G, Camenzind M, et al. 2000. Spatial variability of different fractions of particulate matter within an urban environment and between urban and rural sites. J Air Waste Manag Assoc 50(7):1115-1124.

Ross R. 1999. Atherosclerosis--an inflammatory disease. N Engl J Med 340(2):115-26.

Samet JM, Dominici F, Curriero FC, Coursac I, Zeger SL. 2000a. Fine particulate air pollution and mortality in 20 U.S. cities, 1987- 1994. N Engl J Med 343(24):1742-1749.

Samet JM, Dominici F, Curriero FC, Coursac I, Zeger SL. 2000b. Fine particulate air pollution and mortality in 20 U.S. cities, 1987- 1994. N Engl J Med 343(24):1742-1749.

Sarnat J, Koutrakis P, Suh H. 2000. Assessing the relationship between personal particulate and gaseous exposures of senior citizens living in Baltimore, MD. J Air Waste Manag Assoc 50(7):1184-1198.

Sarnat JA, Long CM, Koutrakis P, Coull BA, Schwartz J, Suh HH. 2002. Using sulfur as a tracer of outdoor fine particulate matter. Environ Sci Technol 36(24):5305-5314.

Selzer RH, Hodis HN, Kwong-Fu H, Mack WJ, Lee PL, Liu CR, et al. 1994. Evaluation of computerized edge tracking for quantifying intima-media thickness of the common carotid artery from B-mode ultrasound images. Atherosclerosis 111(1):1-11.

Selzer RH, Mack WJ, Lee PL, Kwong-Fu H, Hodis HN. 2001. Improved common carotid elasticity and intima-media thickness measurements from computer analysis of sequential ultrasound frames. Atherosclerosis 154(1):185-193.

Sharman JE, Coombes JS, Geraghty DP, Fraser DI. 2002. Exposure to automotive pollution increases plasma susceptibility to oxidation. Arch Environ Health 57(6):536-540.

Soukup J, Becker S, Gilmour MI, Devlin RB. 1995. Urban air particles induce cytokine production and inhibit phagocytosis in human and rat alveolar macrophages. Am J Resp and Crit Care Med 151:A266.

Stein JH, Douglas PS, Srinivasan SR, Bond MG, Tang R, Li S, et al. Distribution and cross-sectional age-related increases of carotid artery intima-media thickness in young adults. The Bogalusa Heart Study. Stroke. doi:10.1161/01.STR.0000147719.27237.14 [Online 28 October 2004].

Suwa T, Hogg JC, Quinlan KB, Ohgami A, Vincent R, van Eeden SF. 2002. Particulate air pollution induces progression of atherosclerosis. J Am Coll Cardiol 39(6):935-942.

Tepper JS, Lehmann JR, Winsett DDW, Costa DL, Ghio AJ. 1994. The role of surface complexed iron in the development of acute lung inflammation and airway hyperresponsiveness. Am J Respir Crit Care Med 149:A839.

Thomas D, Stram D, Dwyer J. 1993. Exposure measurement error: influence on exposure-disease relationships and methods of correction. Ann Rev Publ Health 14:69-93.

van Eeden SF, Tan WC, Suwa T, Mukae H, Terashima T, Fujii T, et al. 2001. Cytokines involved in the systemic inflammatory response induced by exposure to particulate matter air pollutants (PM(10)). Am J Respir Crit Care Med 164(5):826-830.

Wiegman A, Hutten BA, de Groot E, Rodenburg J, Bakker HD, Buller HR, et al. 2004. Efficacy and safety of statin therapy in children with familial hypercholesterolemia: a randomized controlled trial. Jama 292(3):331-337.

Wittekoek ME, de Groot E, Prins MH, Trip MD, Buller HR, Kastelein JJ. 1999. Differences in intima-media thickness in the carotid and femoral arteries in familial hypercholesterolemic heterozygotes with and without clinical manifestations of cardiovascular disease. Atherosclerosis 146(2):271-279.

Zanobetti A, Schwartz J. 2002. Cardiovascular damage by airborne particles: are diabetics more susceptible? Epidemiology 13(5):588-592.

0329

TABLES

Table 1: Description of assigned exposure (outdoor concentration in 2000), and of carotid intima-media thickness (CIMT), and main characteristics of the study population at the time of baseline measurements in the total sample, men, women, women ≥ 60 years, and subjects under lipid-lowering therapy (mean and SD, or %, respectively).

Characteristics		Total sample (798)	Men (443)	Women (355)	Women ≥60 years (186)	Lipid-lowering therapy (109)
$PM_{2.5}$ ($\mu g/m^3$)		20.3 (2.6)	20.1 (2.7)	20.5 (2.4)	20.7 (2.3)	20.0 (2.5)
Ozone (ppb) (annual mean of daily max.)		89.2 (17.9)	89.6 (18.5)	88.8 (17.3)	87.1 (17.2)	88.5 (18.6)
CIMT (μm)		755 (148)	767 (166)	740 (118)	775 (120)	788 (140)
Age (years)		59.2 (9.8)	58.3 (10.3)	60.4 (8.9)	67.3 (5.3)	63.3 (10.0)
Diastolic blood pressure (mmHg)		77.8 (9.2)	79.2 (8.8)	75.9 (9.3)	74.8 (9.5)	78.1 (8.9)
Systolic blood pressure (mmHg)		127.2 (16.3)	126.7 (16.0)	127.8 (16.6)	130.5 (16.7)	130.9 (16.2)
LDL cholesterol (mg/dL)		137.9 (29.5)	137.0 (30.9)	139.0 (27.6)	136.4 (26.9)	125.7 (33.7)
Caucasian		67.3 %	67.7 %	66.8 %	65.0 %	69.7 %
Smoking status	Never smokers	62.9 %	62.8 %	63.1 %	62.9 %	53.2 %
	Former smokers	33.2 %	33.4 %	33.0 %	33.3 %	44.0 %
	Current smokers	3.8%	3.6 %	3.9 %	3.8 %	2.8 %
Environmental tobacco smoke at home		33.5 %	21.9 %	47.9 %	55.4 %	37.5 %
Lipid-lowering therapy		13.7 %	15.3 %	11.5 %	15.1 %	100%
Antihypertensive prescriptions		26.2 %	26.6 %	25.6 %	33.3 %	42.2 %

Table 2: Percent change (and 95% CI) in the carotid intima-media thickness (µm) associated with a 10 µg/m^3 change in ambient outdoor $PM_{2.5}$ concentration at the residential zip code in the total population (N=798). a)

Model [a)] (with adjustment factors in the model)	Total sample (798) % change	p-value	Women ≥ 60 yrs. (186) % change	p-value	Lipid-lowering therapy (109) % change	p-value
None (unadjusted estimate)	5.9 (1.0-10.9)	0.018	19.2 (8.8-30.5)	0.001	15.8 (2.1-31.2)	0.024
Age, gender, education, income [b)]	4.4 (0.0-9.0)	0.056	15.7 (5.7-26.6)	0.002	13.3 (0-28.5)	0.051
All above + active and passive smoking, multivitamins, alcohol	4.2 (-0.2-8.9)	0.064	13.8 (4.0-24.5)	0.002	13.3 (-0.3-28.8)	0.060

a) The table shows the unadjusted association (crude model) and estimates from two multivariate models. In parentheses: 95% confidence intervals of the estimates. The relative effects are based on a linear model with log-IMT as dependent variable.

b) Factors with univariate associations with both, CIMT and $PM_{2.5}$

0331

FIGURE LEGENDS

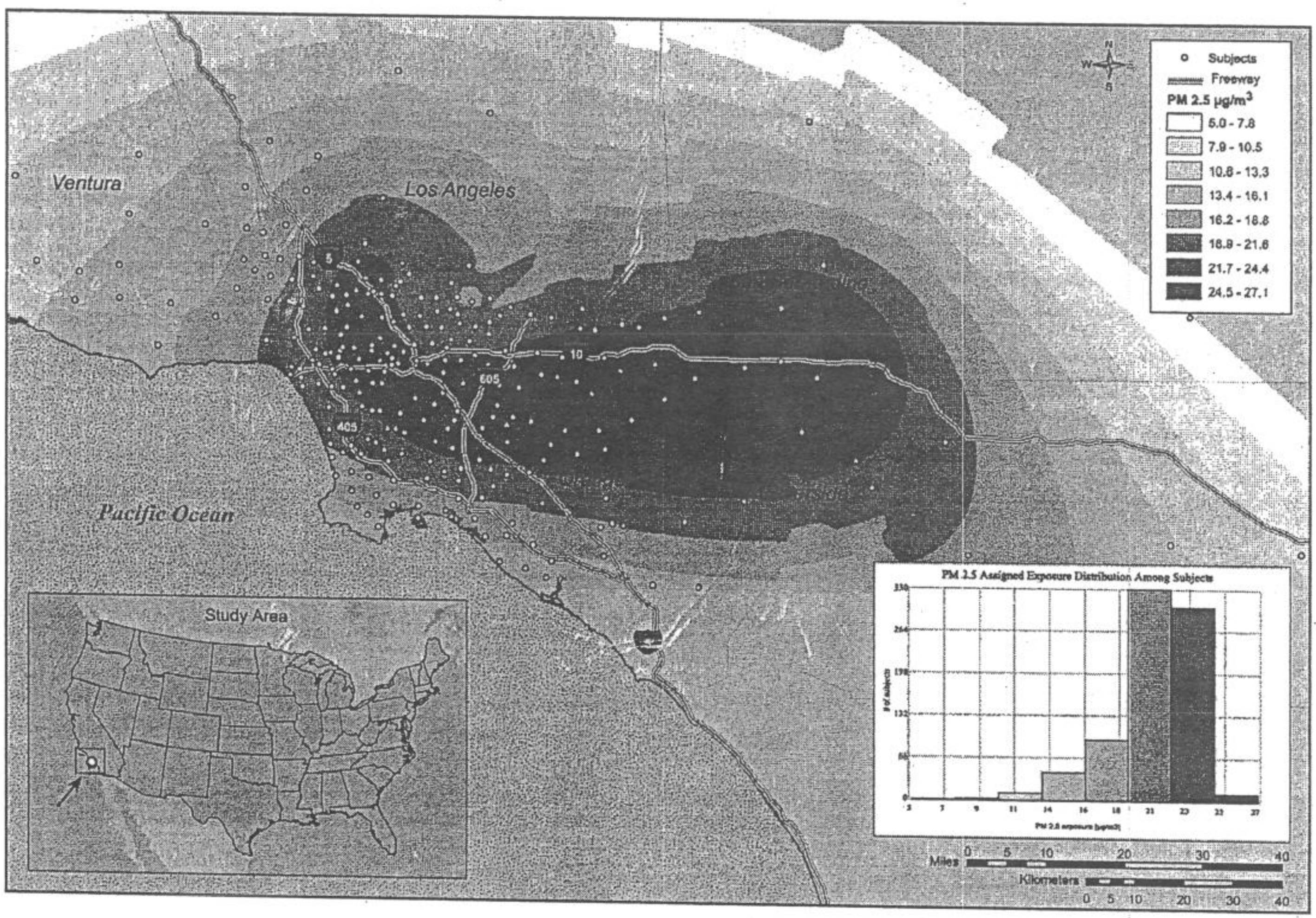
Figure 1: Zip code locations of the study population geo-coded on the $PM_{2.5}$ surface, modeled with 2000 $PM_{2.5}$ data, and distribution of individually assigned concentrations.

Figure 2: Mean CIMT (± 1 standard error) among quartiles of the $PM_{2.5}$ distribution. The range in each quartile is shown in the x-axes. Mean CIMT levels are provided at the population average of the adjustment covariates (age, gender, education, and income). 1st quartile: reference group.

Figure 3: Percent difference (and 95% CI) in CIMT associated with a 10 $\mu g/m^3$ contrast in ambient $PM_{2.5}$ in all subjects and in subgroups. All estimates are based on the cross-sectional linear model with log-IMT as dependent variable, and home outdoor $PM_{2.5}$ as independent variable, adjusted for sex, age, education and income. Number of subjects per group is shown in parenthesis. Data ordered by size of point estimate. The null effect line is highlighted (dash).

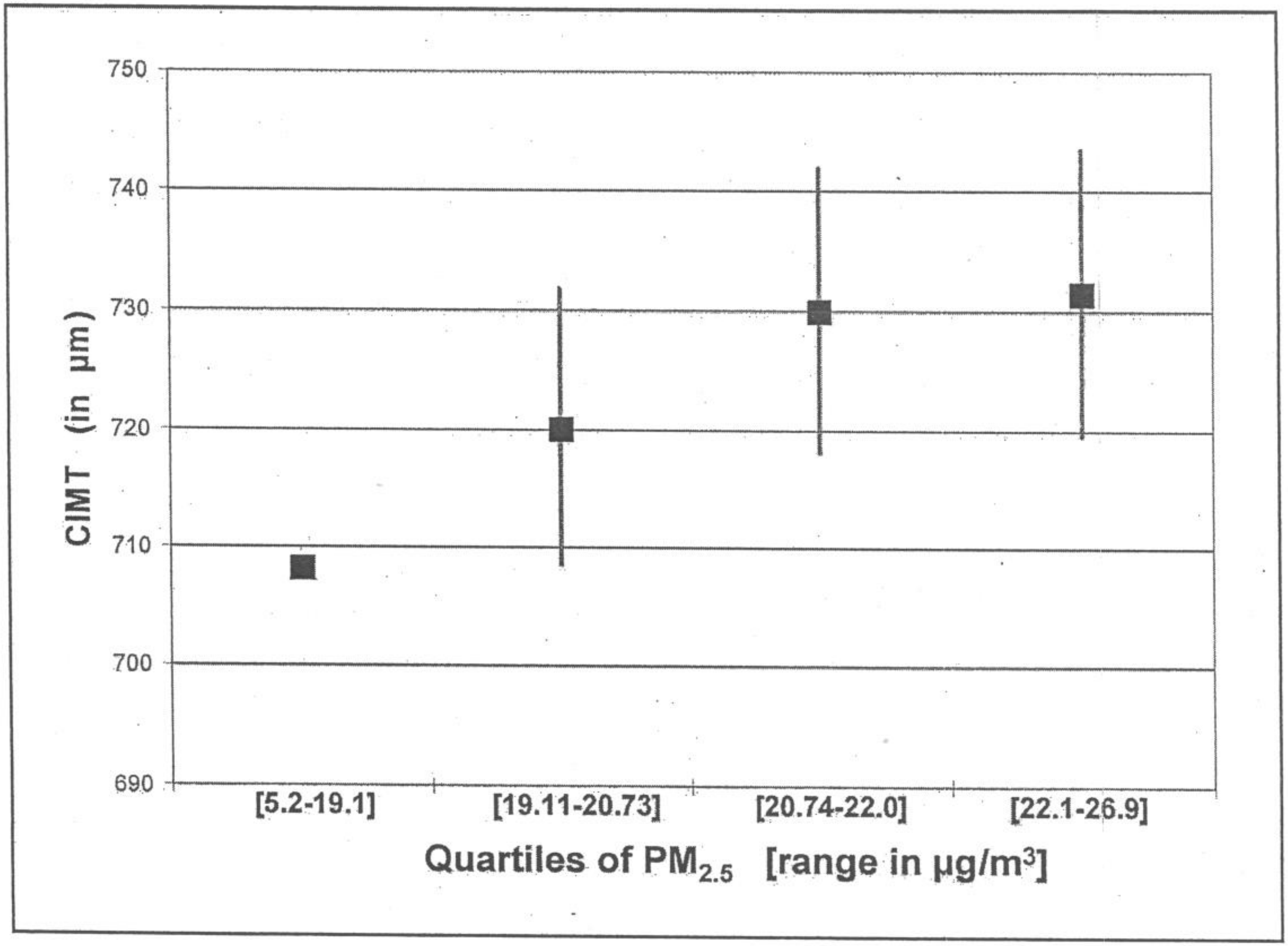
0332

FIGURE 1



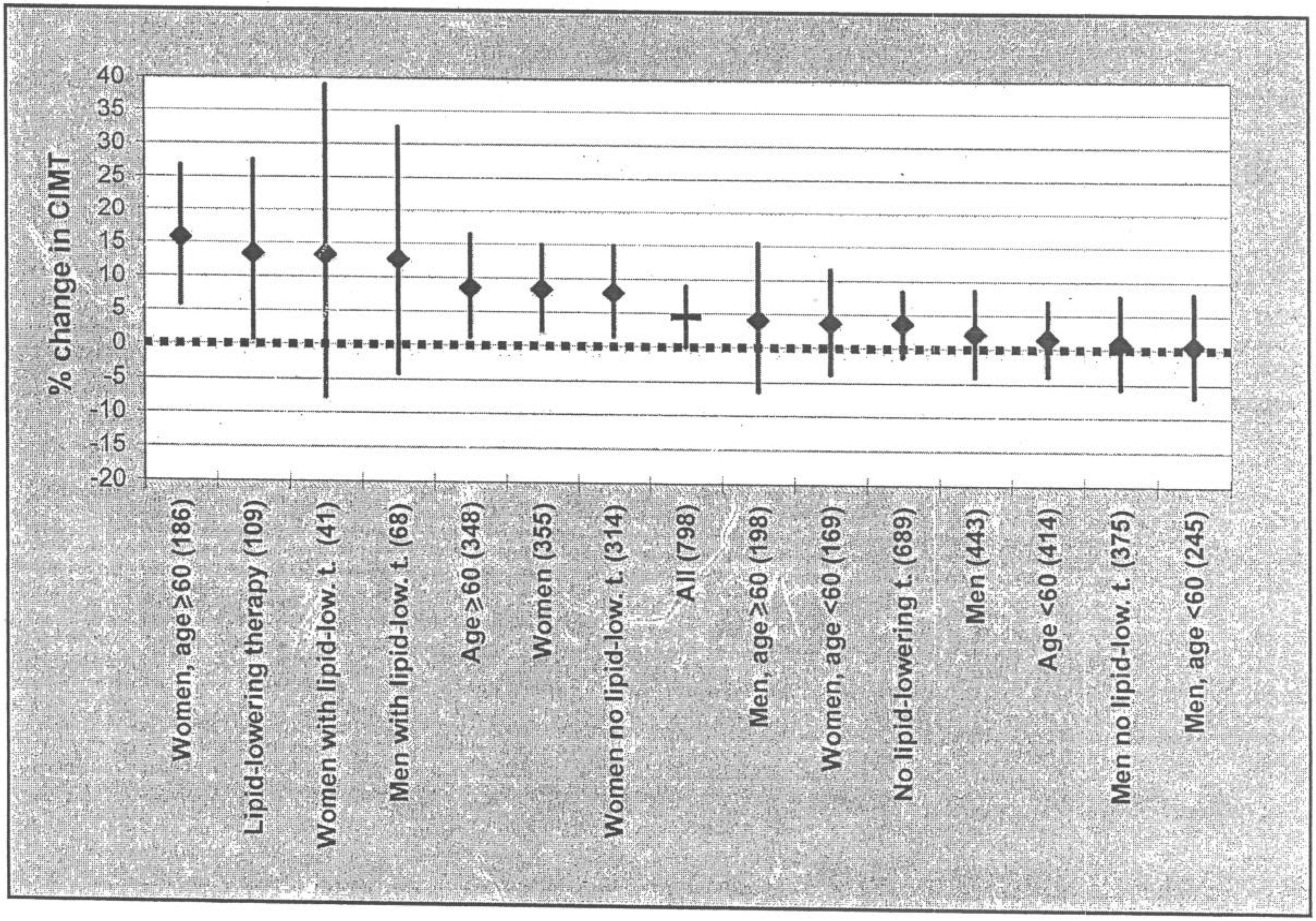
Subjects
Freeway
PM 2.5 µg/m³
5.0 - 7.8
7.9 - 10.5
10.6 - 13.3
13.4 - 16.1
16.2 - 18.8
18.9 - 21.6
21.7 - 24.4
24.5 - 27.1
Ventura
Los Angeles
Pacific Ocean
5
10
405
605
Study Area
PM 2.5 Assigned Exposure Distribution Among Subjects
Miles 0 5 10 20 30 40
Kilometers 0 5 10 20 30 40

FIGURE 2



0334

FIGURE 3


% change in CIMT
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
Women, age ≥60 (186)
Lipid-lowering therapy (109)
Women with lipid-low. t. (41)
Men with lipid-low. t. (68)
Age ≥60 (348)
Women (355)
Women no lipid-low. t. (314)
All (798)
Men, age ≥60 (198)
Women, age <60 (169)
No lipid-lowering t. (689)
Men (443)
Age <60 (414)
Men no lipid-low. t. (375)
Men, age <60 (245)

Spatial Analysis of Air Pollution and Mortality in Los Angeles

Michael Jerrett, Richard T. Burnett,† Renjun Ma,‡ C. Arden Pope III,§ Daniel Krewski,¶ K. Bruce Newbold,‖ George Thurston,** Yuanli Shi,¶ Norm Finkelstein,‖ Eugenia E. Calle,†† and Micheal J. Thun††*

AQ: 1

Background: The assessment of air pollution exposure using only community average concentrations may lead to measurement error that lowers estimates of the health burden attributable to poor air quality. To test this hypothesis, we modeled the association between air pollution and mortality using small-area exposure measures in Los Angeles, California.

Methods: Data on 22,905 subjects were extracted from the American Cancer Society cohort for the period 1982–2000 (5,856 deaths). Pollution exposures were interpolated from 23 fine particle ($PM_{2.5}$) and 42 ozone (O_3) fixed-site monitors. Proximity to expressways was tested as a measure of traffic pollution. We assessed associations in standard and spatial multilevel Cox regression models.

Results: After controlling for 44 individual covariates, all-cause mortality had a relative risk (RR) of 1.17 (95% confidence interval = 1.05–1.30) for an increase of 10 $\mu g/m^3$ $PM_{2.5}$ and a RR of 1.11 (0.99–1.25) with maximal control for both individual and contextual confounders. The RRs for mortality resulting from ischemic heart disease and lung cancer deaths were elevated, in the range of 1.24–1.6, depending on the model used. These PM results were robust to adjustments for O_3 and expressway exposure.

Conclusion: Our results suggest the chronic health effects associated with within-city gradients in exposure to $PM_{2.5}$ may be even larger than previously reported across metropolitan areas. We observed effects nearly 3 times greater than in models relying on comparisons between communities. We also found specificity in cause of death, with $PM_{2.5}$ associated more strongly with ischemic heart disease than with cardiopulmonary or all-cause mortality.

(*Epidemiology* 2005;16: 000–000)

Submitted 26 August 2004; accepted 23 May 2005.

From the *University of Southern California, Los Angeles, California; †Health Canada, Ottawa, Canada; the ‡University of New Brunswick, Fredericton, New Brunswick; §Brigham Young University, Salt Lake City, Utah; the ¶University of Ottawa, Ottawa, Ontario, Canada; ‖McMaster University, Hamilton, Ontario, Canada; **New York University, New York, NY; and the ††American Cancer Society, Atlanta, Georgia.

Supported by the Health Effects Institute, the National Institute of Environmental Health Sciences (grants 5 P30 ES07048 5P01ES011627), the Verna Richter Chair in Cancer Research, and the NSERC/SSHRC/McLaughlin Chair in Population Health Risk Assessment at the University of Ottawa.

Supplemental material for this article (Article Plus) is available with the online version of the journal at www.epidem.com; click on "Article Plus."

Correspondence: Michael Jerrett, Division of Biostatistics, Department of Preventive Medicine, Keck School of Medicine, University of Southern California, 1540 Alcazar Street, CHP-222, Los Angeles, CA 90089-9011. E-mail: jerrett@usc.edu.

ISSN: 1044-3983/05/1606-0001
DOI: 10.1097/01.ede.0000181630.15826.7d

A review of the literature on the chronic health effects of ambient air pollution suggests that studies using the American Cancer Society (ACS) cohort to assess the relation between particulate air pollution and mortality rank among the most influential and widely cited. The original study[1] (a reanalysis that introduced new random-effects methods and spatial analytic techniques[2,3]) and more recent studies with longer follow up and improved exposure data have all demonstrated air pollution effects on all-cause and cause-specific mortality.[4,5] As a result of this robust association and a lack of other studies on the long-term effects, the ACS studies together with the Six-Cities study[6] have been important for government regulatory interventions such as the U.S. Environmental Protection Agency's National Air Quality Standard for Fine Particles. The ACS studies have also been used by the World Health Organization as a basis for estimating the burden of mortality attributable to air pollution.[7]

The assessment of air pollution exposure using only community average concentrations likely underestimates the health burden attributable to elevated concentrations in the vicinity of sources.[8,9] Health effects may be larger around sources, and these effects are diminished when using average concentrations for the entire community. Previous ACS studies have relied on between-community exposure contrasts at the scale of a metropolitan area giving all residents of a city the same exposure concentrations. Exposure to air pollution, however, may vary spatially within a city,[10–14] and these variations may follow social gradients that influence susceptibility to environmental exposures.[3] Residents of poorer neighborhoods may live closer to point sources of industrial pollution or roadways with higher traffic density.[15] This exposure misclassification along social gradients may explain the finding of effect modification by educational status in earlier ACS studies.[2,16] The spatial correspondence between high exposure and potentially susceptible populations within cities may further bias estimates that rely on central monitors to proxy exposure over wide areas. Theoretically, classic exposure measurement error induced by central monitors may also bias results toward the null.[17]

Given the potential of the metropolitan scale to bias health effect estimates, we have assessed the association between air pollution and mortality at the within-community or intraurban scale. We sought an urban location with sufficient geographic scope, air pollution data, and enough ACS subjects to test the association. Los Angeles (LA), California, met these selection criteria. The region has high pollution levels, large intraurban gradients in exposure over a wide geographic area, and strong public awareness that air pollution has serious public health consequences.[18]

METHODS

Cohort Data

We extracted health data from the ACS Cancer Prevention II survey for metropolitan LA at the zip code-area scale (zip codes are used for U.S. mail delivery; average population per zip code in LA is approximately 35,000, with an average area of approximately 22.5 km^2). We constructed distribution-weighted centroids using spatial boundary files based on 1980 and 1990 definitions. We were able to assign exposure to 267 zip code areas with a total of 22,905 subjects (5856 deaths based on follow up to 2000). Some subjects reported only postal box addresses and were therefore excluded. These subjects had been enrolled in 1982 along with over one million others as part of the ACS II survey. Similar to earlier ACS analyses, availability of air pollution data and other relevant information led to the subset of study subjects to be used in the health effects research. Although the ACS cohort is not representative of the general population, the cohort allows for internally valid comparisons within large samples of the American population. This study was approved by the Ethics Board of the Ottawa General Hospital, Canada. Subjects had given informed consent at enrollment into the study.

Control for Confounding

We used 44 individual confounders identified in earlier ACS studies of air pollution health effects.[4] These variables include lifestyle, dietary, demographic, occupational, and educational factors that may confound the air pollution–mortality association. We had more than 10 variables that measure aspects of smoking. Sensitivity analyses revealed that removal of individual variables had little influence on the estimated pollution coefficients; therefore, to promote comparability with results from earlier studies, we report the results with this standard set of 44 variables.

We also assembled 8 ecologic variables for the zip code areas to control for "contextual" neighborhood confounding. "Contextual" effects occur when individual differences in health outcome are associated with the grouped variables that represent the social, economic, and environmental settings where the individuals live, work, or spend time (eg, poverty or crime rate in a neighborhood).[19–22] These contextual effects often operate independently from (or interactively with) the individual-level variables such as smoking. The ecologic variables used represented constructs identified as important in the population health literature and previously tested as potential confounders with the ACS dataset at the metropolitan scale.[23,24] These include income, income inequality, education, population size, racial composition (black, white, Hispanic), and unemployment.[3] A new variable measuring potential exposure misclassification by the proportion having air conditioning was also tested. Similar variables have been in a metaanalysis of acute effects,[25] on the premise that air-conditioned houses are more tightly sealed and have lower penetration of particles indoors. A recent study of personal exposures in LA reported large reductions in penetration of particles for air-conditioned houses.[26] This variable adds partial control for the impact of air conditioning, which may relate both to health outcomes (through prevention of heat stroke) and to air pollution (because high air pollution concentrations and lower proportions of air conditioning are related in our study area). We thus expected the proportion of air conditioning in the zip code area to correlate with lower PM exposures and effects. We also computed principal components of all 8 variables to provide maximal control for confounding while avoiding multicollinearity among the ecologic variables.[27,28]

Exposure Assessment

To derive exposure assessments, we interpolated $PM_{2.5}$ data from 23 state and local district monitoring stations in the LA basin for the year 2000 using 5 interpolation methods: bicubic splines, 2 ordinary kriging models, universal kriging with a quadratic drift, and a radial basis function multiquadric interpolator. We emphasized kriging interpolation because this stochastic method produces the best linear unbiased estimate of the pollution surface.[29] After crossvalidation, we used a combination of universal kriging and multiquadric models. This approach takes advantage of the local detail in the multiquadric surface and the ability to handle trends in the universal surface. We averaged estimated surfaces based on 25-m grid cells. We conducted sensitivity analysis using only the universal estimate and found the results to be similar; therefore, only the findings from the combined model are

balt5/zed-ede/zed-ede/zed00605/zed3871-05z | xppws | S=1 | 9/1/05 | 4:50 | Art: 04-375

reported. Sensitivity analyses were also implemented with the kriging variance. Exposure assignments were downweighted with larger errors in exposure estimates in these analyses (ie, weight equal to the inverse of the standard error in the universal kriging estimate).

Although O_3 has had few associations in earlier ACS studies using between-city contrasts,[1,2,4] exposure to this pollutant is considered a health threat in the LA region, which has some of the highest levels in the United States.[18] For O_3, we obtained data at 42 sites in and around the LA basin from the California Air Resources Board database. We interpolated 2 surfaces using a universal kriging algorithm: one based on the average of the 4 highest 8-hour concentrations over the year 2000 and another based on the expected peak daily concentration, which is a statistical measure designed to assess the likely exceedance of the 8-hour average at the site based on the previous 3 years (1999–2001). Both measures are used as a basis for either federal or state designation of nonattainment areas. They both capture extreme events, but the expected peak daily concentration provides more stability for estimation of spatial patterns than the 1-year measures based on the 4 highest days. Few studies of chronic effects have found significant ozone effects, although acute effects of a small magnitude have been observed.[30] Thus, it seems plausible that an ozone effect would be manifest in those areas most likely to experience exceedances.

Finally, we assessed the impact of traffic by assigning buffers that included zip code-area centroids within either 500 or 1000 meters of a freeway. The U.S. Bureau of the Census feature class codes define freeways as having "limited access," a numbered assignment, and a speed limit of greater than 50 miles per hour.[31] This distance from the zip code-area centroid to the freeway-approximated exposure to traffic pollution, which may exert independent effects in addition to pollutants such as $PM_{2.5}$ and O_3 that vary over larger areas.[8]

Complete residential history information was unavailable for the entire cohort, although we do have information on whether respondents moved between enrollment and 1992 or thereafter (approximately 5633 in LA). Of this group, only 16% moved during follow up, and this diminishes the potential for exposure misclassification resulting from residential mobility.

Analytic Approach

We used Cox proportional hazards regression for our main analyses of association between air pollution and mortality.[32] Because the units of analyses were small zip code areas and previous analyses had indicated spatial autocorrelation in the residual variation of some health effects models, we also developed and used a new spatial random effects Cox model as a crossvalidation of the standard model. We have previously shown that survival experience clusters by community and is spatially autocorrelated between communities.[2,3] Lack of statistical control for these factors can bias the estimates of air pollution effects and underestimate associated standard errors.[3,33] To characterize the statistical error structure of survival data, novel statistical methodology and computer software have been developed to incorporate spatial clustering at the zip code area. Our model can be expressed mathematically in the form

$$h_{ij,\,s}(t) = h_{0,\,s}(t)\ \eta_j\ \exp(\beta' x_{ij,\,s})$$

where h_{ij} is the hazard function or instantaneous hazard probability of death for the i^{th} subject in the j^{th} ZCA, whereas s indicates the stratum (defined by sex, race, and age). Here $h_{0,\,s}(t)$ is the baseline hazard function. The η_j are positive random effects from the subject level representing the unexplained variation in the response among neighborhoods, in this case zip code areas. Only the moments of the random effects need to be specified within our modeling framework: $E(\eta_j) = 1$ and $Var(\eta_j) = \tau^2$. The vector x_{ij} represents the known risk factors for the response such as air pollution, smoking habits, and diet. The regression parameter vector is denoted by β. Estimates of the regression vector β, random effects, their variance, and correlation parameter are obtained by methods previously used for random-effects survival models.[33] Thaysen polygons, which ensure that all points within the polygon are closer to the centroid of that polygon than to any other centroid, were used to assign first-order nearest neighbor contiguity between the zip code areas. These were derived using ArcView 3.2 (ESRI Corp., Redlands, CA). The standard Moran's I tests of spatial autocorrelation were applied to the random effects.

RESULTS

Figure 1 illustrates the pollution surface used in our main analysis, and the Appendix Figure (available with the F1

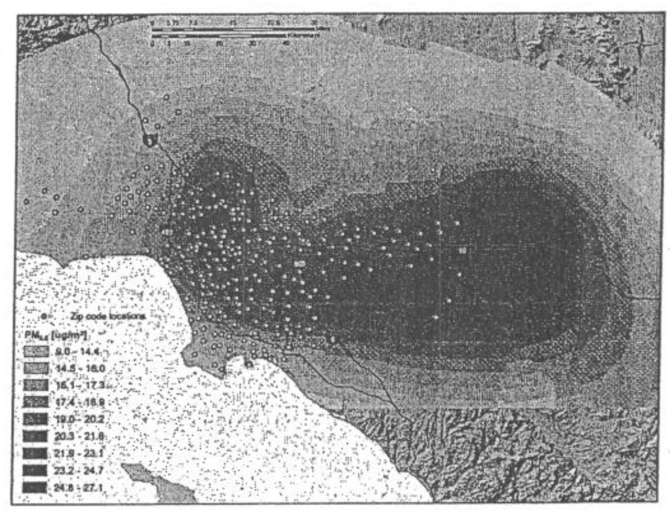


FIGURE 1. $PM_{2.5}$ exposure surface for Los Angeles interpolated with a hybrid universal–multiquartic model.

TABLE 1. Mortality Relative Risk Associated With a 10-$\mu g/m^3$ Increase of $PM_{2.5}$ Concentrations Based on 267 Zip Code Areas in Los Angeles in the American Cancer Society Cohort (1982–2000 follow up) for Various Causes of Death With Adjustment for Covariates

	Cause of Death*				
Covariates	All Causes (n = 5856) RR (95% CI)	IHD (n = 1462) RR (95% CI)	Cardio Pulmonary (n = 3136) RR (95% CI)	Lung Cancer (n = 434) RR (95% CI)	Digestive Cancer (n = 429) RR (95% CI)
$PM_{2.5}$ only	1.24 (1.11–1.37)	1.49 (1.20–1.85)	1.20 (1.04–1.39)	1.60 (1.09–2.33)	1.29 (0.87–1.90)
44 individual covariates	1.17 (1.05–1.30)	1.39 (1.12–1.73)	1.12 (0.97–1.30)	1.44 (0.98–2.11)	1.18 (0.79–1.75)
Air conditioning	1.17 (1.05–1.31)	1.41 (1.13–1.76)	1.15 (0.99–1.33)	1.42 (0.96–2.08)	1.14 (0.76–1.70)
Percent black	1.16 (1.05–1.29)	1.39 (1.11–1.72)	1.12 (0.97–1.30)	1.45 (0.99–2.13)	1.18 (0.79–1.75)
Percent white	1.15 (1.03–1.28)	1.36 (1.09–1.70)	1.10 (0.95–1.28)	1.51 (1.02–2.23)	1.16 (0.78–1.74)
Percent Hispanic	1.15 (1.02–1.28)	1.33 (1.06–1.67)	1.11 (0.95–1.29)	1.46 (0.98–2.20)	1.12 (0.74–1.71)
Percent unemployed	1.15 (1.03–1.28)	1.37 (1.09–1.71)	1.13 (0.97–1.31)	1.33 (0.90–1.97)	1.18 (0.78–1.77)
Mean income	1.17 (1.05–1.30)	1.39 (1.12–1.73)	1.13 (0.97–1.30)	1.44 (0.98–2.11)	1.19 (0.80–1.76)
Total population	1.17 (1.05–1.30)	1.38 (1.11–1.72)	1.12 (0.96–1.29)	1.45 (0.99–2.12)	1.20 (0.80–1.78)
Income inequality	1.14 (1.02–1.28)	1.31 (1.04–1.64)	1.07 (0.92–1.25)	1.33 (0.90–1.98)	1.21 (0.80–1.81)
Percent postsecondary education	1.16 (1.05–1.29)	1.38 (1.11–1.72)	1.12 (0.97–1.30)	1.42 (0.97–2.08)	1.16 (0.78–1.72)
All social factors (principal component analysis)	1.15 (1.03–1.29)	1.32 (1.05–1.66)	1.10 (0.94–1.28)	1.43 (0.96–2.13)	1.20 (0.80–1.80)
Air conditioning, mean income, percent postsecondary education, social factor (low Latino–high income)	1.11 (0.99–1.25)	1.26 (0.99–1.61)	1.08 (0.92–1.27)	1.20 (0.79–1.82)	1.13 (0.74–1.73)
Parsimonious contextual covariates	1.11 (0.99–1.25)	1.25 (0.99–1.59)	1.07 (0.91–1.26)	1.20 (0.79–1.82)	1.14 (0.74–1.74)
Copollutant control					
44 individual covariates + O_3 (expected peak daily concentration) + $PM_{2.5}$	1.20 (1.07–1.34)	1.45 (1.15–1.82)	1.19 (1.02–1.38)	1.47 (0.98–2.20)	1.16 (0.77–1.77)
44 Individual covariates + O_3 (average of 4 highest 8 h maxima) + $PM_{2.5}$	1.18 (1.06–1.32)	1.42 (1.14–1.78)	1.15 (0.99–1.34)	1.52 (1.02–2.26)	1.17 (0.78–1.76)
44 individual covariates + intersection with freeways within 500 m + $PM_{2.5}$	1.17 (1.05–1.31)	1.38 (1.11–1.72)	1.13 (0.97–1.31)	1.46 (0.99–2.16)	1.21 (0.81–1.80)
Copollutant risk estimates					
O_3 (expected peak daily concentration)	0.98 (0.96–1.01)	0.97 (0.93–1.02)	0.97 (0.94–0.99)	0.99 (0.91–1.07)	1.01 (0.93–1.09)
O_3 (average of 4 highest 8 h maxima)	0.99 (0.98–1.01)	0.98 (0.95–1.02)	0.99 (0.96–1.01)	0.97 (0.91–1.03)	1.01 (0.95–1.07)
Intersection with freeways within 500 m	0.99 (0.88–1.11)	0.90 (0.71–1.14)	0.92 (0.77–1.08)	1.44 (0.94–2.21)	0.84 (0.53–1.35)
Intersection with freeways within 1000 m	0.98 (0.89–1.06)	1.05 (0.89–1.24)	0.98 (0.88–1.11)	0.94 (0.69–1.30)	0.88 (0.63–1.22)

continued on next page

*ICD-9 code for ischemic heart disease (IHD) 410–414; for cardiopulmonary 400–440, 460–519; for lung cancer 162; for digestive cancer 150–159; for other cancers 140–149, 160, 161, 163–239; for endocrine 240–279; for diabetes 250; for digestive 520–579; male accidents 800+; female accidents 800+.

0341

TABLE 1. Continued

Other Cancers (n = 992) RR (95% CI)	Cause of Death* Endocrine (n = 95) RR (95% CI)	Diabetes (n = 57) RR (95% CI)	Digestive (n = 151) RR (95% CI)	Male Accidents (n = 75) RR (95% CI)	Female Accidents (n = 47) RR (95% CI)	All Others (n = 497) RR (95% CI)
1.09 (0.85–1.40)	3.22 (1.31–7.91)	2.38 (0.76–7.52)	2.17 (1.11–4.26)	1.52 (0.61–3.83)	1.08 (0.35–3.31)	1.11 (0.74–1.67)
1.06 (0.82–1.36)	2.75 (1.10–6.87)	2.10 (0.64–6.87)	1.98 (1.01–3.91)	1.35 (0.53–3.43)	0.86 (0.25–2.94)	1.13 (0.75–1.69)
1.06 (0.82–1.37)	2.73 (1.09–6.84)	2.10 (0.64–6.94)	1.95 (0.98–3.85)	1.50 (0.58–3.89)	1.01 (0.29–3.58)	1.05 (0.69–1.59)
1.05 (0.82–1.36)	2.70 (1.07–6.79)	2.09 (0.63–6.89)	2.02 (1.03–3.98)	1.29 (0.50–3.31)	0.91 (0.27–3.06)	1.10 (0.73–1.66)
1.05 (0.81–1.36)	2.55 (1.00–6.51)	2.05 (0.61–6.82)	1.96 (0.98–3.92)	1.19 (0.46–3.12)	0.93 (0.27–3.23)	1.10 (0.72–1.68)
1.04 (0.80–1.36)	2.60 (1.00–6.75)	2.07 (0.60–7.15)	1.72 (0.85–3.51)	1.41 (0.53–3.76)	0.71 (0.20–2.53)	1.17 (0.76–1.80)
1.01 (0.78–1.31)	2.27 (0.89–5.78)	1.82 (0.55–6.08)	1.83 (0.91–3.65)	1.51 (0.58–3.95)	0.88 (0.25–3.08)	1.10 (0.73–1.67)
1.07 (0.83–1.37)	2.61 (1.07–6.39)	2.06 (0.64–6.65)	1.99 (1.00–3.94)	1.35 (0.53–3.44)	0.80 (0.22–2.83)	1.12 (0.75–1.69)
1.06 (0.83–1.37)	2.76 (1.11–6.86)	2.10 (0.64–6.87)	2.02 (1.02–3.98)	1.35 (0.53–3.44)	0.72 (0.21–2.49)	1.12 (0.74–1.69)
1.08 (0.83–1.40)	2.84 (1.12–7.21)	2.15 (0.64–7.19)	1.98 (0.98–3.99)	1.29 (0.50–3.37)	0.74 (0.20–2.71)	1.15 (0.75–1.75)
1.05 (0.82–1.36)	2.72 (1.10–6.76)	2.07 (0.64–6.70)	1.99 (1.01–3.93)	1.41 (0.55–3.65)	0.89 (0.26–3.12)	1.14 (0.75–1.71)
1.06 (0.82–1.38)	2.50 (0.99–6.32)	2.12 (0.64–7.07)	1.88 (0.92–3.83)	1.17 (0.43–3.20)	0.59 (0.15–2.23)	1.21 (0.79–1.86)
1.04 (0.79–1.38)	2.40 (0.92–6.27)	1.92 (0.55–6.73)	1.55 (0.74–3.26)	1.89 (0.66–5.40)	0.64 (0.15–2.79)	1.11 (0.72–1.72)
1.06 (0.80–1.40)	2.29 (0.88–5.95)	1.79 (0.52–6.21)	1.55 (0.74–3.24)	1.88 (0.66–5.36)	0.70 (0.17–2.86)	1.10 (0.72–1.70)
1.08 (0.83–1.41)	2.59 (1.01–6.63)	2.17 (0.63–7.40)	1.91 (0.94–3.89)	1.35 (0.50–3.61)	1.12 (0.30–4.21)	0.95 (0.64–1.39)
1.07 (0.83–1.39)	2.76 (1.08–7.00)	2.29 (0.68–7.70)	1.82 (0.90–3.67)	1.29 (0.49–3.40)	0.98 (0.28–3.48)	0.98 (0.67–1.43)
1.08 (0.83–1.39)	2.49 (0.98–6.32)	1.82 (0.55–6.02)	2.20 (1.11–4.37)	1.34 (0.53–3.43)	0.73 (0.21–2.54)	1.02 (0.71–1.48)
0.99 (0.94–1.04)	1.05 (0.88–1.24)	0.98 (0.79–1.22)	1.02 (0.90–1.17)	1.00 (0.83–1.21)	0.87 (0.68–1.12)	1.06 (0.99–1.14)
0.99 (0.95–1.03)	1.00 (0.88–1.14)	0.94 (0.79–1.12)	1.06 (0.95–1.17)	1.03 (0.88–1.20)	0.93 (0.77–1.13)	1.04 (0.99–1.10)
1.19 (0.89–1.59)	0.64 (0.26–1.62)	0.45 (0.12–1.70)	2.54 (1.10–5.85)	0.57 (0.17–1.91)	0.87 (0.28–2.70)	0.87 (0.58–1.29)
0.90 (0.72–1.12)	1.55 (0.88–2.75)	1.77 (0.83–3.76)	0.49 (0.24–0.98)	1.05 (0.51–2.15)	2.02 (0.89–4.60)	1.15 (0.87–1.53)

online version of this article) illustrates the absolute and relative standard errors of estimation for the interpolated universal kriging surface. Approximately 50% of the modeled surface has errors that are less than 15% of the monitored value, whereas 67% of the surface lies within 20% of the monitored values. For the most part, absolute standard errors for the densely populated areas of the study region are less than 3 $\mu g/m^3$. Only on the periphery of the study area do errors become large compared with monitored values, but these places have very few of our study subjects. Interestingly, the range of exposure within LA (20 $\mu g/m^3$) exceeds what we observed in previous studies based on contrasts among 116 cities (16 $\mu g/m^3$).[4]

Results for all-cause and cause-specific deaths are reported in Table 1. This table shows the $PM_{2.5}$ effect with varying levels of control for confounding. Relative risks (RRs) are expressed as 10 $\mu g/m^3$ exposure contrasts in $PM_{2.5}$ followed by the 95% confidence interval (95% CI). Using the example of all-cause mortality and with each succeeding stage, including the previous individual-level controls, we find that for $PM_{2.5}$ alone and controlling just for age, sex, and race, the RR is 1.24 (95% CI = 1.11–1.37), whereas the RR with the 44 individual confounders[4] is 1.17 (1.05–1.30). All subsequent results include the 44 individual-level control variables and one or more ecologic variables. For example, with 44 individual variables and the ecologic variable of unemployment, the RR of $PM_{2.5}$ is 1.15 (1.03–1.28). When we add 4 social factors extracted from the principal component analysis (and accounting for 81% of the total variance in the social variables), the RR is 1.15 (1.03–1.29). Including all ecologic variables associated with mortality in bivariate models reduces the pollution coefficient to RR of 1.11 (0.99–1.25). Finally, for the parsimonious model that includes ecologic confounder variables that both reduce the pollution coefficient and have associations with mortality, the RR is 1.11 (0.99–1.25).

Comparing these results directly with the earlier analyses using between-community contrasts, the health effects are nearly 3 times greater for this analysis (ie, 17% increase compared with 6% in earlier studies in models that control for the 44 individual confounders). With control for neighborhood confounders, effect estimates are still approximately 50% to 90% higher than in previous analyses.

In models with only individual covariates and $PM_{2.5}$, some residual spatial autocorrelation was present in the random effects from the model clustered on zip code area. We attempted to remove this autocorrelation by fitting a model with a ρ autocorrelation term that used mortality information from nearest neighbors as a predictor of mortality in the ZCA j, but the autocorrelation persisted (results not shown). When contextual socioeconomic status variables were included in the model, however, the Moran's I tests revealed no significant spatial autocorrelation. Table 2 shows the results of the Moran's I test for all-cause and ischemic heart disease mortality. Visual inspection of the random effects, η_j, confirmed the results from the Moran's I testing.

Sensitivity analyses using weighted estimation with weights equal to the inverse of the standard error on the universal kriging exposure model demonstrated that the risk estimates were robust to measurement error in the exposure estimate (results not shown). Point estimates remained elevated.

DISCUSSION

Our results suggest that the chronic health effects associated with intraurban gradients in exposure to $PM_{2.5}$ may be even larger than previously reported associations across metropolitan areas. Using the direct comparison to previous ACS studies, we see effects that are nearly 3 times larger than in models relying on between-community exposure contrasts. We also note convincing evidence of specificity in these health effects, with a stronger association between air pollu-

TABLE 2. Results of the Spatial Autocorrelation Analysis on the Random Effects With Various Levels of Control for Confounding

			First-Order Neighborhood Matrix		Second-Order Neighborhood Matrix	
Model	PM Effect RR (95% CI)	Sigma Squared	Spatial Autocorrelation Moran's I	Normal *P* Value	Spatial Autocorrelation Moran's I	Normal *P* Value
All-cause mortality						
44 individual covariates	—	0.00701	0.078	0.021	0.038	0.812
$PM_{2.5}$ + 44 individual covariates	1.165 (1.027–1.321)	0.00442	0.073	0.030	0.030	0.157
$PM_{2.5}$ + 44 individual covariates + parsimonious contextual covariates	1.120 (0.996–1.260)	0.00050	0.016	0.571	−0.017	0.572
IHD mortality						
44 individual covariates	—	0.00476	0.025	0.419	0.037	0.154
$PM_{2.5}$ + 44 individual covariates	1.391 (1.120–1.726)	0.00182	0.008	0.735	0.017	0.382
$PM_{2.5}$ + 44 individual covariates + parsimonious contextual covariates	1.269 (1.005–1.602)	0.00120	−0.016	0.733	0.010	0.583

tion and ischemic heart disease than for the more general measures of cardiopulmonary deaths or all-cause mortality (Fig. 2 displays the ordering in the risks presented in the tables). These findings concur with recent studies at the metropolitan level, which again demonstrate that ischemic heart disease drives the cardiopulmonary association with air pollution.[5]

F2

Among the cancer deaths, we also observe ordering in the risks, with decreasing risks as we move from lung cancer to digestive cancer to all cancers. Given that the lung would be most directly affected by air pollution, this finding gives corroborative evidence that the association did not occur by chance.

The larger effects in LA raise the question of whether some underlying aspect of this subcohort differs in characteristics that modify the association between mortality and air pollution. We compared the full cohort with the LA subcohort and found no major differences in attributes likely to modify the air pollution–mortality association, with the exception that the LA cohort was better educated. Based on the findings from the earlier analyses in which subjects with lower education experienced larger health effects,[1,2,4] we would expect the effect size in LA to be smaller than in the full cohort. Thus, differences in underlying characteristics appear unlikely to explain the larger effects we observed in LA.

In comparing our results with the earlier national-level ACS studies, we examined the reduction in $PM_{2.5}$ levels in LA to 50 other metropolitan areas that had data for 1980 and for the year 2000 we used in our study. (See Krewski et al[2] for a description of the data.) The mean reduction was 31%, with a range from 0.4% to 59%. LA experienced a reduction of 24.5%, just above the lowest quartile of 23.5%. $PM_{2.5}$ has therefore declined at a slightly slower rate in LA compared with much of the United States. If we assume that current $PM_{2.5}$ in LA is at 75.5% (ie, accounting for 24.5% reduction) of the 1980 value and the average metropolitan area is at 69% of the 1980 value, some of the increase in the risks may be attributable to the relatively smaller reductions in LA. We tested this scaling effect by computing the ratio of reductions (0.69/75.5 = 0.914) and multiplied our raw coefficients by this factor before estimating the RR. The RR declines for all-cause mortality with the 44 individual variables to just over 15% and with maximal adjustment for confounders to 10%. Although reduced by up to 1.6%, we conclude that the majority of the increase over previous estimates reported by Pope et al[34] is probably not attributable to relative differences in the rate of reduction in ambient air pollution.

The findings for endocrine deaths also reveal another interesting possibility. Chronic air pollution exposure, similar to acute exposures,[34] may adversely affect people with diabetes more than the general population. Alternatively, the finding may indicate some uncontrolled confounding because we expect people with type 2 diabetes to live in neighborhoods with poorer social environments. This possibility appears unlikely because of the extensive control we applied for contextual neighborhood variables. This potential problem appears improbable because we see internal validity in the effects of social confounders measured in the zip code areas.

Although the accidental deaths were unexpectedly elevated in men, subsequent analyses revealed that the risks were attributable to deaths in the early years of the cohort

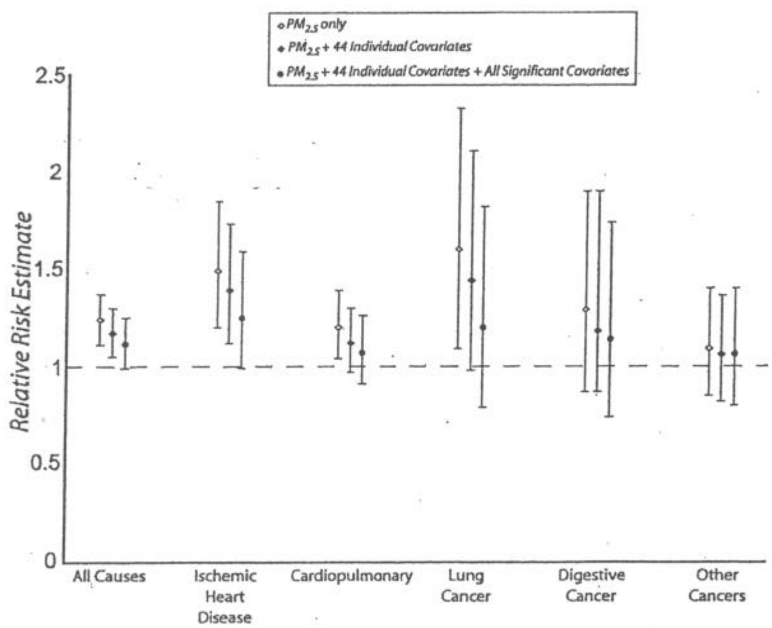


FIGURE 2. Risk plots summarizing mortality relative risks (RR) and 95% CIs associated with a 10-$\mu g/m^3$ increase in ambient $PM_{2.5}$ by cause of death.

before causes of death were coded in detail. As a result, we were unable to assess specific causes for this elevation.

Ozone had few elevated risks in any of our analyses and did not confound the relationship between particles and mortality. This finding agrees with earlier ACS studies indicating that ozone is not associated with elevated mortality risk,[2,4] but contradicts studies on nonsmoking Adventists in southern California, where associations between lung cancer in males and ozone exposure were detected.[35] Recent national studies have reported elevated acute risks of ozone exposure,[30] but risk estimates were small, as would be expected of a study on acute as compared with chronic effects.[36]

In assessing the association with freeway buffers, point estimates were particularly elevated for lung cancer, endocrine, and digestive mortality. The PM—mortality association remained robust to the freeway buffer, and risk estimates were unchanged when this variable was included in the model. Although imprecision in the freeway exposures resulting from the zip code area assignment of proximity may have biased our results toward the null, we did observe a RR for lung cancer of 1.44, and the other cause-specific mortality metrics indicate that more precise estimation of traffic effects are warranted in future research.

In previous studies based on the ACS cohort, all individuals within the same metropolitan area were assigned the same level of exposure based on the average ambient concentration observed at fixed-site air pollution monitors in that city. We hypothesized that the use of such a broad ecologic indicator of exposure leads to exposure measurement error, which in turn can bias estimates of mortality associated with air pollution exposure. Mallick et al[37] analyzed the effect of this source of exposure measurement error based on plausible assumptions about error magnitude in the Six-Cities Study of air pollution and mortality.[6] This investigation suggested that the RR of mortality resulting from particulate air pollution may be underestimated by a factor of approximately 2- to 3-fold as a consequence of exposure misclassification, a finding consistent with the present results.

We recognize the possibility of exposure measurement error from using recent exposure models for a cohort enrolled in 1982. There are empiric as well as theoretical reasons that prevent this potential problem from seriously limiting the results. Empirically, other ACS analyses done at the metropolitan scale have found that these more recent exposure estimates predicted mortality with results similar to those based on earlier monitoring data.[4] Also, the well-known meteorologic and topographic conditions of LA, along with a dominant on-shore breeze and steep mountains to the north and east, control much of the spatial pattern of pollution in the region. Our results agree with findings of earlier studies on the pattern of spatial variation in PM.[38] Although levels may rise and fall in absolute terms, major changes in the spatial patterns within the region over time appear unlikely, and the rank ordering among assigned exposures should be maintained.

From a theoretical perspective, even if spatially heterogeneous changes to pollution levels within a city occurred as a result of new emissions during the follow up, this would lead to larger exposure measurement error, and a bias toward the null would dominate, assuming a classic error structure. With a Berkson error structure, the variance of the dose–response estimate would be inflated.[17] In either case, with current exposure models, the health effects likely have a lower probability of false-positive error, and we would expect the measurement error to reduce effect sizes and inflate their variance. High dose–response relationships can be caused by underestimation of concentrations in the high-exposure areas, but for these areas, the monitoring networks tend to be dense and the kriging errors were smaller than in most of the study area. Finally, the findings were robust to weighting for errors in the kriging estimate (ie, eastern parts of the LA region), which decreases the likelihood that elevated risks arise as a result of underestimation in the high-exposure groups.

Although we are unable to reconstruct likely exposures to $PM_{2.5}$ for our exposure surface, we have assessed the relationship at 51 central monitors between $PM_{2.5}$ measured in 1980 and those of a period similar to that of our 2000 estimates (ie, 1999–2000). These data were used in previous national studies,[4] in which details on their derivation are available. Figure 3 illustrates the regression scatterplot for the 1999–2000 values on the 1980 measurements. The coefficient of determination is approximately 68%, and overall the latter periods are predicted well by the earlier measurements.

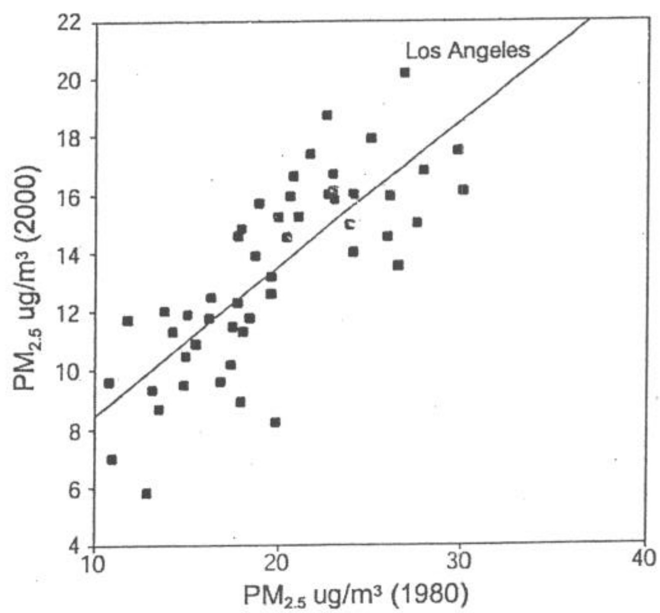


FIGURE 3. 2000 $PM_{2.5}$ regressed onto 1980 $PM_{2.5}$ (n = 51 cities, $R^2 = 0.61$).

0345

In addition, we examined the relationship of historical PM_{10} data in the LA area with the 2000 $PM_{2.5}$ estimates used in our analysis. The period of maximal overlap between the sites occurs in 1993, where we had 8 PM_{10} readings at the same locations as the subsequent $PM_{2.5}$ measurements. By regressing the 2000 $PM_{2.5}$ measurements on those PM_{10} measurements in 1993, we observe an R^2 value of 90% (Fig. 4).

F4

In both of these correlation analyses comparing earlier monitoring data with more recent $PM_{2.5}$ measurements, we found evidence that areas with higher particle concentrations in earlier periods were likely to retain their spatial ranking. Those metropolitan areas likely to be high in 1980 also had a similar tendency in 2000.

Only the Norwegian cohort study has used time windows of exposure.[39] In this study, the authors found that timing of the exposure window had little influence on the estimation of health effects; they used exposure windows in the middle of the follow-up period for most of their results. All of the other cohort studies have taken a similar approach to ours and computed the risk based on relatively short-term air pollution monitoring data. A case–control study in Stockholm, Sweden, investigated time windows for lung cancer.[40] This study found that windows of exposure 20 years before disease onset were more strongly associated with cancer than later periods. In our study, we found elevated risks of lung and digestive cancers, even with the more recent exposure model. The likely stability in the spatial pattern of exposure in LA probably accounts for this similarity of our findings to the 2 European studies that have used time windows.

Generally, our results agree with recent evidence suggesting that intraurban exposure gradients may be associated with even larger health effects than reported in interurban studies. Hoek et al[8] reported a doubling of cardiopulmonary mortality (RR = 1.95; 95% CI 1.09–3.52) for Dutch subjects living near major roads. Canadian cohort studies controlling for medical care utilization and preexisting chronic conditions through record linkage have also uncovered large health effects with proximity to major roads at the intraurban scale.[16] Recent results from the cohort in Norway also suggest associations between intraurban gradients in gaseous pollutants and mortality.[40] All of these studies have implicated traffic as the source of pollution associated with the larger observed effects. In LA, the proportion of primary particles attributable to traffic is approximately 3.7%, whereas in the rest of the country, it is 0.75%.[41] Thus, beyond improved precision in the exposure models, the larger health effects reported here may be partly the result of higher proportions of traffic particulate in LA.

No previous studies have assessed associations based on a continuous exposure model with $PM_{2.5}$, which limits the use of the estimates for current policy debates that tend to focus on fine particles. In this study, we used $PM_{2.5}$ with a continuous exposure metric that promotes comparison with previous studies on health effects and contributes to current regulatory debates.

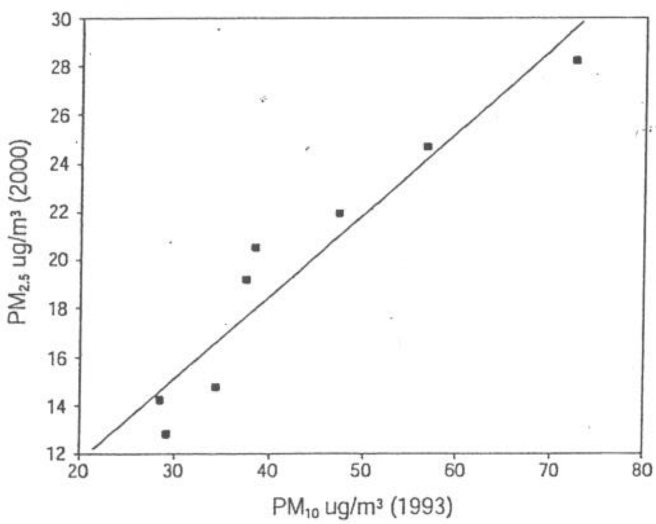


FIGURE 4. 2000 $PM_{2.5}$ regressed onto 1993 PM_{10} (n = 8 sites in LA, R_2 = 0.91).

REFERENCES

1. Pope CA, Thun MJ, Namboodiri MM, et al. Particulate air pollution as a predictor of mortality in a prospective study of US adults. *Am J Respir Crit Care Med.* 1995;151:69–674.
2. Krewski D, Burnet RR, Goldberg MS, et al. *Reanalysis of the Harvard Six Cities and the American Cancer Society Study of Particulate Air Pollution and Mortality, Phase II: Sensitivity Analysis.* Cambridge, MA: Health Effects Institute; 2000.
3. Jerrett M, Burnett R, Willis A, et al. Spatial analysis of the air pollution-mortality association in the context of ecologic confounders. *J Toxicol Environ Health.* 2003;66:1735–1777.
4. Pope CA, Burnett RT, Thun MJ, et al. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. *JAMA.* 2002;287:1132–1141.
5. Pope CA, Burnett RT, Thurston GD, et al. Cardiovascular mortality and long-term exposure to particulate air pollution. *Circulation.* 2004;109: 71–77.
6. Dockery D, Pope CA3rd, Xu X, et al. An association between air pollution and mortality in six US cities. *N Engl J Med.* 1993;329:1753–1759.
7. *WHO Strategy on Air Quality and Health.* Geneva: World Health Organization; 2001.
8. Hoek G, Brunekreef B, Goldbohm S, et al. Association between mortality and indicators of traffic-related air pollution in The Netherlands: a cohort study. *Lancet.* 2002;360:1203–1209.
9. Peters A, Pope CA. Cardiopulmonary mortality and air pollution. *Lancet.* 2002;360:1184–1185.
10. Briggs D, de Hoogh C, Gulliver J, et al. A regression-based method for mapping traffic-related air pollution: application and testing in four contrasting urban environments. *Sci Total Environ.* 2000;253:151–167.
11. Zhu Y, Hinds W, Kim S, et al. Study of ultrafine particulates near a major highway with heavy-duty diesel traffic. *Atmos Environ.* 2002;36: 4323–4335.
12. Jerrett M, Burnett RT, Kanaroglou P, et al. A GIS-environmental justice analysis of particulate air pollution in Hamilton, Canada. *Environment and Planning.* 2001; *A*33:955–973.
13. Brauer M, Hoek G, van Vliet P, et al. Estimating long-term average particulate air pollution concentrations: application of traffic indicators

and geographic information systems. *Epidemiology*. 2003;14:228–239.
14. Brunekreef B, Holgate S. Air pollution and health. *Lancet*. 2002;360: 1233–1242.
15. O'Neill M, Jerrett M, Kawachi I, et al. Health, wealth and air pollution. *Environ Health Perspect*. 2003;111:186–1870.
16. Finkelstein M, Jerrett M, DeLuca P, et al. A cohort study of income, air pollution and mortality. *Can Med Assoc J*. 2003;169:397–402.
17. Thomas DC, Stram D, Dwyer J. Exposure measurement error: influence on exposure—disease relationships and methods of correction. *Annu Rev Public Health*. 1993;14:69–93.
18. Künzli N, McConnell R, Bates D, et al. Breathless in Los Angeles: the exhausting search for clean air. *Am J Public Health*. 2003;93:1494–1499.
19. Diez Roux AV. A glossary for multilevel analysis. *J Epidemiol Community Health*. 2002;56:588–594.
20. Pickett KE, Pearl M. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health*. 2001;55:111–122.
21. Curtis S, Taket A. *Health and Societies: Changing Perspectives*. London: Edward Arnold; 1996.
22. Macintyre S, Ellaway A. Ecological approaches: rediscovering the role of the physical and social environments. In: Berkman L, Kawachi I, eds. *Social Epidemiology*. Oxford: Oxford University Press; 2000.
23. Evans GW, Kantrowitz E. Socioeconomic status and health: the potential role of environmental risk exposure. *Annu Rev Public Health*. 2002;23:303–331.
24. Willis A, Krewski D, Jerrett J, et al. Selection of ecologic covariates in the American Cancer Society study. *J Toxicol Environ Health*. 2003;66: 1591–1604.
25. Janssen N, Harssema H, Brunekreef B, et al. Assessment of exposure to traffic related air pollution of children attending schools near motorways. *Atmos Environ*. 2001;35:3875–3884.
26. Meng Q, Turpin B, Korn L, et al. Influence of ambient (outdoor) sources on residential indoor and personal $PM_{2.5}$ concentrations: analyses of RIOPA data. *J Expo Anal Environ Epidemiol*. 2005;15:17–28.
27. Luginaah I, Jerrett M, Elliott S, et al. Health profiles of Hamilton: characterizing neighbourhoods for health investigations. *GeoJournal*. 2001;53:135–147.
28. Krieger N, Chen JT, Waterman PD, et al. Geocoding and monitoring of US socioeconomic inequalities in mortality and cancer incidence: does the choice of area-based measure and geographic level matter? The public health disparities geocoding project. *Am J Epidemiol*. 2002;156: 471–482.
29. Burrough PA, McDonnell RA. *Principals of Geographical Information Systems*. Oxford University Press; 1998.
30. Bell ML, McDermott A, Zeger SL, et al. Ozone and short-term mortality in 95 US urban communities, 1987–2000. *JAMA*. 2004;292:2372–2378.
31. *First Edition TIGER/Line Technical Documentation: US Bureau of the Census Feature Class Codes (CFCC)*; 2004.
32. Hosmer W, Lemeshow S. *Applied Survival Analysis*. New York: Wiley and Sons; 1999.
33. Ma R, Krewski D, Burnett RT. Random effects Cox models: a Poisson regression modelling approach. *Biometrika*. 2003;90:157–169.
34. Goldberg MS, Burnett R, Bailar JC III, et al. The association between daily mortality and ambient air particle pollution in Montreal, Quebec. 2. Cause-specific mortality. *Environ Res*. 2001;86:26–36.
35. Abbey DE, Nishino N, McDonnell WF, et al. Long-term inhalable particles and other air pollutants related to mortality in nonsmokers. *Am J Respir Crit Care Med*. 1999;159:373–382.
36. Künzli N, Medina S, Kaiser R, et al. Assessment of deaths attributable to air pollution: should we use risk estimates based on time series or on cohort studies? *Am J Epidemiol*. 2001;153:1050–1055.
37. Mallick R, Fung F, Krewski D. Adjusting for measurement error in the Cox proportional hazards regression model. *J Cancer Epidemiol Prevent*. 2002;7:155–164.
38. Kim BM, Teffera S, Zeldin MD. Characterization of $PM_{2.5}$ and PM_{10} in the South Coast Air Basin of southern California: part 1—spatial variations. *J Air Waste Manag Assoc*. 2001;50:2034–2044.
39. Nafstad P, Lund Håheim L, Wisløff T, et al. Urban air pollution and mortality in a cohort of Norwegian men. *Environ Health Perspect*. 2004;112:610–615.
40. Nyberg F, Gustavsson P, Jarup L, et al. Urban air pollution and lung cancer in Stockholm. *Epidemiology*. 2000;11:487–495.
41. 1999 National Emission Inventory Documentation and Data—Final Version 3.0. (1999). US Environmental Protection Agency, Technology Transfer Network Clearinghouse for Inventories & Emissions Factors web site. Available at: http://www.epa.gov/ttn/chief/net/1999inventory.html. Accessed February 1, 2005.

0347

AUTHOR QUERIES

AUTHOR PLEASE ANSWER ALL QUERIES 1

AQ1— EDQ: Highest education degree for authros' not available

0348

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 21, 2004 VOL. 351 NO. 17

Exposure to Traffic and the Onset of Myocardial Infarction

Annette Peters, Ph.D., Stephanie von Klot, M.P.H., Margit Heier, M.D., Ines Trentinaglia, B.S., Allmut Hörmann, M.S., H. Erich Wichmann, M.D., Ph.D., and Hannelore Löwel, M.D., for the Cooperative Health Research in the Region of Augsburg Study Group

ABSTRACT

BACKGROUND

An association between exposure to vehicular traffic in urban areas and the exacerbation of cardiovascular disease has been suggested in previous studies. This study was designed to assess whether exposure to traffic can trigger myocardial infarction.

METHODS

We conducted a case–crossover study in which cases of myocardial infarction were identified with the use of data from the Cooperative Health Research in the Region of Augsburg Myocardial Infarction Registry in Augsburg, in southern Germany, for the period from February 1999 to July 2001. There were 691 subjects for whom the date and time of the myocardial infarction were known who had survived for at least 24 hours after the event, completed the registry's standardized interview, and provided information on factors that may have triggered the myocardial infarction. Data on subjects' activities during the four days preceding the onset of symptoms were collected with the use of patient diaries.

RESULTS

An association was found between exposure to traffic and the onset of a myocardial infarction within one hour afterward (odds ratio, 2.92; 95 percent confidence interval, 2.22 to 3.83; P<0.001). The time the subjects spent in cars, on public transportation, or on motorcycles or bicycles was consistently linked with an increase in the risk of myocardial infarction. Adjusting for the level of exercise on a bicycle or for getting up in the morning changed the estimated effect of exposure to traffic only slightly (odds ratio for myocardial infarction, 2.73; 95 percent confidence interval, 2.06 to 3.61; P<0.001). The subject's use of a car was the most common source of exposure to traffic; nevertheless, there was also an association between time spent on public transportation and the onset of a myocardial infarction one hour later.

CONCLUSIONS

Transient exposure to traffic may increase the risk of myocardial infarction in susceptible persons.

From the Institute of Epidemiology (A.P., S.K., M.H., I.T., H.E.W., H.L.) and the Institute for Health Economics (A.H.), GSF–National Research Center for Environment and Health, Neuherberg; and the Department of Epidemiology, Medical Faculty, Ludwig-Maximilians-Universität, Munich (H.E.W.) — all in Germany. Address reprint requests to Dr. Peters at the Institute of Epidemiology, GSF–National Research Center for Environment and Health, Ingolstädter Landstr. 1, 87564 Neuherberg, Germany, or at peters@gsf.de.

N Engl J Med 2004;351:1721-30.

0350

Table 3. Sensitivity Analyses of the Effect of Different Control-Selection Strategies on the Association of Exposure to Traffic and the Onset of a Myocardial Infarction (MI).*

Sensitivity-Analysis Model	Case Exposure	Control Exposure	No. of Patients	Odds Ratio (95% CI)
	hr before MI			
A†	1	24–71	625	2.92 (2.23–3.84)
B†	1	24–95	625	2.98 (2.27–3.90)
C†‡	1	24–95	404	3.47 (2.51–4.79)
D	1	25	613	2.86 (1.74–4.70)
E	1	25, 49, 73	623	3.11 (2.10–4.60)
F‡	1	25, 49, 73	407	3.50 (2.21–5.53)
G§	25	49	558	0.83 (0.45–1.52)
H§	49	73	451	1.69 (0.85–3.36)
I†§	25	49–72	579	1.20 (0.83–1.74)
J†§	73	25–48	458	0.94 (0.61–1.44)

* Complete sets of data were available for subjects in models C and F. For models B and E, all available data were used, but some values were missing. CI denotes confidence interval. Hour 0 is considered the time of the myocardial infarction.

† The analysis was adjusted for time of day with the use of 23 indicator variables, to control for the possible influence of circadian variation.

‡ There were no missing values in the control periods.

§ The analysis was performed for nonrisk periods (control periods defined a priori) to assess the potential for recall bias; in the absence of bias, the expected odds ratio was 1.00.

those younger than 60 (Table 4). Effect estimates were larger for subjects with diabetes and those who were unemployed, but only employment status significantly modified the association between the risk of a myocardial infarction and exposure to traffic. The frequency of exposure to traffic differed according to the time of day (morning, 8.3 percent; afternoon, 7.1 percent; and night, 0.9 percent; $P<0.001$) and according to day of the week (Monday, 6.0 percent; Tuesday, 5.8 percent; Wednesday, 5.7 percent; Thursday, 4.7 percent; Friday, 5.7 percent; Saturday, 4.4 percent; and Sunday, 2.9 percent; $P<0.001$). Only the time of day showed an effect modification of borderline significance (Table 4).

DISCUSSION

We observed an association between exposure to traffic while traveling in cars, buses, and trolley cars and while riding on a bicycle or motorcycle and the onset of a myocardial infarction within one hour afterward. Travel in a car was the most common source of exposure, but travel by public transportation was also associated with the onset of a myocardial infarction within one hour afterward.

We used a case–crossover design that made possible the assessment of transient risk factors — that is, risk factors that may trigger acute events in susceptible patients. These risk factors include strenuous exercise,[1-3] anger,[4] and the use of cocaine[5] or marijuana.[6] Transient risk factors have only a short-term effect, whereas chronic risk factors, such as smoking, the presence of dyslipidemia, and a sedentary lifestyle, which promote atherosclerosis and prothrombotic conditions and may result in an impaired myocardium, have a long-term effect and determine vulnerability to acute coronary events.[15]

By virtue of the case–crossover design, exposure during the case periods and the control periods was determined for the same individual subject. The strategy for selecting the control periods and the potential for recall bias are of primary concern in judging the validity of the analyses. We used data on activities in each hour from the hour of onset of the myocardial infarction up to 71 hours before onset that were collected by means of bedside interviews. We included multiple control periods and controlled for the time of day in multivariate analyses. The restriction of the comparison to periods at the same time of day was designed to control for circadian patterns, but if daily routines are slightly modified, the restriction might result in an underestimation of exposure to traffic during the control periods and might therefore lead to an overestimation of the effect of exposure, as suggested in the sensitivity analyses. The possibility that patients may have better recall of the hours before the onset of the myocardial infarction than of the days before the event cannot be excluded. Consequently, an underestimation of exposure to traffic during the control periods would have inflated the estimates of the effect of such exposure as a trigger in individual cases. Sensitivity analyses in which different control-selection strategies were applied showed remarkably similar results. Comparison analyses of traffic exposures at nonrisk periods (control periods defined a priori) suggested there was no substantial recall bias with regard to the periods 24 to 71 hours before the onset of the myocardial infarction.

In the case–crossover design, conditions that do not vary over time do not induce confounding. Other transient risk factors such as strenuous exercise or stress (e.g., anger) might confound the associations we observed. However, multivariate analyses

0351

Table 4. Subgroup Analyses of the Association of Exposure to Traffic with the Onset of the Myocardial Infarction (MI) within the Next Hour, with Case–Crossover Analyses Restricted to Activities within the Study Area.*

Characteristic	No. of Subjects (%)	Odds Ratio (95% CI)†	P Value	P Value for Heterogeneity of Subgroups
Total	625 (100)	2.92 (2.22–3.83)	<0.001	—
Male	474 (76)	2.59 (1.90–3.53)	<0.001	—
Female	151 (24)	4.51 (2.55–8.00)	<0.001	0.09
Age				
<60 yr	268 (43)	2.36 (1.59–3.51)	<0.001	—
≥60 yr	357 (57)	3.91 (2.66–5.73)	<0.001	0.07
Employment status				
Employed	246 (39)	2.20 (1.47–3.28)	<0.001	—
Not employed‡	379 (61)	4.20 (2.88–6.12)	<0.001	0.02
First MI	536 (86)	2.93 (2.20–3.92)	<0.001	0.92
Survival >28 days	621 (99)	2.94 (2.24–3.86)	<0.001	1.00
Other conditions				
Diabetes	130 (21)	4.63 (2.57–8.33)	<0.001	0.07
Hypertension	416 (67)	3.34 (2.38–4.67)	<0.001	0.21
Angina	148 (24)	4.07 (2.26–7.32)	<0.001	0.14
None	158 (25)	2.23 (1.31–3.82)	0.003	—
Located in Augsburg§	298 (48)	2.84 (1.88–4.29)	<0.001	0.55
Smoking status				
Current smoker	228 (36)	2.35 (1.47–3.76)	<0.001	—
Former smoker	185 (30)	2.73 (1.66–4.52)	<0.001	—
Nonsmoker	212 (34)	4.04 (2.54–6.43)	<0.001	0.25
Symptoms¶				
Symptoms recorded	152 (24)	2.31 (1.26–4.21)	0.007	—
No symptoms recorded	473 (76)	3.12 (2.30–4.24)	<0.001	0.38
Cold during the wk before MI				
Yes	40 (6)	5.48 (1.92–15.6)	0.002	—
No	585 (94)	2.83 (2.13–3.75)	<0.001	0.23
Time of day				
Morning (6 a.m.–12:59 p.m.)	241 (39)	3.58 (2.38–5.37)	<0.001	—
Afternoon(1 p.m.–8:59 p.m.)	192 (31)	3.03(1.95–4.70)	<0.001	—
Night (9:00 p.m.–5:59 a.m.)	192 (31)	1.03 (0.36–2.92)	0.96	0.09
Day of MI				
Monday	89 (14)	3.46 (1.69–7.06)	<0.001	—
Tuesday	80 (13)	1.62 (0.55–4.81)	0.38	—
Wednesday	84 (13)	3.63 (1.77–7.42)	<0.001	—
Thursday	85 (14)	2.96 (1.42–6.16)	0.004	—
Friday	101 (16)	2.97 (1.55–5.69)	0.001	—
Saturday	92 (15)	3.77 (2.00–7.14)	<0.001	—
Sunday	94 (15)	2.30 (1.05–5.04)	0.04	0.86

* Exposure to traffic comprises time spent in cars, on public transportation, and on motorcycles and bicycles. CI denotes confidence interval.

† The analyses were adjusted with the use of 23 indicator variables for time of day, to control for the potential influence of circadian variation.

‡ Retired persons and housewives were included in this group.

§ Patients were located within the boundaries of the city of Augsburg at all times in the case and control periods.

¶ Symptoms included angina pectoris, chest pain, cold sweat, dizziness, nausea, shortness of breath, vomiting, and unconsciousness.

involving information on other triggers did not produce evidence of strong within-person confounding. Strenuous activity was confirmed as a substantial risk factor for the onset of a myocardial infarction in this study, as suggested earlier.[1-3] Riding a bicycle might be considered strenuous activity; indeed, the risk estimates associated with the use of a bicycle were reduced when we controlled for exercise, but there was no change in the overall effect estimate for exposure to traffic. Studies that assessed the role of anger as a trigger for myocardial infarction identified major life events as potential triggers but not moderate levels of psychological stress,[4] which are instead related to an elevation in long-term risk.[16] The estimates for traffic exposure might be confounded by the stress associated with getting up in the morning, which is itself a risk factor for myocardial infarction.[2] Getting up in the morning was an independent risk factor in our study, but it did not confound the association between exposure to traffic and the onset of a myocardial infarction.

The association between exposure to traffic and the onset of a myocardial infarction was stronger in the subgroup of subjects who were unemployed than in the subgroup of those who were employed. This finding indicates that the associations we observed were not due to commuting regularly to work. The subjects in this study used a car for transportation most of the time. We had no data on whether the individual subject had been driving the car or on the reasons for driving. Driving in different volumes of traffic might also be a factor to consider. Unfortunately, data on the circumstances of driving could not be collected reliably in retrospective interviews. However, because the association was also observed for persons who used public transportation, it is unlikely that the effect is entirely attributable to the stress linked with driving a car. No evidence for a statistically significant effect modification according to the day of the week was observed, but the estimated risks were larger for morning and afternoon hours than for night hours, when the density of the traffic is low. When only subjects who had no typical or atypical symptoms during the four days before the onset of the myocardial infarction were considered, no difference in the estimates was observed. Therefore, the possible effects of car trips undertaken to consult a doctor because of an evolving myocardial infarction could be ruled out.

Subjects who had had nonfatal myocardial infarctions were recruited on the basis of the nearly complete records of a myocardial-infarction registry.[13] Of the cases of myocardial infarction included in this study, 8 percent were attributable to exposure to traffic. The subgroup analyses indicated that women, persons 60 years of age or older, and patients with diabetes are at higher risk for the onset of a myocardial infarction after exposure to traffic than are men, persons younger than 60 years of age, and persons without diabetes. These results suggest that other persons in the KORA registry who were unable to provide diary information and who were therefore not included in our study might have been more susceptible to the risk of myocardial infarction after exposure to traffic than the subjects who were included.

A rather crude measure of exposure to traffic was used in this study. Potentially, a combination of different factors, such as stress, noise, and traffic-related air pollution, may contribute to the observed associations. While persons are driving a car, symptoms of a possible arrhythmia may be common among those who are eligible for treatment with an implantable cardiac defibrillator.[17] Chronic exposure to stress and noise is a well-documented risk factor for cardiovascular diseases, since such exposure can lead to elevated stress hormone concentrations.[18] A recently published study from the Netherlands indicates that among people who live near major roads, the risk of death due to cardiopulmonary diseases is nearly twice as high as that among those who do not live near major roads.[9] An increase in the risk of death due to ischemic heart disease has been documented in those whose occupations expose them to traffic, such as police officers who regulate traffic.[19] The short-term health effects of air pollution on the cardiovascular system have been studied intensively in the past decade. Particulate matter is considered to be of primary concern.[20,21] Studies of exposure to ambient particles have indicated that passengers in cars and buses have a greater exposure than is measured at a distance of 100 m or more from vehicular traffic.[22,23] The concentrations of particulate matter varied according to the route and the density of the traffic and might resemble concentrations at urban curbsides. For people traveling by car or bus, exposure to particulates is about two times as high as for cyclists.[22,24-26] Although high rates of ventilation increase the amount of particles deposited in the airways,[22,25,26] cyclists may be able to leave congested situations (i.e., polluted microenvironments) more quickly than people in cars or buses.[22]

The disruption of a vulnerable but not necessarily stenotic atherosclerotic plaque in response to hemodynamic stress has been suggested as a mechanism that triggers a myocardial infarction; thereafter, the hemostatic and vasoconstrictive forces determine whether the resultant thrombus will become occlusive.[27] Particulate air pollution has been associated with transient increases in plasma viscosity,[28] acute-phase reactants,[29-31] and endothelial dysfunction,[32] as well as with altered autonomic control of the heart.[33-37] These changes have also been observed in healthy officers of the highway patrol in association with the concentration of particulate matter in their vehicles[38] and might be consistent with an increased risk of a myocardial infarction after a transient elevation in the concentrations of ambient particles in vulnerable subjects.[39]

Given our current knowledge, it is impossible to determine the relative contribution of risk factors such as stress and traffic-related air pollution. Nevertheless, patients who are at risk for acute coronary events are likely to profit from recent efforts to improve the air quality in urban areas with the use of cleaner vehicles and improved city planning.

Supported by a research agreement (98-4) with the Health Effects Institute, Boston, by the GSF–National Research Center for Environment and Health, Neuherberg, Germany, and by a grant (R-827354) from the Environmental Protection Agency (to Drs. Peters and Wichmann).

REFERENCES

1. Mittleman MA, Maclure M, Tofler GH, Sherwood JB, Goldberg RJ, Muller JE. Triggering of acute myocardial infarction by heavy physical exertion: protection against triggering by regular exertion. N Engl J Med 1993;329:1677-83.
2. Willich SN, Lewis M, Lowel H, Arntz HR, Schubert F, Schroder R. Physical exertion as a trigger of acute myocardial infarction. N Engl J Med 1993;329:1684-90.
3. Hallqvist J, Moller J, Ahlbom A, Diderichsen F, Reuterwall C, de Faire U. Does heavy physical exertion trigger myocardial infarction? A case-crossover analysis nested in a population-based case-referent study. Am J Epidemiol 2000;151:459-67.
4. Verrier RL, Mittleman MA. Life-threatening cardiovascular consequences of anger in patients with coronary heart disease. Cardiol Clin 1996;14:289-307.
5. Mittleman MA, Mintzer D, Maclure M, Tofler GH, Sherwood JB, Muller JE. Triggering of myocardial infarction by cocaine. Circulation 1999;99:2737-41.
6. Mittleman MA, Lewis RA, Maclure M, Sherwood JB, Muller JE. Triggering myocardial infarction by marijuana. Circulation 2001;103:2805-9.
7. Peters A, Dockery DW, Muller JE, Mittleman MA. Increased particulate air pollution and the triggering of myocardial infarction. Circulation 2001;103:2810-5.
8. Peters A, Pope CA III. Cardiopulmonary mortality and air pollution. Lancet 2002;360:1184-5.
9. Hoek G, Brunekreef B, Goldbohm S, Fischer P, van den Brandt PA. Association between mortality and indicators of traffic-related air pollution in the Netherlands: a cohort study. Lancet 2002;360:1203-9.
10. Bigert C, Gustavsson P, Hallqvist J, et al. Myocardial infarction among professional drivers. Epidemiology 2003;14:333-9.
11. Gustavsson P, Plato N, Hallqvist J, et al. A population-based case-referent study of myocardial infarction and occupational exposure to motor exhaust, other combustion products, organic solvents, lead, and dynamite. Epidemiology 2001;12:222-8.
12. Maclure M, Mittleman MA. Should we use a case-crossover design? Annu Rev Public Health 2000;21:193-221.
13. Lowel H, Lewis M, Hormann A, Keil U. Case finding, data quality aspects and comparability of myocardial infarction registers: results of a south German register study. J Clin Epidemiol 1991;44:249-60.
14. Mittleman MA, Maclure M, Robins JM. Control sampling strategies for case-crossover studies: an assessment of relative efficiency. Am J Epidemiol 1995;142:91-8.
15. Naghavi M, Libby P, Falk E, et al. From vulnerable plaque to vulnerable patient: a call for new definitions and risk assessment strategies: Part I. Circulation 2003;108:1664-72.
16. Williams JE, Paton CC, Siegler IC, Eigenbrodt ML, Nieto FJ, Tyroler HA. Anger proneness predicts coronary heart disease risk: prospective analysis from the Atherosclerosis Risk in Communities (ARIC) study. Circulation 2000;101:2034-9.
17. Akiyama T, Powell JL, Mitchell LB, Ehlert FA, Baessler C. Resumption of driving after life-threatening ventricular tachyarrhythmia. N Engl J Med 2001;345:391-7.
18. Ising H, Babisch W, Kruppa B. Noise-induced endocrine effects and cardiovascular risk. Noise Health 1999;1(4):37-48.
19. Forastiere F, Perucci CA, Di Pietro A, et al. Mortality among urban policemen in Rome. Am J Ind Med 1994;26:785-98.
20. Samet JM, Dominici F, Curriero FC, Coursac I, Zeger SL. Fine particulate air pollution and mortality in 20 U.S. cities, 1987–1994. N Engl J Med 2000;343:1742-9.
21. Pope CA III, Burnett RT, Thurston GD, et al. Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. Circulation 2004;109:71-7.
22. Adams HS, Nieuwenhuijsen MJ, Colvile RN, McMullen MA, Khandelwal P. Fine particle (PM2.5) personal exposure levels in transport microenvironments, London, UK. Sci Total Environ 2001;279:29-44.
23. Praml G, Schierl R. Dust exposure in Munich public transportation: a comprehensive 4-year survey in buses and trams. Int Arch Occup Environ Health 2000;73:209-14.
24. Bevan MAJ, Proctor CJ, Baker-Rogers J, Warren ND. Exposure to carbon monoxide, respirable suspended particulates, and volatile organic compounds while commuting by bicycle. Environ Sci Technol 1991;25:788-91.
25. van Wijnen JH, Verhoeff AP, Jans HW, van Bruggen M. The exposure of cyclists, car drivers and pedestrians to traffic-related air pollutants. Int Arch Occup Environ Health 1995;67:187-93.
26. Rank J, Folke J, Jespersen PH. Differences in cyclists' and car drivers' exposure to air pollution from traffic in the city of Copenhagen. Sci Total Environ 2001;279:131-6.
27. Muller JE, Abela GS, Nesto RW, Tofler GH. Triggers, acute risk factors and vulnerable plaques: the lexicon of a new frontier. J Am Coll Cardiol 1994;23:809-13.
28. Peters A, Döring A, Wichmann HE, Koenig W. Increased plasma viscosity during air pollution episode: a link to mortality? Lancet 1997;349:1582-7.
29. Peters A, Fröhlich M, Döring A, et al. Particulate air pollution is associated with an acute phase response in men. Eur Heart J 2001;22:1198-204.
30. Pekkanen J, Brunner EJ, Anderson HR, Tiittanen P, Atkinson RW. Daily concentrations of air pollution and plasma fibrinogen

0354

in London. Occup Environ Med 2000;57:818-22.
31. Schwartz J. Air pollution and blood markers of cardiovascular risk. Environ Health Perspect 2001;109:Suppl 3:405-9.
32. Brook RD, Brook JR, Urch B, Vincent R, Rajagopalan S, Silverman F. Inhalation of fine particulate air pollution and ozone causes acute arterial vasoconstriction in healthy adults. Circulation 2002;105:1534-6.
33. Pope CA III, Verrier RL, Lovett EG, et al. Heart rate variability associated with particulate air pollution. Am Heart J 1999;138:890-9.
34. Liao D, Creason J, Shy C, Williams R, Watts R, Zweidinger R. Daily variation of particulate air pollution and poor cardiac autonomic control in the elderly. Environ Health Perspect 1999;107:521-5.
35. Gold DR, Litonjua A, Schwartz J, et al. Ambient pollution and heart rate variability. Circulation 2000;101:1267-73.
36. Magari SR, Hauser R, Schwartz J, Williams PL, Smith TJ, Christiani DC. Association of heart rate variability with occupational and environmental exposure to particulate air pollution. Circulation 2001;104:986-91.
37. Pope CA III, Hansen ML, Long RW, et al. Ambient particulate air pollution, heart rate variability, and blood markers of inflammation in a panel of elderly subjects. Environ Health Perspect 2004;112:339-45.
38. Riediker M, Cascio WE, Griggs TR, et al. Particulate matter exposure in cars is associated with cardiovascular effects in healthy young men. Am J Respir Crit Care Med 2004;169:934-40.
39. Brook RD, Franklin B, Cascio W, et al. Air pollution and cardiovascular disease: a statement for healthcare professionals from the Expert Panel on Population and Prevention Science of the American Heart Association. Circulation 2004;109:2655-71.

0355

AJRCCM Articles in Press. Published on June 7, 2004 as doi:10.1164/rccm.200403-281OC

Title: Traffic-related air pollution near busy roads: the East Bay Children's Respiratory Health Study

Authors and Affiliations

Janice J. Kim [1], Svetlana Smorodinsky[1,2], Michael Lipsett[1,2], Brett C. Singer[3], Alfred T. Hodgson[3], Bart Ostro[1*]

[1]Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, Oakland, CA

[2] current affiliation: California Department of Health Services, Oakland, CA

[3]Atmospheric Sciences Department and [3]Indoor Environment Department, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, Berkeley, CA

***Corresponding author:**
Bart Ostro, Ph.D.
Office of Environmental Health Hazard Assessment
1515 Clay Street, 16th Floor, Oakland, CA 94612
Telephone: (510) 622-3157
Fax: (510) 622-3210
Email: Bostro@oehha.ca.gov

The contents and opinions expressed in this manuscript are those of the authors and do not represent the official position of the Office of Environmental Health Hazard Assessment, the California Environmental Protection Agency, or the California Department of Health Services.

Running title: Traffic and respiratory health

Source of support (grants, gifts, equipment and/or drugs) : not applicable
Subject Category: # 118 (Environmental and Occupational Health: Air Pollution)

Word Count (body):3390

This article has an online data supplement, which is accessible from this issue's table of contents online at www.ats.journals.org.

0358

Abstract

Recent studies, primarily in Europe, have reported associations between respiratory symptoms and residential proximity to traffic; however, few have measured traffic pollutants or provided information about local air quality. We conducted a school-based cross-sectional study in the San Francisco Bay Area in 2001. Information on current bronchitis symptoms and asthma, home environment, and demographics were obtained by parental questionnaire (n=1,109). Concentrations of traffic pollutants (particulate matter (PM_{10}, $PM_{2.5}$), black carbon (BC), and nitrogen oxides (NO_X and NO_2)) were measured at ten school sites during several seasons. Although pollutant concentrations were relatively low, we observed differences in concentrations between schools nearby versus those more distant (or upwind) from major roads. Using a two-stage multiple logistic regression model, we found associations between respiratory symptoms and traffic-related pollutants. Among those living at their current residence for at least one year, the adjusted odds ratios (OR) for asthma in relation to an interquartile difference in NO_X were OR = 1.07; (95% confidence interval, 1.00-1.14). Thus, we found spatial variability in traffic pollutants and associated differences in respiratory symptoms in a region with good air quality. Our findings support the hypothesis that traffic-related pollution is associated with respiratory symptoms in children.

Word count: 196

Suggested MeSH: Air Pollution, Vehicle Emissions, Asthma, Bronchitis, Epidemiology

0359

Introduction

Numerous epidemiological studies have documented adverse effects of air pollution on health. (1) The majority of these population-based studies have used pollutant concentrations measured at central monitoring sites to estimate exposures and have not, in general, considered local spatial variability in pollutant levels. However, motor vehicle emissions, the principal source of ambient air pollution in most urban areas, are likely to vary substantially within a given community, and researchers have begun to document differences in traffic-related pollutants on a neighborhood scale.(2,3)

Recently, a number of epidemiological studies have reported associations between residential proximity to busy roads and a variety of adverse respiratory health outcomes in children, including respiratory symptoms, asthma exacerbations, and decrements in lung function.(4-10) In some reports, truck traffic has been more strongly associated with these adverse outcomes than total vehicular traffic. (6,7,10) (11)

Most studies have used metrics of proximity to traffic as surrogates of exposure to traffic pollution (e.g., residential proximity to major roads, traffic volume at the nearest road, or modeled levels of traffic pollution). Few have measured pollutant concentrations as part of the exposure assessment or provided information on local air quality. (7,10,12) (11) The majority of studies have been conducted in Europe and Japan, where fleet composition (diesel vs. gasoline), emissions factors, fuel specifications, land use, and population distributions near busy roads differ from those in the U.S. Regional and micro-environmental concentrations of particulate matter may be higher in European cities compared with many parts of the United States.(13) Therefore, it is important to evaluate the extent to which proximity to traffic may be associated with health impacts in the United States. Previous studies in the U.S. were conducted in areas of Southern California and the Northeast with significant local air quality problems; both used metrics of proximity to traffic, not measured pollutant concentrations.(8) (14)

The objective of this study was to explore associations between respiratory symptoms and exposures to traffic-related air pollutants among children living and attending schools near busy roads in an urban area with high traffic density, but good regional air quality. Some of the results of these studies have been previously reported in the form of abstracts.(15)

Methods: (word count 552)

Study design and health assessment

We conducted a school-based cross-sectional study in the San Francisco metropolitan area (Alameda County, California) in 2001. The study area was comprised of ten neighborhoods that span a busy traffic corridor. School sites were selected to represent a range of locations upwind and downwind of major roads (Figure 1).

In Spring 2001, we enrolled children (Grades 3-5) in participating classes (n=64) using methods similar to those used in other school-based studies. (16)(17,18) We obtained information on health outcomes (bronchitis symptoms in the past 12 months and physician-confirmed asthma in the past 12 months), demographics, home environmental factors and activity factors using parental questionnaires (English and Spanish).(16-18) For additional information on the study design and health assessment, see the online supplement.

The study protocol was approved by the Committee for the Protection of Human Subjects, California Health and Human Services Agency.

Air Pollution from Traffic:

We measured concentrations of traffic pollutants (particulate matter (PM_{10}, $PM_{2.5}$), black carbon (BC), and nitrogen oxides (NO_X and NO_2)) at the school sites. PM_{10} and $PM_{2.5}$ mass concentrations were measured using filter-based samples, while BC concentrations were determined on the PM_{10} filter samples using an established light attenuation method that we validated for fiberfilm filters.(19) (20) NO_X and NO_2 concentrations were determined with passive diffusion samplers (Ogawa, Inc., USA). Nitric oxide (NO) concentrations were calculated as the difference between NO_X and NO_2.

Pollutant monitoring was conducted simultaneously at all school sites for 11 one-week intervals in the spring (March - June) and for eight weeks in the fall (September-November) of 2001. NO_X and NO_2 were sampled during all weeks at each school. PM_{10} and $PM_{2.5}$ and the BC concentrations were not measured every week. Study-averaged air pollution concentrations were calculated at each school by first normalizing the data to account for occasional missing values. Additional details are described in the online data supplement and elsewhere.(21)

In preliminary analyses, we also used school location in relation to prevailing winds and proximity to busy roads as an additional traffic metric. .

Data Analysis

We examined associations between pollutants and health outcomes using a two-stage hierarchical modeling strategy. This method has been used in other epidemiological studies of air pollution when pollutants were measured at the group level.(22) (18) In our study, the exposure groups are represented by the neighborhood schools. In the first stage, we initially identified potential confounders (demographic, host, or home environmental variables) associated with health outcomes in this dataset. We then performed exploratory stepwise logistic regressions to develop a model in which individual-level characteristics best predicted the odds of each health outcome. Explanatory variables that remained significant at $p<0.15$ were retained in the model. We then fit a logistic regression model that included an indicator variable for each school in addition to the individual-level covariates.

In the second stage, the adjusted school-level logits or prevalence rates determined in the first stage were regressed on the school-specific ambient pollutant concentrations. In this manner, we obtained the log odds ratios relating asthma or bronchitis symptoms to air pollution, after adjusting for individual-level risk factors.

We calculated adjusted odds ratio(s) (ORs) for a change in measured pollutant concentration equal to the interquartile ranges (IQR) of the pollutant distributions. Analyses were conducted using SAS version 8.2 for Windows (Cary, NC) and STATA version 8 (College Park, TX).

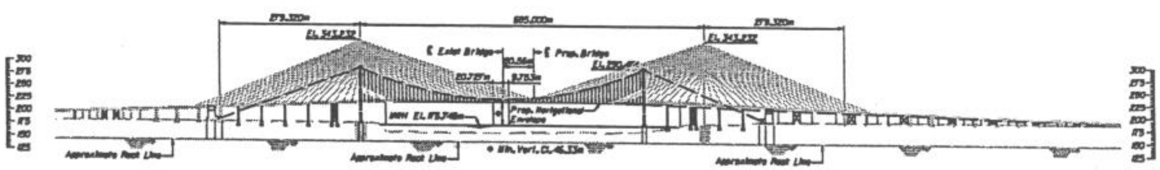
Results

We distributed 1,574 questionnaires in 64 participating classrooms in the 10 schools. Three children were excluded because their parents spoke neither English nor Spanish. Among the remaining students, there was a response rate of 70.7 % (1,111/1,571). Participation rates across schools ranged from 61 to 83%. Approximately 30% completed the questionnaire in Spanish. Two children with reported cystic fibrosis were excluded from the analysis. The final analysis sample consisted of 1109 questionnaires.

Table 1 summarizes the participants' demographic characteristics, prevalence of selected personal and home environmental characteristics and respiratory health outcomes. Our study population was racially diverse. About 30% of households had incomes below the federal poverty line. Fourteen percent of the parental respondents reported having been told by a doctor that their child had asthma in the preceding 12 months. This represents a measure of period prevalence of asthma and would include some incident cases. Twelve percent of children had bronchitis symptoms in the past year. Of those reporting bronchitis symptoms in the past 12 months, 43% also reported having asthma. Using a slightly different definition of asthma (physician-diagnosed ever, and asthma symptoms, including wheezing, in the past 12 months), 11 % of our study population had current asthma.

The estimated pollutant concentrations at the schools are summarized in Table 2. Concentrations of several pollutants (i.e., BC, NO_X, NO and, to a lesser extent, NO_2) were higher at schools located within 300 meters downwind of a freeway compared to those at schools upwind or further from major traffic sources. There was less variation in $PM_{2.5}$ and PM_{10}. Concentrations of BC, NO_X, and NO were highly correlated ($r^2 \sim 0.9$ for each inter-pollutant correlation). The study average $PM_{2.5}$ (12 $\mu g/m^3$) was similar to the annual average concentration of $PM_{2.5}$ at the central monitoring station, located approximately 15 kilometers south of the study area. NO_X and NO_2 measurements at the school sites away from traffic were similar to levels measured at the regional site. (21).

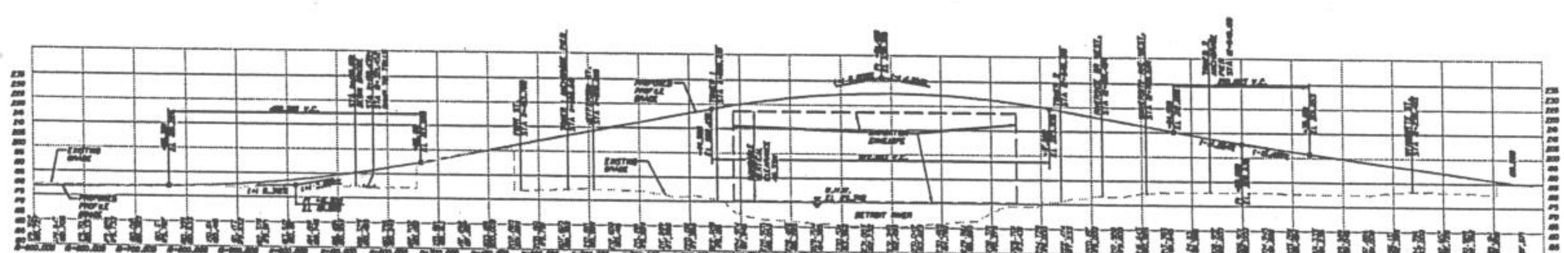
Table 3 summarizes the results of the two-stage hierarchical logistic regression models of the odds of asthma and bronchitis symptoms in the previous year in relation to six different pollutants, each examined in separate regressions. Results are shown for all subjects, for long-term residents only (one year or longer at the current address), and for the latter group stratified by gender. In addition to the traffic metric, explanatory variables retained in all the final models for asthma and bronchitis included chest illness before age two, household mold/moisture, and pests observed in the home in the preceding 12 months. The final models for asthma also included maternal history of asthma. Addition of other potential confounders such as race/ethnicity, socioeconomic variables, maternal smoking during pregnancy, current smoker in the home, air conditioning, and gas stove use, yielded similar pollutant effect estimates.



LEGEND

3 LANE CABLE STAY

RELOCATED HURON CHURCH ROAD



American Consulting Professionals of Michigan, PLLC

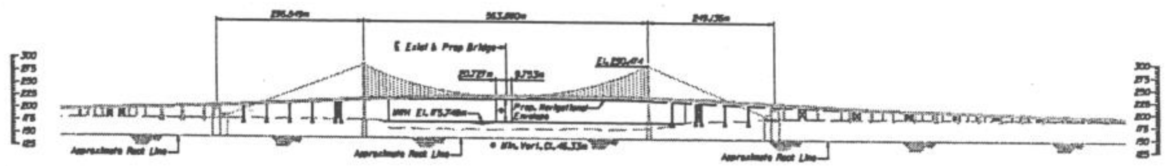
AMBASSADOR

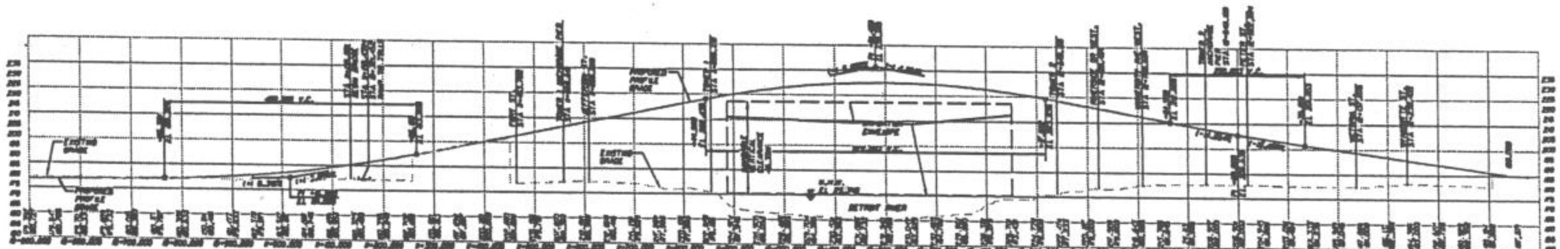
AMBASSADOR BRIDGE ENHANCEMENT PROJECT
3 LANE CABLE STAY BRIDGE (EAST SIDE)

SHEET NO.
ALT. 3

LEGEND

3 LANE SUSPENSION BRIDGE



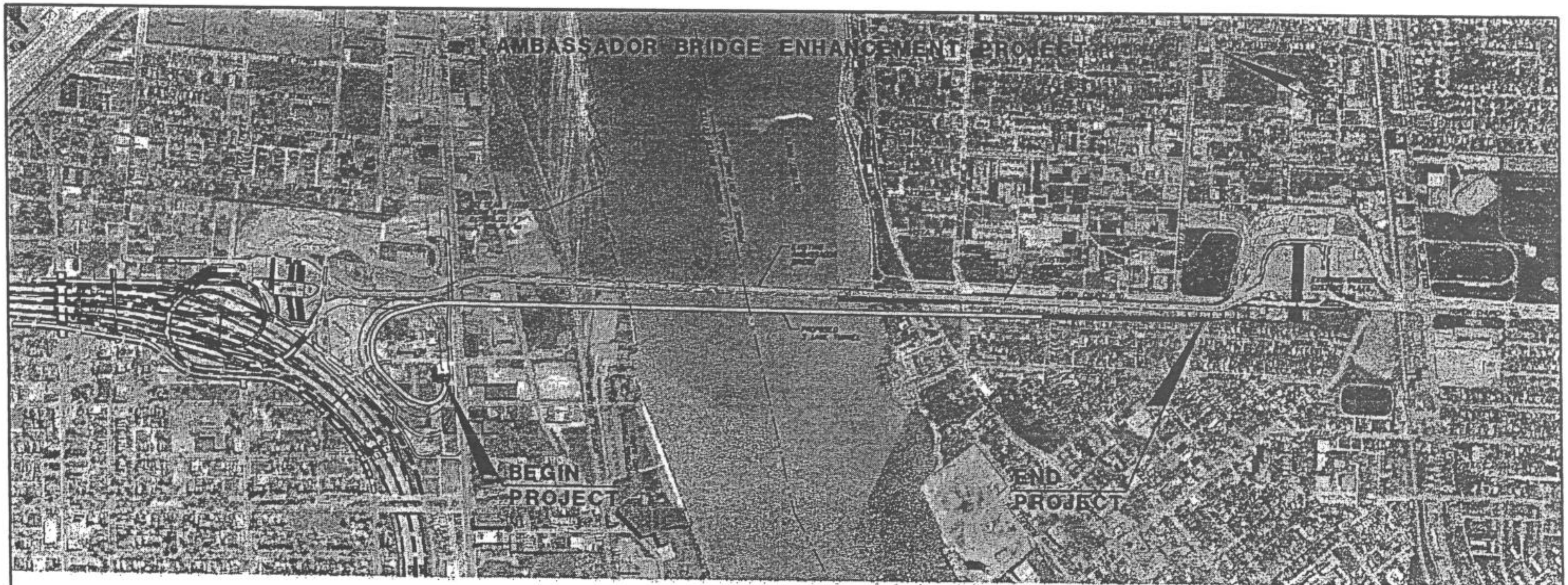


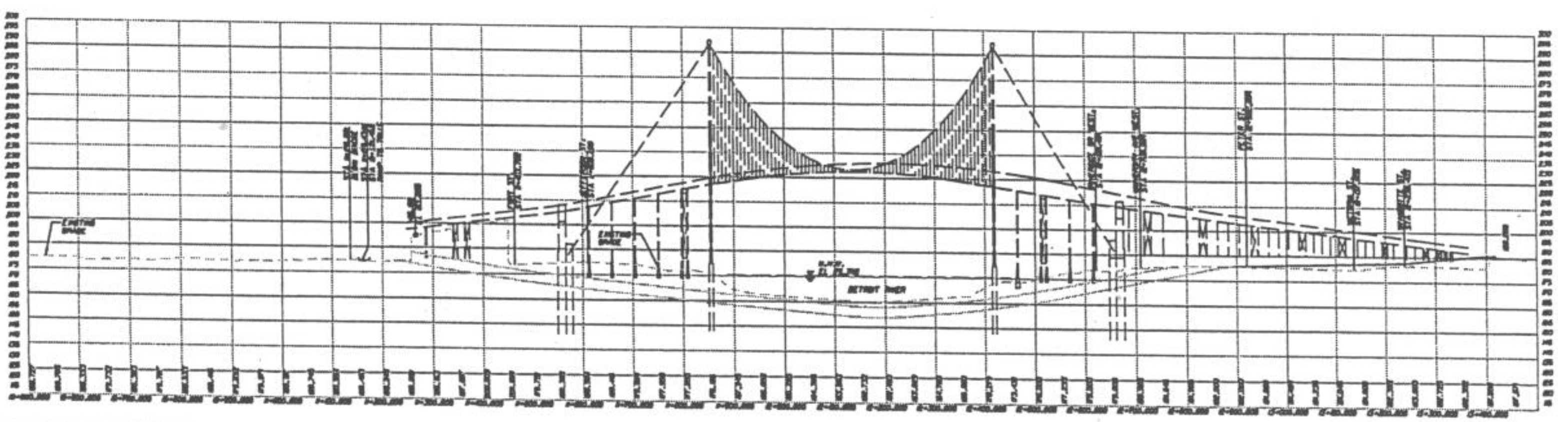
American Consulting Professionals of Michigan, PLLC

AMBASSADOR

AMBASSADOR BRIDGE ENHANCEMENT PROJECT
3 LANE SUSPENSION BRIDGE (WEST SIDE)

SHEET NO.
ALT. 4





LEGEND

3 LANE TUNNEL

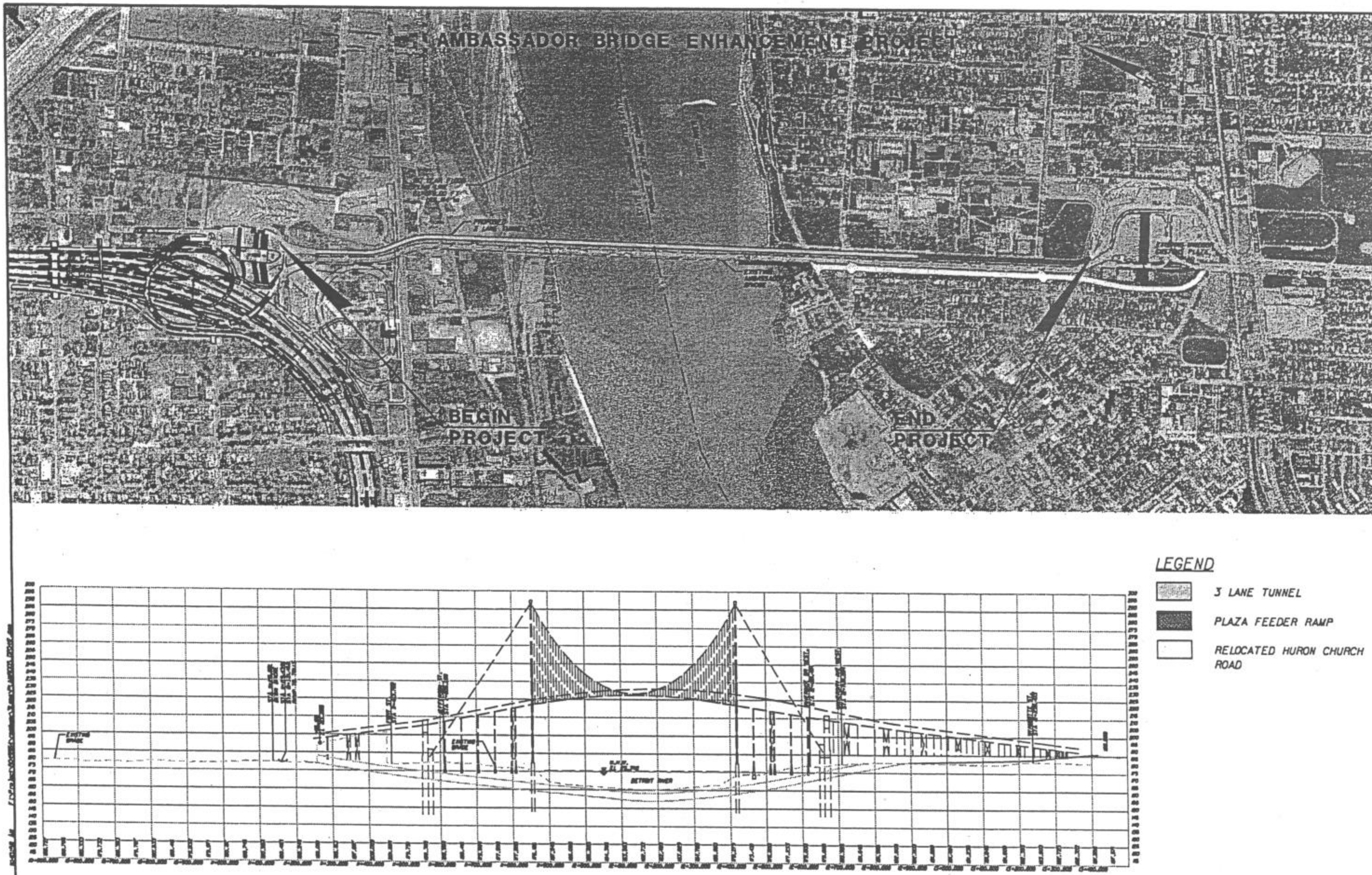
PLAZA FEEDER RAMP

American Consulting Professionals of Michigan, PLLC

AMBASSADOR

AMBASSADOR BRIDGE ENHANCEMENT PROJECT
3 LANE TUNNEL (WEST SIDE)

SHEET NO.
ALT. 6



AMBASSADOR BRIDGE ENHANCEMENT PROJECT
3 LANE TUNNEL (EAST SIDE)

SHEET NO.
ALT. 7

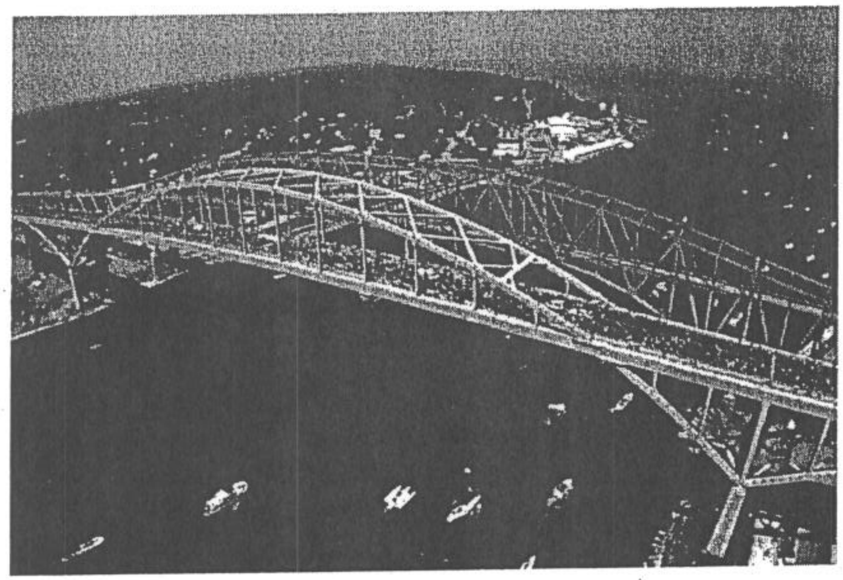
0278

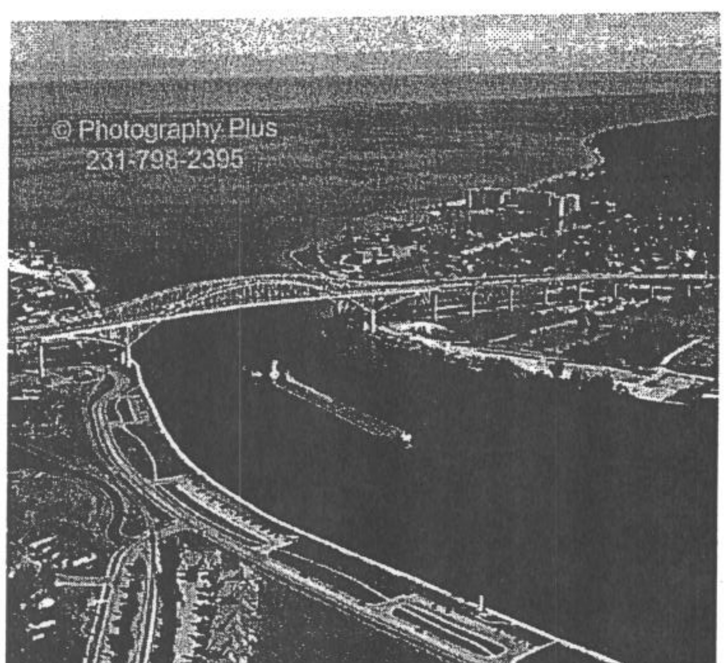
PRECEDENCE

Blue Water Bridge, Port Huron Michigan

http://www.bwba.org/frames.html
http://www.fhwa.dot.gov/eihd/2bluewb.htm

The original Blue Water Bridge was built in 1938 and is a highly visible historic landmark that carries I-94 across the St. Clair River to Canada. A comprehensive public participation program considered various alternatives and recommended a continuous tied arch design. The selection complemented the original bridge without compromising its historical integrity.





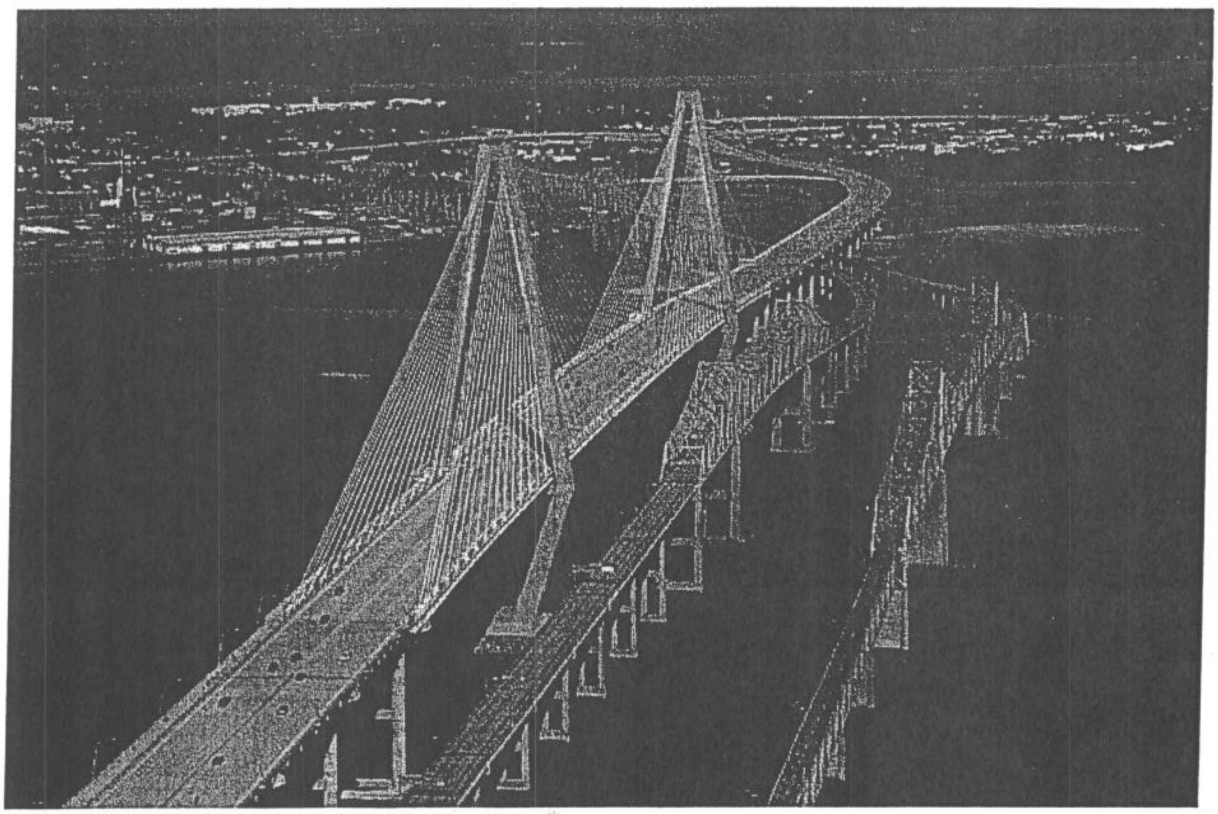
http://www.photography-plus.com/image_pages/PortHuron.htm

0279

Arthur Ravenel Jr. Bridge, Charleston South Carolina

http://www.charlestonwiki.org/Arthur_Ravenel_Bridge
http://frank.itlab.us/bridge/Modern_Steel_Construction_ravenel_bridge.pdf

The dramatic Cooper River Bridge—the longest cable-stayed bridge in North America—opened in July 2005 a year ahead of schedule, saving the South Carolina Department of Transportation (SCDOT) an estimated $150 million. The approximately three-mile-long bridge, including the main span, high level approaches, ramps and interchanges, was designed and constructed in a four year period. The bridge's main span allows for both a widening of the navigation channel to 1,000' and a deepening of the dredged depth of 10' to accommodate larger shipping vessels. The project, which is the largest single transportation infrastructure project in the state's history, evolved from studies that began in 1988 to address the need to replace the deficient 1929 John P. Grace Memorial and 1966 Silas N. Pearman bridges between Charleston and Mount Pleasant. Also, there was a more recent need to improve shipping clearances in the upper reaches of Charleston Harbor.



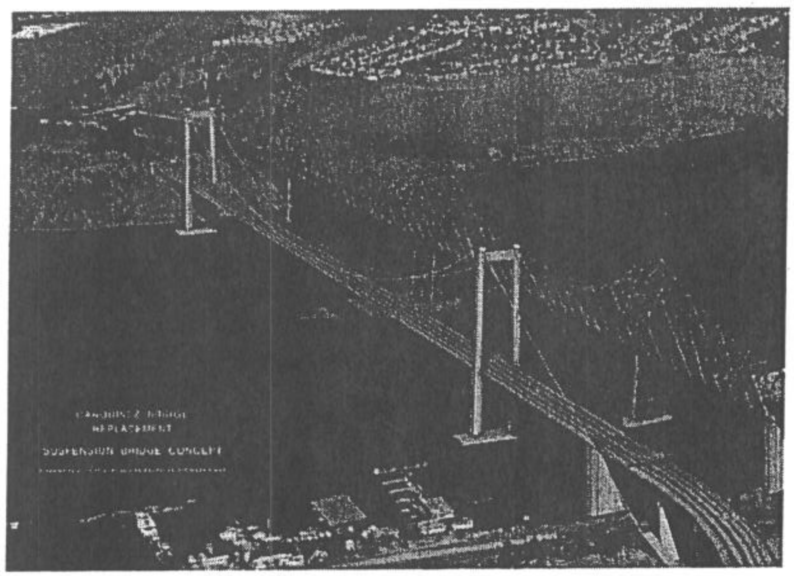
0280

Carquinez Strait Bridge, California

http://www.ketchum.org/carquinez.html

The Carquinez Bridge refers to parallel bridges which cross the Carquinez Strait linking Vallejo, California to the north, with Crockett, California to the south. The original bridge, a steel cantilever bridge, was designed by Robinson & Steinman and dedicated on May 21, 1927. It cost $8 million to build and was the first major bridge in the San Francisco Bay Area.[1]

In 2003, as a resolution to seismic problems of the aging 1927 span, a new suspension bridge was opened to replace it. This new bridge was named the Alfred Zampa Memorial Bridge, after an ironworker who worked on a number of the San Francisco Bay Area bridges, including the Golden Gate Bridge. This span features a pedestrian and bicycle path, completing a bike trail which circles the entire Bay Area. The span measures 0.66 miles (3465 feet / 1056.1 m / 1.06 km). The bridge was dedicated on November 8, 2003 and opened for traffic on November 11. It is the newest suspension bridge built in the United States, as of 2003.

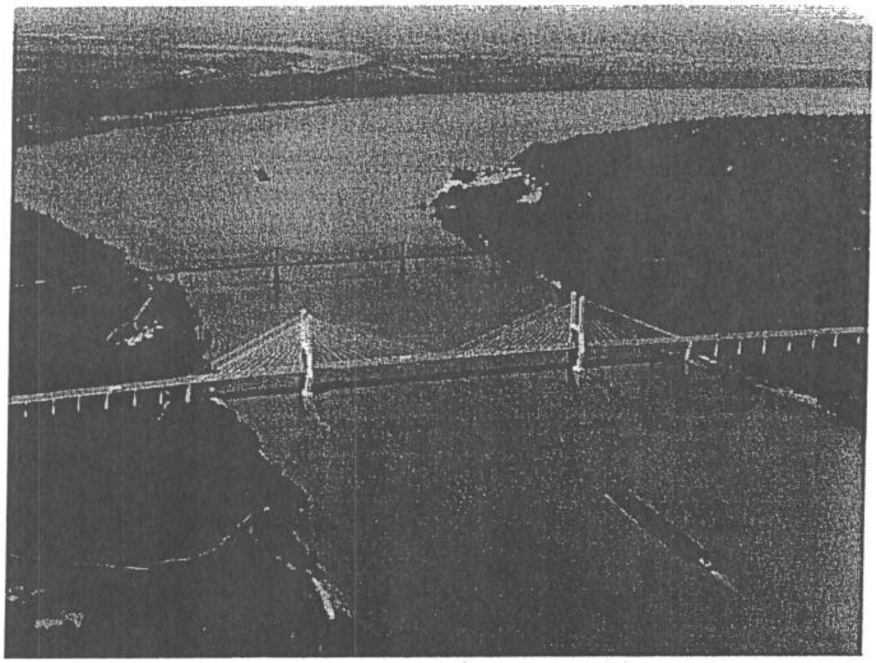


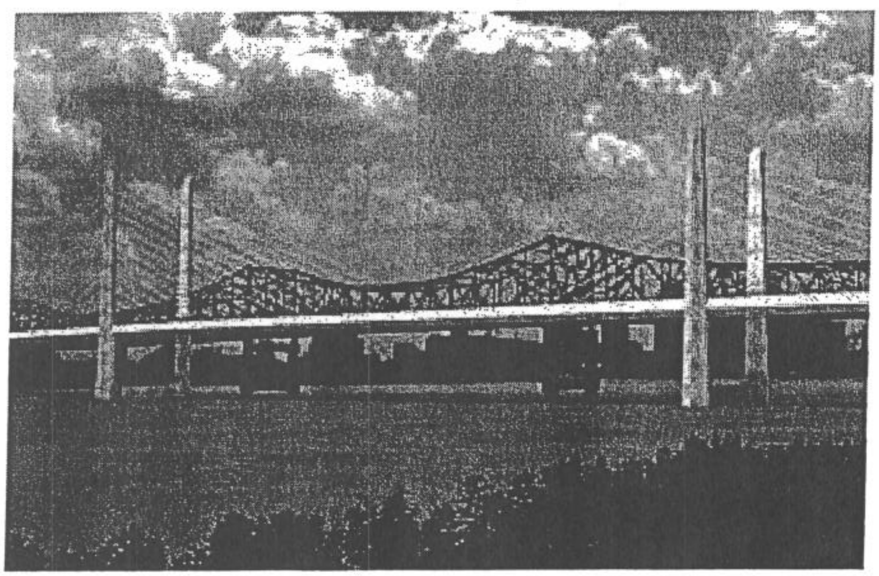
0281

US 82 Greenville Bridge, Mississippi

http://bridgepros.com/projects/Greenville/
http://www.greenvillebridge.com/2b_2006.htm

As steel through-truss bridges were the preferred design when the first Greenville Bridge was constructed, the cable stayed bridge is a popular choice today. Many of the newest bridges in the country and along the Mississippi River are cable stayed designs. Steel truss bridges and cable stayed bridges both represent the best technology and the best economy of their times.



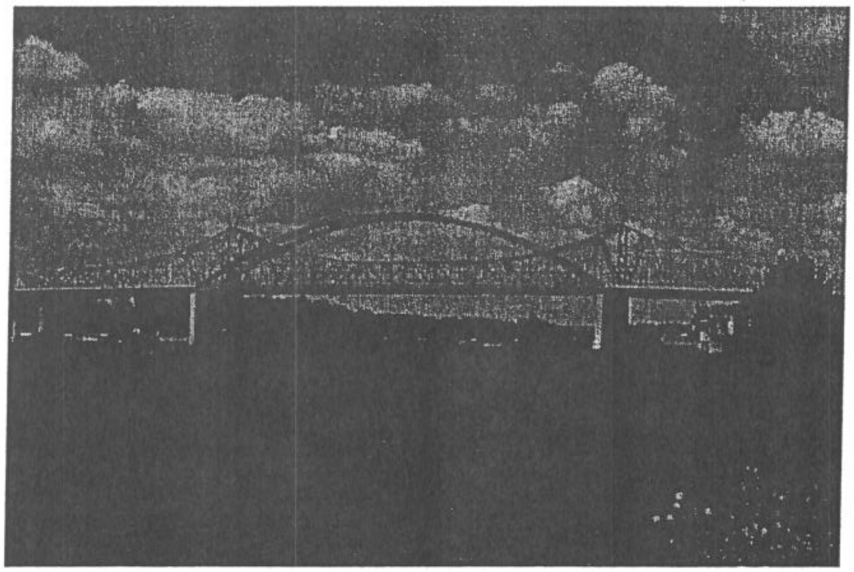


0282

La Crosse Bridge, Wisconsin

http://www.johnweeks.com/upper_mississippi/pagesA/umissA05.html

There are two bridges at this crossing. The older steel truss bridge is known as the Cass Street Structure. The new steel arch bridge was added in 2005. It is known as the Cameron Avenue Structure. Together, they are called The Mississippi River Bridge. The 87 foot tall arch for the Cameron Avenue bridge was built in a drydock downstream and floated into place. This allowed the main channel to remain open for shipping during construction. The Cass Street bridge is being rehabilitated during 2005 and 2006, with all traffic routed on the Cameron Avenue bridge during the project.



0283

Veterans Memorial - Rainbow Bridges

http://en.wikipedia.org/wiki/Rainbow_Bridge_(Texas)
http://www.answers.com/topic/rainbow-bridge-texas

Rainbow Bridge

Rainbow Bridge is a cantilever bridge crossing the Neches River in Southeast Texas (29.9805 - 93.8703) just upstream from Sabine Lake. It allows State Highway 87 and State Highway 73 to connect Port Arthur in Jefferson County on the southwest bank of the river with Bridge City in Orange County on the northeast bank.

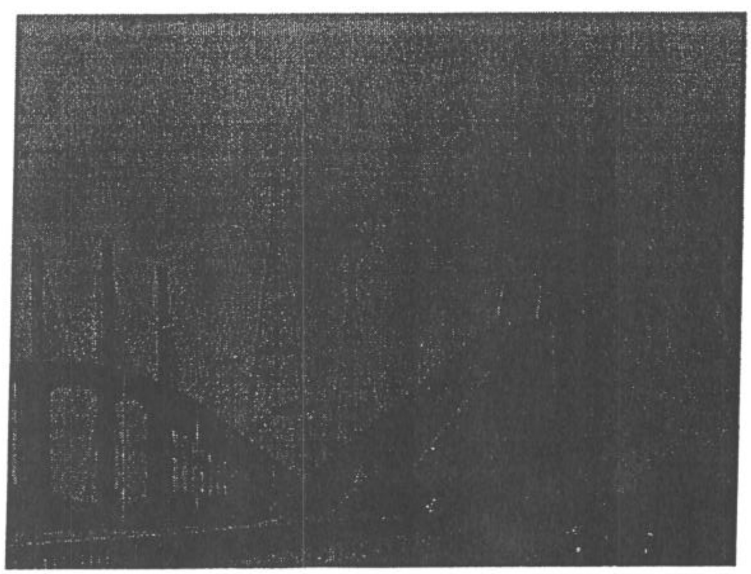
Construction on the bridge began in 1936 under the guidance of the Texas State Highway Department. Due to concerns by the upstream city of Beaumont about the bridge posing a threat to ship navigation, the Rainbow Bridge was built with a 680 foot (210 m) main span. In addition, it has a vertical clearance of 177 feet (54 m)[1], which was intended to allow the tallest ship in the US Navy, the USS Patoka, passage under the bridge.

The bridge was completed on September 8, 1938. The nearby town of Prairie View took on the name "Bridge City" in response. Initially named the "Port Arthur-Orange Bridge", it received its current name in 1957. The bridge was listed in the National Register of Historic Places in 1996.

The USS Patoka never sailed the Neches River. The Rainbow Bridge remains the highest bridge in Texas [2].

Veterans Memorial Bridge

In 1988, construction began on the Veterans Memorial Bridge, the first cable-stayed bridge in Texas. This bridge runs parallel to the Rainbow Bridge, and was dedicated on September 8, 1990. With a vertical clearance of 143 feet (43.5 m), the bridge is somewhat shorter than its neighbor [3]. After the completion of the Veterans Memorial Bridge, the Rainbow Bridge was closed for renovations. On its re-opening in 1997[citation needed], the Rainbow Bridge became one way, handling southbound traffic only. The Veterans Memorial Bridge serves northbound traffic [4].



0284

KEEPING UP WITH TECHNOLOGY

Bridge building has had two time periods that can be looked at as golden ages. The first is in the late 19th century as the explosive growth of the railroads resulted in building a large number of big metal monsters to cross the untamed rivers of both the US and Europe. Prime examples of these include the Eads Bridge in St. Louis, and the Forth Rail Bridge over the Firth Of Forth near Edinburgh, Scotland.

The second golden age of bridge construction was in the middle half of the 20th century as many monumental suspension bridges were built. These were all national landmarks, giant works of industrial art, and epic construction projects. This was an era when technologies and materials were rapidly advancing, but modeling, testing, and computers were still decades in the future. This era saw successes like the Golden Gate Bridge and Oakland Bay Bridge, both in San Francisco, and colossal failures like the Tacoma Narrows Bridge.

Following World War II, Europe needed to build a large number of big bridges very quickly in order to get its economy back up and running. Steel was in short supply, so large metal bridges were out of the question. Suspension bridges were too costly, in both time and materials, so they were not practical to construct. This left a major issue of how to build badly needed bridges with resources that were available at the time.

To solve this problem, transportation engineers developed the Cable Stayed Bridge. In a cable stayed bridge, the roadway is supported by cables that run directly to the suspension towers. This differs from a suspension bridge in that a suspension bridge has a suspension cable that runs from tower to tower, and the roadway is carried by down cables that link to the suspension cable. A cable stayed bridge has only one set of cables. This results in a bridge that is relatively lightweight in construction, is far less costly than a metal cantilever brides, and uses far less cable than a suspension bridge. These advantages result in a far less costly bridge that can still span a surprisingly long distance.

Source: North American - Cable Stayed Bridge Registry - Maintained By John Weeks

0285

NPS GUIDANCE ON ADDITIONS TO HISTORIC STRUCTURES

A new addition should be constructed in a manner that preserves significant materials and features and preserves the historic character. Finally, an addition should be differentiated from the historic building so that the new work is not confused with what is genuinely part of the past.

A project involving a new addition to a historic building is considered acceptable within the framework of the National Park Service's standards if it:

Preserve Significant Historic Materials and Features.

- Avoid constructing an addition on a primary or other character- defining elevation to ensure preservation of significant materials and features.
-
- Minimize loss of historic material comprising external walls and internal partitions and floor plans.

Preserve the Historic Character

- Make the size, scale, massing, and proportions of the new addition compatible with the historic building to ensure that the historic form is not expanded or changed to an unacceptable degree.
- Place the new addition on an inconspicuous side or rear elevation so that the new work does not result in a radical change to the form and character of the historic building.
- Consider setting an infill addition or connector back from the historic buildings wall plane so that the form of the historic building--or buildings--can be distinguished from the new work.
- Set an additional story well back from the roof edge to ensure that the historic building's proportions and profile are not radically changed.

Protect the Historical Significance--Make a Visual Distinction between Old and New

- Plan the new addition in a manner that provides some differentiation in material, color, and detailing so that the new work does not appear to be part of the historic building. The character of the historic resource should be identifiable after the addition is constructed.

Source: US Department of the Interior National Park Service Technical Preservation Services briefing Number 14, 1986.

0286

SIERRA CLUB
FOUNDED 1892

[redacted]
U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

September 13, 2006

Dear [redacted]

Thank you for the opportunity to comment on the Detroit International Bridge Company's ("DIBC") permit application to build a second span of the Ambassador Bridge ("Bridge"). The Sierra Club is a nation-wide grassroots environmental organization dedicated to protecting our communities. The Sierra Club and its members in the Detroit metropolitan area are concerned about the environmental impacts of a second span of the Ambassador Bridge. These concerns are discussed below and are supported by applicable law or findings where necessary. We believe that this project has potentially significant environmental impacts rendering it ineligible for a categorical exclusion from the requirements of the National Environmental Policy Act ("NEPA"). Due to the fact that this project would have potentially significant impacts, the United States Coast Guard should conduct an environmental assessment to determine the extent of those impacts and should move forward as required by law in addressing those impacts through mitigation or further environmental impact review.

The proposed "Ambassador Bridge Enhancement Project" involves a second bridge span between Detroit, MI and Windsor, Ontario, adding six lanes to the existing four. In their "Preliminary Review Permit Application" the project proponent, DIBC has concluded that there will be no potentially significant environmental impacts resulting from this new bridge and that the project is thus qualified for a Categorical Exclusion ("CatEx") exempting it from environmental review. This conclusion is incorrect and without merit. The permit application is filled with conclusory terms and lacks sufficient analysis or detail to support a finding of no impact.

In filling out the "CatEx Checklist," DIBC answered "NO" to every question asking whether this project would have an adverse environmental impact.[1] Several of these answers are misleading and false and do not give appropriate consideration of the project impacts. DIBC's

[1] Coast Guard CatEx Checklist. Exhibit A.

0287

answers should be discarded upon further review. Below is an accurate and more comprehensive answer to the checklist questions suggesting that the correct answer to many of them is actually "YES" and at the very least, more data is needed to make a reasoned decision. Further review suggests that there are potentially significant environmental impacts that would result from this project and that a CatEx is not applicable.

a. **Checklist Question A:** ***Is the action likely to be inconsistent with any applicable Federal, State, Indian tribal, or local law, regulation or standard designed to protect any aspect of the environment?***

The Coast Guard should not rely on DIBC's promise that this project will not have any air quality impacts or increased traffic volumes. As we discuss in great detail below under Question D, there are potentially significant air quality impacts that will result from this project as well as increased traffic volume. Given our response to Question D below, it seems appropriate that more information and analysis will be necessary to determine whether further compliance with Federal, State, Indian tribal or local law, regulations or standards will be required. In particular, a local "Hot-Spot" analysis might be required as well as compliance with Federal and State air quality regulations and a conformity determination by the South East Michigan Council of Governments ("SEMCOG").

When considering the relevant environmental standards, the Coast Guard should also consider the standards set by the Environmental Protection Agency for $PM_{2.5}$ non-attainment areas. We have pointed out below that the Detroit area has been designated as a non-attainment area for the national standards for fine particulates. When an area is designated in non-attainment, certain transportation projects must undergo a review for localized impact for $PM_{2.5}$ also known as a "HotSpot" analysis.[2] This standard was developed by the Environmental Protection Agency to ensure that areas that have failed to attain national standards are reviewing projects that may exacerbate the negative impact of that pollutant on air quality and human health. This standard should not be ignored as the Coast Guard reviews the application for a permit for the expansion of the Ambassador Bridge. Due to the 150% increase in the size of the existing Bridge and the correlation between traffic and $PM_{2.5}$, the Coast Guard must consider the potential impact of $PM_{2.5}$ emissions from the project, their effects on nearby communities, and their impact on the ability of the region to attain the $PM_{2.5}$ NAAQS. The federal $_{2.5}$ hotspot analysis is a relevant standard to apply.

b. **Checklist Question B:** ***Is the action likely to have results that are inconsistent with locally desired social, economic, or other environmental conditions?***

The Coast Guard needs more data before accepting DIBC's answer of "NO" to this question. The purposes of NEPA are to ensure that environmental information is available to the public before decisions are made and before action is taken. This information is expected to be accurate and of high quality. Public scrutiny is seen as essential to meeting the goals of NEPA.[3] Up until this point, the public has not been given an opportunity to comment on this project. DIBC has not conducted outreach to local organizations in determining what desired social,

[2] 71 Fed. Reg 12467.

[3] 40 C.F.R. § 1500.1.

0288

economic or other environmental conditions actually are. An answer of "NO" without this outreach or public participation frustrates the purpose of NEPA in requiring public scrutiny. Without more information, the Coast Guard cannot accept that this action is unlikely to be inconsistent with the desired environmental conditions in this community.

Public participation was addressed in a response to a letter written by [redacted] Division Administrator for the Federal Highway Administration, Michigan Division. [redacted] noted that there was no evidence in the documentation supporting a categorical conclusion about public involvement or coordination with local officials. [redacted] the Project Manager and consultant for the twinning project responded to this criticism. He disagreed, stating, "numerous public meetings were held during the preparation, completion and approval of the Gateway Project and clearly that project anticipated the construction of a second span across the river..." Public meetings held ten years ago are not sufficient to satisfy the need for public involvement on *this* project. While a second span of the Bridge was *anticipated* in the 1997 Environmental Assessment done for the Gateway Project, it was not the focus of the project nor part of the environmental analysis. The reference to the second span and the possibility of its realization was so uncertain that the public was not given the opportunity to make meaningful comment on its impact on the desired social, economic, or environmental conditions. The information given to the public in 1997 with regard to a second bridge was not sufficiently detailed, accurate, or based on expert analysis in a way that would comply with the purposes of NEPA as described above.

[redacted] response does not take into consideration the possibility of changed conditions in the last decade. In ten years, the social, economic and environmental conditions may have changed such that these considerations must be revisited. For example, as discussed below, the regulatory regime for air quality impacts is significantly different now than it was ten years ago. Transportation studies have been published giving us more information regarding the impact of road construction on the human environment. These new environmental considerations, along with changes to local social and economic conditions must be analyzed as part of the decision to grant a CatEx. They are entirely absent from the submitted environmental documentation for the Ambassador Bridge Enhancement Project such that an answer of "NO" to checklist question B is inappropriate without further outreach and analysis.

In addition to investigating the locally desired social, economic, or other environmental conditions, it is important for the Coast Guard to take into consideration their legal mandate to give consideration to the issues of environmental justice. The Coast Guard, as a federal agency, shall make achieving environmental justice part of its mission by identifying and addressing "disproportionately high and adverse human health or environmental effects" on low-income or minority populations resulting from its programs and activities.[4] The area of southwest Detroit is already burdened by the adverse environmental impacts of the existing Ambassador Bridge and the infrastructure that surrounds it and this project may exacerbate an existing problem. In addition to the air pollution attributable to the traffic corridor, Wayne County is one of the dirtiest counties in the Country.[5] The list of existing sources of pollution is long and includes oil, automobile, steel, wastewater and power industries to name a few. Southwest Detroit is made up

[4] Exec. Order No.12,898, 59 Fed. Reg. 7629 (Feb. 11, 1994).

[5] www.scorecard.org.

of African American, Hispanic and low-income neighborhoods. This area is deserving of special attention as the Coast Guard considers this permit and the burdensome environmental impacts a new bridge will produce on top of a long legacy of environmental devastation.

c. **Checklist Question D:** ***Is the action likely to adversely affect a significant aspect of the natural environment?***

The answer to this question is a resounding "YES." Specifically, the Sierra Club is extremely concerned with the potentially adverse impacts on air quality that will result from the twinning of the Ambassador Bridge. The discussion of air quality impacts in the permit application is incomplete and entirely insufficient to provide the foundation for the "NO" answer provided on the application checklist. The science on this subject is replete with conclusions regarding the adverse effect of car and truck emissions on human health. In light of this science, the Coast Guard should conduct further review into the potential air quality impacts of six added lanes to the existing traffic corridor, a 150% increase in the roadway capacity of the existing Ambassador Bridge

The connection between air pollution from traffic and human health is undeniable. The environmental impact of highways has been a source of concern since the 1960s and was even cited as a major factor behind the enactment of NEPA.[6] Air pollution from transportation sources includes a toxic mixture of particulate matter measuring 2.5 microns in diameter ($PM_{2.5}$), carbon monoxide, nitrogen oxides (NOx), volatile organic compounds (VOCs), and mobile source air toxics including diesel particulate matter. $PM_{2.5}$ is often linked to increased mortality, hospitalization for respiratory problems, decreased lung function, and increased respiratory symptoms[7] as well as cardiovascular and pulmonary causes of death.[8] Exposure to this toxic mixture from exposure to vehicular traffic in urban areas may increase the risk of a heart attack in susceptible persons.[9] Fine particulates are more likely to be mixtures of chemicals and metals that result from combustion sources (such as gasoline or diesel engines) and can penetrate deeper into lung tissue and even enter the blood stream. $PM_{2.5}$ and mobile source air toxics are the subject of a growing body of scientific evidence linking these pollutants to substantial adverse human health impacts.

The impact of mobile source air pollution on children is particularly acute. Some studies have shown a correlation between asthma and attending school near major roadways. A study in California's East Bay was designed to determine the relationship of the proximity of middle schools to freeways and adverse health effects.[10] The study found that the closer the schools were to the freeways, the higher the concentrations of $PM_{2.5}$ and diesel exhaust. Also higher,

---

[6] Bob Yuhnke, *NEPA's Uncertainty Principle in the Federal Legal Scheme Controlling Air Pollution From Motor Vehicles*, 35 E.L.R 10273 (2005).

[7] N. Kunzli, et al, *Ambient Air Pollution and Atherosclerosis in Los Angeles, National Institute of Environmental Health Sciences* (Nov 2004). Exhibit B.

[8] Michael Jerrett, et. al., *Spatial analysis of Air Pollution and Mortality in Los Angeles*, Epidemiology, Vol. 16 No. 6 (Nov. 2005). Exhibit C.

[9] Annete Peters, et. al, *Exposure to Traffic and the Onset of Myocardial Infarction*, N. Engl. J. Med Vol 351 No. 17 (Oct. 21, 2004). Exhibit D.

[10] Janice J. Kim et al., *Traffic-Related Air Pollution Near Busy Roads: The East Bay Children's Respiratory Health Study*, 170 Am. J. Respiratory & Critical Care Med. 520 (2004). Exhibit E.

was the prevalence of asthma and bronchitis among students at the schools most affected by motor vehicle emissions.[11] Another study followed school children in 12 California communities, finding large deficits in lung function among those students living in communities with high pollutant concentrations.[12] Reductions in lung function and other health complications connected to exposure to air pollution were expected to impact those children for the remainder of their lifetimes. Yet another important study found that preliminary data suggested that concentrations of pollutants primarily generated by motor vehicle fuel combustion were higher in areas of close proximity to roadways with higher vehicle density.[13]

The U.S. Environmental Protection Agency ("EPA") recognizes that air pollution levels near major roadways are significantly higher than at locations farther away:

> Urban-scale assessments done in Houston, TX and Portland, OR illustrated steep gradients of air toxic concentrations along major roadways, as well as better agreement with monitor data. Results of the Portland study show average concentrations of motor vehicle-related pollutants are ten times higher at 50 meters from a road than they are at greater than 400 meters a road. These findings are consistent with pollutant dispersion theory, which predicts that pollutants emitted along roadways will show highest concentrations nearest a road, and concentrations exponentially decrease with increasing distance downwind. These near-road pollutant gradients have been confirmed by measurements of both criteria pollutants and air toxics, and they are discussed in detail in Chapter 3 of the RIA.[17]

Studies show that these elevated levels of ambient air pollution near major roadways result in a commensurate increase in indoor air pollution near roadways. Citing a leading study that assessed children's exposure to traffic-related air pollution while attending schools near roadways, the EPA notes:

> Overall results indicate that indoor pollutant concentrations are significantly correlated with traffic density and composition, percentage of time downwind, and distance from major roadways.[18]

The American Academy of Pediatrics has warned that children and infants are among the most susceptible to the harmful effect of air pollution.[19] The AAP notes:

---

[11] See also W. James Gauderman et. al., Childhood Asthma and Exposure to Traffic and Nitrogen Dioxide, Epidemiology, Vol. 16 No.6 (Nov 2005) (examining the association between traffic-related pollution and childhood asthma) Exhibit F.

[12] J.W. Gauderman et al., *The Effect of Air Pollution on Lung Development From 10-18 Years of Age*, 351 New Eng. J. Med. 1057 (2004). Exhibit G.

[13] Northeast States for Coordinated Air Use Management, Indoor/Outdoor School Air Monitoring Pilot Project. (Sept. 13, 2002). Exhibit H.

[17] 71 Fed. Reg. 15804 (citations omitted).

[18] 71 Fed. Reg. 15804 (citations omitted).

[19] American Academy of Pediatrics (AAP), *Ambient Air Pollution: Health Hazards to Children. Committee on Environmental Health*, Pediatrics Vol. 114 Pp 1699-1707 (2004). Exhibit I.

0291

In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies have found links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma.[20]

The AAP reports that these harmful health effects result in large part, from motor vehicle pollution:

Motor vehicles represent the principal source of air pollution in many communities, and concentrations of traffic pollutants are greater near major roads.[21]

Air quality impacts on children's respiratory health are often compounded when these pollutants are present in high concentrations on playgrounds and athletic fields, where children are at even higher risk during physical activity.[22]

The connection between adverse health impacts in children and mobile source air pollution is especially relevant to the Ambassador Bridge Enhancement Project. The Border Transportation Partnership, a group proposing another bridge across the Detroit River, has published a map locating all of the schools in southwest Detroit.[23] This map shows half a dozen schools located at the foot of the existing Ambassador Bridge. These schools range from elementary through high schools, with the presence of children from the ages of roughly 5 through 18 who will be exposed to ambient concentrations of these harmful pollutants from increased traffic resulting from the new span of the Ambassador Bridge. This is in addition to the many children who may be living nearby who would be subject to these impacts in their neighborhood.

In addition to the risks to children and developing respiratory function, serious cancer risk is attributed to mobile source air pollution. A 2000 study done in the Los Angeles air basin measured exposures to 30 toxic air pollutants a 22 locations in the basin.[24] This study, known as MATES II, found that 90% of cancer risk attributed to air pollutants came from mobile sources. Logically, this risk was more pronounced near freeways and other locations dominated by mobile sources.[25] [26]

Detroit already has its fair share of air quality problems. The Detroit area is currently a non-attainment area for the National 8-hour ozone standards, as well as for National standards

---

[20] AAP, *Ambient Air Pollution: Health Hazards to Children. Committee on Environmental Health,*Pediatrics Vol. 114 Pp 1699-1707 (2004).

[21] AAP, *Ambient Air Pollution: Health Hazards to Children. Committee on Environmental Health,*Pediatrics Vol. 114 Pp 1699-1707 (2004).

[22] Kenneth W. Rundell, et. al., *Vehicular Air Pollution, Playgrounds, and Youth Athletic Fields,* Inhalation Toxicology, Vol. 18 Page 541-547 (2006). Exhibit J.

[23] See Central Area Alternatives Map. Exhibit K. *Also available at* www.partnershipborderstudy.com.

[24] South Coast Air Quality Management District, *Multiple Air Toxics Exposure Study-II* (March 2000), *available at* http://www.aqmd.gov/matesiidf/matestoc.htm.

[25] See also Amir Sapkota and Timothy J. Buckly, *The Mobile Source Effect on Curbside 1,3-Butadiene, Benzene, and Particle-Bound Polycyclic Aromatic Hydrocarbons Assessed at a Tollbooth,* Journal of the Air & Waste Management Association, Vol. 53 (June 2003) (examining traffic counts and vehicle class combined with curbside concentrations of environmental carcinogens). Exhibit L.

[26] See Also, AAP(2004) noting the cancer risk resulting from diesel exhaust.

0292

for $PM_{2.5}$, two criteria pollutants that carry serious human health concerns.[27] In addition to air quality problems, the city has identified capacity problems associated with the projected increases in vehicle and truck traffic over the next 30 years. Health related air quality impacts must be considered within this context. An additional six lane bridge, coupled with the necessary infrastructure to manage the increased vehicle capacity will lead to increased mobile source air pollution in southwest Detroit.

DIBC asserts that an increase in traffic is not anticipated as a result of the construction of additional lanes across the river. However, there is evidence to the contrary, suggesting that increased lane miles actually does result in an overall increase in traffic, and therefore, an increase in mobile source pollution.[28] NEPA analysis is required to ascertain how the proposed project would effect traffic levels. Rather than summarily concluding that a 150% increase in capacity will not result in an increase in traffic, the agency must perform appropriate modeling to quantify anticipated traffic levels. This modeling must account for the phenomenon of induced travel.[29]

The air quality and resulting health impacts of this bridge cannot be ignored. Increased lane miles lead to increased traffic. Increased traffic will lead to increases in mobile source air pollution including $PM_{2.5}$ and other air toxics which have been repeatedly linked to reduced lung function in developing children, heart attacks in susceptible populations, certain cancers as well as lasting health impacts from this exposure. The consensus among the environmental health professionals about the seriousness of this problem suggests that a six lane increase to a Bridge that has several schools positioned near its base is a project that has potentially significant, potentially life threatening impacts on human health and should be analyzed for those impacts.

Air pollution may not be the only environmental concern stemming from this project. It appears that the Michigan Department of Natural Resources ("MDNR") has identified state and federally endangered mollusk species. Before DIBC can move forward, they must obtain a "no effect" statement from the MDNR. The Coast Guard should be aware of the potential impacts that might include the direct destruction of species and disturbance of critical habitat for the endangered species identified by MDNR.

The new span of the Ambassador Bridge has the potential to have a negative impact on parklands that are adjacent to the Bridge and plaza areas. Section 4(f) of the Department of Transportation Act requires that programs or projects shall not be approved if they require use or harm to publicly owned land from a park, recreation area, wildlife and waterfowl refuge or any area of national, state, or local significance unless no prudent alternative exists. While the plans for the new span of the Bridge indicate that no such land will be used, it is important for the Coast Guard to investigate this claim and assure that the project, both the Bridge and any plazas or roadways built to accommodate the Bridge, will not use adjacent parklands in a way that would violate the requirements of 4(f).

---

[27] 69 Fed. Reg 56697 (Marginal non-attainment for 8-hour ozone); 70 Fed. Reg. 943 (non-attainment for $PM_{2.5}$)
[28] Robert B. Noland and Lewison L. Lem, *A Review of the Evidence for Induced Travel and Changes in Transportation and Environmental Policy in the US and the UK,* Transportation Part D, 7 (2002). Exhibit M.
[29] See Id.

d. **Checklist Question F:** ***Is the action likely to generate controversy on environmental grounds?***

Yes, this project has already generated controversy on environmental grounds. An article written in the Metro Times titled "The battle of the bridge: Distrust of Moroun has Delray residents rallying behind a public span" is a good indicator of more controversy to come.[30] There is no doubt that adverse environmental consequences will be associated with increased truck traffic in southwest Detroit. Residents are also concerned with the decision making process. The Ambassador Bridge project is a private project, funded entirely by the project proponent, DIBC and its affiliates. Members of the public are concerned that a closed door, private project will lack the transparency involved with public projects and environmental review.

In addition to gathering information regarding public sentiment on the bridge enhancement project, it would be prudent for the Coast Guard to hold a public hearing regarding the permit application to better gauge public concerns in making a final determination regarding controversy on environmental grounds.

e. **Checklist Question I:** ***Is the action part of an ongoing pattern of actions (whether under the control of GSA or others) that are cumulatively likely to have adverse effects on the human environment?***

The twin span of the Ambassador Bridge is being described as entirely separate and apart from any other ongoing projects. This is not an accurate portrayal of other projects in the area and the Coast Guard should consider the environmental impacts of this bridge in connection with other projects in the area, that cumulatively, are likely to have a significant impact on the environment.

The second span of the Detroit Bridge will touch down in Detroit in the area that is the subject of the Gateway Project. The Gateway Project is a series of improvements to the ingress and egress systems at the foot of the existing bridge as well as improved toll and customs areas. This project was the subject of an environmental assessment done in January, 1997. The permit application repeatedly asserts that the "Ambassador Bridge Enhancement Project" consists *only* of an additional six lane bridge span. DIBC asserts that this project "is not a part of the ongoing "Gateway Project," however, four paragraphs later, DIBC notes that the bridge enhancement project would "seamlessly interact with the Gateway Project."

It is clear that these two projects, while analyzed separately by the project proponent, may have significant cumulative impacts on the air quality in the region.[31] NEPA requires that when several proposals for action will have cumulative or synergistic environmental impact,

---

[30] Ben Lefebvre, "*The battle of the bridge: Distrust of Moroun has Delray residents rallying behind a public span,*" Metro Times (May 24, 2006).

[31] Certain improvements to the transportation infrastructure on the Canadian side are also proposed. While these are not necessarily within the Coast Guard's permitting authority, the possibility that changes to traffic flow in Canada might increase overall traffic coming over the added lanes to the Ambassador Bridge should be considered by the Coast Guard as part of the overall, or cumulative impacts this project would have.

their environmental consequences must be considered together.[32] As discussed above, the air quality impacts of this project have not been analyzed to the extent necessary to make a determination that there is no impact and, in fact, studies on the issue suggest that air quality impacts will be significant. The finding of no impact entered on the Gateway Project is inapplicable to a cumulative impacts analysis now because the environmental assessment from that project did not identify air quality harms that are now required for $PM_{2.5}$, 8 hour ozone and other air toxics tests.

These two projects may also be considered "similar actions" under NEPA. Actions are considered similar when, viewed with other reasonably foreseeable or proposed agency actions, they have similarities that provide a basis for evaluating their environmental consequences together. These similarities can include common timing or geography. [33] The geography of these two projects is not only common but largely identical. The Gateway Project and the new bridge span will intersect and abut each other on common land. The timing of these two projects, for the purposes of an impact analysis, is also common. While the Gateway Project was analyzed for environmental impacts nearly ten years ago, to the best of our knowledge, it is far from complete. It is foreseeable that some of the construction from the Gateway Project will coincide with the construction of the proposed bridge. Because of the close geographic and temporal proximity of these two different but related projects, the Coast Guard should consider the environmental impacts together in making a determination whether further environmental review should be done. This analysis must include the impacts of construction, as well as the impacts resulting from the completed projects.

In addition to the Ambassador Bridge Enhancement Project, a second proposal for a bridge is being worked out by the Border Transportation Partnership, a group formed to assess the mobility needs of the international border traffic. This partnership includes members from the Federal Highway Administration, Michigan Department of Transportation, Ontario Ministry of Transportation and Transport Canada. While the Partnership has taken steps to determine the best location for a new bridge based on social, economic, and environmental considerations, DIBC has moved forward without these considerations to build another span of their Ambassador Bridge. There is no indication that the second span of the Ambassador would be built instead of the bridge proposed by the Border Transportation Partnership. Therefore, it is possible that both bridge proposals will move forward, resulting in two new border crossings in Detroit within close proximity of each other.[34] The possibility of this result should lead the Coast Guard to require more information regarding the location and proposal the bridge by the Border Transportation Partnership and the plan for that project to move forward if a second span of the Ambassador Bridge is built.

Conclusion

In conclusion, the Sierra Club and its members in the Detroit metropolitan area urge the Coast Guard to deny the application of a CatEx to the Ambassador Bridge Enhancement Project. Based on the above information, we feel that there are significant questions about the

---

[32] *Kleppe v. Sierra Club*, 427 U.S. 390 (1976); 40 C.F.R. § 1508.25.
[33] 40 C.F.R. § 1508.25.
[34] See the Central Area Alternatives Map. Exhibit K.

0295

environmental impact of this project, many of which have not been sufficiently addressed in the CatEx, and some which have not been addressed at all. Under NEPA, "An agency must prepare an EIS if 'substantial questions are raised as to whether a project...may cause significant degradation of some human environmental factor.'"[35] According to the Coast Guard's own NEPA implementing procedures, an environmental assessment or environmental impact statement shall be prepared for actions normally categorically excluded, but which are likely to involve significant impacts on the environment, substantial controversy on environmental grounds or be inconsistent with any Federal, State or local law. Based on our revised answers to the Coast Guard's CatEx checklist, an environmental impact statement is appropriate in this situation, and at the very least, an environmental assessment should be done to further determine what environmental impacts may be significant.

Hanging on this permit decision is the consideration of all environmental impacts that will potentially stem from this project. DIBC has stated that construction on this Bridge may commence shortly after the granting of a Coast Guard permit. If true, the timing of this project and the Coast Guard's position as the final agency arbiter of environmental impact is extremely important. Given the potential for significant environmental impacts, the Coast Guard should conduct a full environmental impact study before issuing the permit sought by DIBC.

Thank you for your consideration in this matter.

[redacted]

Staff Attorney
Sierra Club
85 Second Street, Second Floor
San Francisco, CA 94105
415-977-5725
415-977-5793 (Fax)

Enclosures (13)

0296

[35] LaFlamme v. FERC, 852 F.2d 389, 397 (9th Cir. 1998).

ENVIRONMENTAL CHECKLIST

NOTE: This checklist should be completed by the decision-maker in consultation with an ENVIRONMENTAL PROTECTION SPECIALIST. Please read the information on how to properly complete this checklist on pages 4-10 and make sure each question is answered using the accompanying explanations found on the pages cited after each question. Attempting to answer these questions without reading the accompanying explanations may result in an incorrect or incomplete environmental analysis.

***Project Description:**

Activity Year:

0298

(***Note:** Checklist preparer may want to attach additional descriptive information on the proposed action such as: diagrams, site maps, and photographs.)

Part I. Checklist Analysis.

	YES	NO	NEED DATA
1. Is there likely to be a significant effect on public health or safety? (p. 5)			
2. Does the proposed action occur on or near a unique characteristic of the geographic area, such as a historic or cultural resource, park land, prime farmland, wetland, wild and scenic river, ecologically critical area, or property requiring special consideration under 49 U.S.C. 303(c)? (p. 5-6)			
3. Is there a potential for effects on the quality of the environment that are likely to be highly controversial in terms of scientific validity or public opinion? (p. 7)			
4. Is there a potential for effects on the human environment that are highly uncertain or involve unique or unknown risks? (p. 7)			
5. Will the action set a precedent for future actions with significant effects or a decision in principle about a future consideration? (p. 7)			
6. Are the action's impacts individually insignificant, but cumulatively significant when considered along with other past, present, and reasonably foreseeable future actions? (p. 7-8)			
7. Is the proposed action likely to have a significant impact on a district, site, highway, structure, or object that is listed in or eligible for listing in the National Register of Historic Places, or to cause the loss or destruction of a significant scientific, cultural, or historic resource? (p.8)			
8. Will the proposed action have a significant effect on species or habitats protected by Federal law or Executive Order ? (p. 9)			
9. Is there a potential or threatened violation of a Federal, State, or local law or requirement imposed for the protection of the environment? (p. 9-10)			
10. Is the action likely to have other significant effects on public health and safety or on any other environmental media or resources that are not specifically identified in this checklist? (p. 10)			

Part II. Comments or Additional Information Related to Part I:

0299

Part II. **<u>Comments or Additional Information Related to Part I (continued)</u>:**

Part III. **<u>Conclusions</u>.**

1. A CE is recommended for this proposed action. [ ]
Comments:

2. An EA is recommended for this proposed action. [ ]
Comments:

3. An EIS is recommended for this proposed action. [ ]
Comments:

Date	*Preparer/Environmental Project Manager	Title/Position
Date	**Environmental Reviewer	Title/Position

*The USCG preparer signs for NEPA documents prepared in-house. The USCG environmental project manager signs for NEPA documents prepared by an applicant, a contractor, or another outside party. **Signature of the Environmental Reviewer for the Bridge Administration Program may be that of the preparer's.

0300

0301

ehp Environmental Health PERSPECTIVES
ehponline.org
Published by the National Institute of Environmental Health Sciences

Ambient Air Pollution and Atherosclerosis in Los Angeles

Künzli N, Jerrett M, Mack WJ, Beckerman B, LaBree L, Gilliland F, Thomas D, Peters J, Hodis HN

doi:10.1289/ehp.7523 (available at http://dx.doi.org/)
Online 22 November 2004

0302

The National Institute of Environmental Health Sciences
National Institutes of Health
U.S. Department of Health and Human Services

Ambient Air Pollution and Atherosclerosis in Los Angeles

Künzli N, Jerrett M, Mack WJ, Beckerman B, LaBree L, Gilliland F, Thomas D, Peters J, Hodis HN.

Divisions of Environmental Health and Biostatistics, Department of Preventive Medicine and Atherosclerosis Research Unit, Division of Cardiovascular Medicine; Keck School of Medicine University of Southern California

CONTACT

Nino Künzli, M.D. Ph.D.

Associate Professor, Keck School of Medicine University of Southern California

Division of Environmental Health

1540 Alcazar Street CHP 236, Los Angeles, CA 90033-9013

Email: kuenzli@usc.edu Tel (323) 442 - 2870 Fax (323) 442 - 3272

0303

RUNNING TITLE:

Air Pollution and Atherosclerosis

KEY WORDS

Atherosclerosis, air pollution, particulate matter

ACKNOWLEDGEMENT

Supported in part by the National Institute on Aging (grants R01AG-13860 (VEAPS) and R01AG-17160 (BVAIT)), the National Institute of Environmental Health Sciences (grant P30 ES07048, 5P01ES11627), the Wright Foundation, the Hastings Foundation, and the Health Effects Institute. There is no conflict of interest.

ABBREVIATIONS

ACS:	American Cancer Society
BVAIT:	B-Vitamin Atherosclerosis Intervention Trial
CCA	common carotid artery
CIMT:	Carotid intima-media thickness
CVD :	Cardiovascular disease
ETS:	Environmental Tabacco Smoke
GIS:	Geographic information system
LA:	Metropolitan Los Angeles area
PM:	Particulate matter
PM2.5 :	particulate matter less than or equal to 2.5 micrometers in aerodynamic diameter
VEAPS:	Vitamin E Atherosclerosis Progression Study

Outline of Section Headers:

Abstract

Introduction

Method

Result

Discussion

References

1.0 Project Description

1.1 Purpose, Need and Benefits

Existing international border crossings in the Detroit River area consist of the Ambassador Bridge, the Detroit-Windsor Tunnel, two railroad tunnels, and a ferry crossing. The Ambassador Bridge connects Detroit, Michigan, United States and Windsor, Ontario, Canada. The main span of the existing Ambassador Bridge was the longest in the world when it was completed in 1929 and is currently the busiest international border crossing in North America. The Detroit International Bridge Company (DIBC) and Canadian Transit Company (CTC) own and operate the existing Ambassador Bridge as well as the connecting plazas. DIBC and CTC are commonly owned companies, the former owning the U.S. assets and the latter the Canadian.

The project identified as the "Ambassador Bridge Enhancement Project" "Proposed Project" described in this document consists of the construction of an adjacent span to the Ambassador Bridge, just west of the existing span. The second span will provide four full service traffic lanes plus two lanes dedicated to low risk commercial travelers. The second span will be a new state-of-the-art cable stayed bridge that will connect directly to the Canadian and U.S. plazas owned by DIBC/CTC. The Ambassador Bridge Enhancement Project will be constructed entirely within the limits of the current operations of the DIBC/CTC. By constructing a new state of the art span across the Detroit River, the existing span will be freed up to allow it to be rehabilitated and to then serve as a backup, redundant resource in case of an emergency or another impediment against the free flow of people and goods across the new span as well as serve as a pedestrian and bicycle facility.

This project is not a part of the ongoing "Ambassador Bridge Gateway Project" ("Gateway Project") being completed by the Michigan Department of Transportation and the DIBC/CTC scheduled to open in 2009, nor is it a part of the "Windsor Plaza Expansion Project" being completed by the DIBC/CTC on the Canadian side with the east expansion completed in January, 2006 and the west expansion scheduled to be completed in mid 2007. Some discussion of the Gateway Project and Windsor Plaza Expansion will be useful for understanding the context for the Ambassador Bridge Enhancement Project. Poor quality access to international border crossings and congestion at border crossings can have an adverse impact on trade between the United States and Canada and therefore adversely impact the economies of both countries. In response to this, the Gateway Project was developed and is currently underway to provide direct and improved access between the Ambassador Bridge and the United States interstate system (I-75, I-96). The Gateway Project, which is an MDOT project in which DIBC is participating, was originally approved -- following an Environmental Assessment and a Finding of No Significant Impact (FONSI) – by the Federal Highway Administration on October 23, 1997. The Environmental Assessment was subsequently reevaluated and the FONSI was reaffirmed on two different occasions; first on September 9, 1999 and secondly on January 15, 2004. The Environmental Assessment and

Programmatic Section 4(f) Evaluation documents that were prepared and approved for the Gateway Project included *"construction of a new deck that will accommodate a future second span bridge to Canada"*. Three primary objectives are cited on page 1-1 of the Final Environmental Assessment for the Gateway Project including *"Accommodate future border crossing capacity needs and a potential future second span of the Ambassador Bridge located west of and adjacent to the existing bridge"*. The Gateway Project improvements are scheduled to be completed in 2009.

The Ambassador Bridge Enhancement Project would seamlessly integrate with the Ambassador Bridge Gateway Project already underway in the Detroit River area by building a new bridge adjacent to the existing Ambassador Bridge. This will reduce congestion, promote economic growth and development, and likely improve air quality. The DIBC/CTC has identified several design option alternatives for this bridge and has determined that the option discussed in Section 1.3 is the most feasible.

1.1.1 National Interest and Security Considerations

The purpose of the Proposed Project is to ensure that the free flow of trade and people can continue to occur unimpeded at the busiest border crossing in North America. With trade between the United States and Canada being vital to the economic health of both countries, it is critical that this border crossing continue to function efficiently even though the existing span across the river is approaching 80 years of age. By constructing a new state of the art span adjacent to the existing span, the efficient function of the entire facility will be assured for the next century.

Construction of a span adjacent to the existing structure will allow almost all of the construction to take place without impacting the traffic on the existing facility. Once the new structure is complete, all traffic will be shifted onto the new structure to allow the existing bridge to be evaluated and rehabilitated without impact to the traffic flow. By constructing the bridge in such a fashion, the national interest of both countries will be well served by the continued promotion of the economies of both countries by ensuring that the free flow of international trade can continue unabated.

Once the second span has been constructed and the existing bridge has been rehabilitated, the existing bridge will be made available as a redundant resource should there be an emergency on the new structure in which traffic is impeded. This redundancy will ensure that this vital border crossing be functional even if a major problem were created on the new structure. The existing bridge would also be available for pedestrian and bicyclist amenities.

The construction of a cable stayed structure rather than a suspension bridge will greatly improve the structural redundancy of the span. On the existing suspension bridge, the superstructure is supported in its entirety by the two main catenary cables. Should one of these cables be severed, a catastrophic failure would almost certainly occur. Conversely, the superstructure of the proposed bridge will be supported by numerous cables, providing a greater level of structural security and integrity than was achievable with the 1920's technology with which the existing span was constructed.

1.1.2 Support for the Project

Interest in building a bridge between the United States and Canada within the Ambassador Bridge corridor was advanced during the Environmental Assessment stage for the Ambassador Bridge Gateway Project. One of the three primary objectives of the Gateway Plaza Expansion Project was to "Accommodate future border crossing capacity needs and a potential future second span of the Ambassador Bridge located west of and adjacent to the existing bridge."

The Detroit River International Crossing (DRIC) study also showed support for a crossing at the existing Ambassador Bridge. The DRIC study ranked the Ambassador Bridge site (X12/II-4) as number 1 using the Citizen Weighted Score and number 2 using the Technical Team Weight Score out of 37 possible locations to place a new bridge. This ranking was due to few impacts on neighborhoods and the natural environment and because of its improvements to regional mobility.

The general consensus among the public and local businesses is in favor of an additional span in the same corridor as the Ambassador Bridge in order to maintain the current operations and allow for the improvement of operations by making the two outside lanes dedicated to low risk cross-border commercial traffic under the Free and Secure Trade (FAST) program. Nearly 40 businesses with operations in both the Detroit area and Southern Ontario and labor groups representing both public and private sector employees have expressed their strong support for the Ambassador Bridge Enhancement Project. A compilation of the letters DIBC/CTC has received to date may be found in Appendix X to this study.

There are many reasons why members of the local community support this effort. The economic benefits derived from the Proposed Project head the list. Several companies expressed the view that the improvement in the operations and functionality of the facility would support their plans for the future. The United States Chamber of Commerce, Michigan Chamber of Commerce and Canada Chamber of Commerce all express support for the Proposed Project, each recognizing that additional infrastructure capacity is vital to meet the demands of trade between the United States and Canada. They further state that if additional infrastructure capacity is not provided, a loss of jobs, and increase in congestion and delays will result. The addition of the FAST lanes, as proposed in the Ambassador Bridge Enhancement Project, was also cited by many local businesses as expediting the border crossing process which would provide a level of dependability that would improve the efficiency of those businesses.

Funding and the creation of jobs are other reasons often cited by the public and local agencies as the reason for their support for the Ambassador Bridge Enhancement Project. The bridge is estimated to cost approximately $500 million to design and build. The money raised by DIBC through toll revenues and spent by the privately-owned DIBC could be used as credits for United States Department of Transportation (USDOT) matching grants for regional transportation projects replacing the need to spend local or state monies.

Similar to the Ambassador Bridge Gateway plaza expansion, construction and maintenance on the new bridge would also create much needed jobs in both Detroit and Windsor. Current investments by the DIBC/CTC have already created over 500 new jobs in the past two years in Southwest Detroit. This is now the only section of the city exhibiting a population growth.

Lastly, the Ambassador Bridge Enhancement Project gains support for environmental reasons. Building a bridge adjacent to the Ambassador Bridge and tying into an existing plaza will result in fewer environmental effects relative to proposals to construct an entirely new bridge at a different location. The proposed bridge would:

- not disrupt or segregate the community,
- not require that any piers be placed in the Detroit River,
- not require that any construction take place in the River,
- not degrade air quality or increase noise pollution and can in fact reduce air pollution as a result of decreased idling time,
- not require any residential relocations in Detroit,
- not have any wetland or floodplain impacts; and
- not have any adverse impacts on threatened or endangered species or habitat.

Additional public support for the Ambassador Bridge Enhancement Project was manifest at a public workshop held on March 1, 2007. As with any transportation project, public involvement is an important aspect of the Ambassador Bridge Enhancement Project. The goal of public involvement is to fully inform and involve all interested public officials, citizens, and special interest groups in the development of transportation projects. The workshop was held at the Earhart Middle School in Detroit and was attended by approximately 53 people.

Twelve comments were received at the workshop. The majority of the public at this workshop favored the Proposed Project for the reasons stated above. However, several attendees expressed concern regarding several potential environmental impacts that are addressed in this Draft EA. Comments and meeting minutes from the public workshop can be found in Appendix X.

1.1.3 Trade Considerations

More trade goods cross the United States/Canadian border through this corridor than any other land crossing in North America. It is critical to the economic health of both countries that this crossing remain fully functional. A study commissioned by the Border Transportation Partnership indicated that if "no improvements were made to border crossing capabilities in the Detroit River area by 2030, the two nations will realize the loss of up to 70,000 Canadian jobs and 80,000 U.S. jobs. The combined annual loss of production is forecast to be CAN$21.5 billion or US$13.4 billion."

Booths have been constructed in each plaza that are dedicated to the processing of low risk truck travelers in the FAST program. The FAST program is a joint U.S.-Canadian initiative involving the Canada Border Services Agency (CBSA) and the United States Customs and Border Protection (CBP), however, FAST can best be described as a commercial process offered to pre-approved importers, carriers and registered drivers. Approved companies using approved carriers and registered drivers can experience shipments being cleared with greater speed, certainty and at lower costs. Participants in the program must meet the requirements of Canada's Partners in Protection (PIP) program or the United States Customs Trade Partnership Against Terrorism (C-TPAT) program.

Without having dedicated lanes for such purposes, the advantages of such a program cannot be fully implemented since the flow of FAST trucks is greatly impeded by backups in the general purpose lanes. The construction of a new structure with lanes dedicated for such purposes will significantly improve the operation of the entire facility and encourage more transporters to apply for the program.

The addition of a new state-of-the-art bridge in the Ambassador Bridge Corridor adds much needed redundancy to the regional transportation system. While the existing Ambassador Bridge is closed for evaluation and rehabilitation, the proposed bridge will be available to provide access to the international border. The current bridge will then be used for redundancy if there is an occasion when the new span needs to be taken out of service for an extended period of time. Redundancy at the Ambassador corridor will allow shipments to continue to move efficiently across the border, thus reducing potential adverse impacts to the local, regional and national economy. The existing bridge would also be available for pedestrian and bicycle uses.

1.1.4 Spin-off Benefits and Interrelated Projects

The Proposed Project is not expected to create any spin-off development. In addition, it is not intended to draw additional traffic to the bridge or the region. The spin-off benefits, however, will be related to the preservation of the existing span, which is an historic structure listed on the National Register of Historic Places, and the provision of a modern, redundant transportation infrastructure at this vital corridor. The goal of the Ambassador Bridge Enhancement Project is to move existing traffic more efficiently while protecting the structural integrity of the existing Ambassador Bridge. The existing bridge will also be made available for internal operational needs, as well as providing pedestrian and bicyclist amenities. Greater efficiency in processing the commercial traffic would be achieved by the using the two dedicated FAST Truck lanes on the new bridge to more effectively organize the commercial traffic to support the newly configured plaza (Ambassador Plaza Gateway Plaza Expansion) and FAST lane operations previously approved for construction and operation. This traffic lane organization is expected to reduce the amount of idling time for trucks while awaiting customs approval.

Projects that are related to the Ambassador Bridge Enhancement Project are the rehabilitation of the existing bridge, the Canadian Plaza Expansion and the Ambassador Bridge Gateway Project. The existing Ambassador Bridge will be repaired and rehabilitated once the Ambassador Bridge Enhancement Project is complete. The plazas are being upgraded to conform to current security standards and provide more efficient traffic flow with the existing infrastructure already in place and are not part of the Ambassador Bridge Enhancement Project.

2.0 Alternatives Analysis

2.1 Build Alternative

2.1.1 Project Location

The Proposed Project extends approximately 6,200 feet (1,890 metes) in length between Detroit, Michigan, United States and Windsor, Ontario, Canada. The entire Proposed Project is located within UTM Zone 17 and falls between the following NAD 1983 coordinates:

Location	Northing	Easting
Southwest Corner	4685333.573	329341.561
Southeast Corner	4685560.670	329798.526
Northwest Corner	4687046.737	328555.151
Northeast Corner	4687257.383	328919.180

2.1.2 Project Components and Structure

The major component of the preferred alternative for the Ambassador Bridge Enhancement Project is the construction of a six-lane cable stayed bridge connecting Detroit, Michigan, United States with Windsor, Ontario, Canada. The bridge will connect directly into the existing plazas in Detroit and Windsor. No modifications will be required in the plazas which have been designed to accept this span.

The Proposed Project is a bridge approximately 6,200 feet (1,890 m) in length with about 2,200 feet (670 m) traversing the Detroit River from tower to tower. The bridge will be a minimum of 152 feet (46 m) above the Detroit River within the clearance envelope as required by the United States Coast Guard (USCG), which meets the minimum vertical clearance requirements for deep draft navigation. The location of the United States tower will be approximately 100 feet (30 m) north of the Detroit River. The location of the Canadian tower will be approximately 100 feet (30 m) south of the Detroit River. The height of each tower will be approximately 544 feet (165.7 m) above existing ground. The total width of the bridge will be approximately 102 feet (31 m). Each of the six lanes will be 12 feet (3.6 m) wide. The bridge will have sufficient width to accommodate two shoulders in each direction. The outside shoulders will be 6 feet (1.8 m) wide and the inside shoulders 8 feet (2.4 m) wide. There will be no sidewalk on the bridge. See Appendix X.X or Figure X.X for typical sections and conceptual plans.

The bridge will be a cable stayed bridge supported on cast-in-place concrete substructure elements with deep foundations founded on rock. The bridge deck will be constructed using precast or cast-in-place concrete with expansion joints at the ends of the cable stayed spans and supported on either steel or concrete beams and stringers. A preliminary design profile of the bridge approaches requires a maximum grade of 5.0% on the north approach and 4.55% on the south approach.

2.1.3 Construction Plan

No permanent construction support facilities will be required. During construction of the Proposed Project, temporary concrete production or other processes supporting construction of the bridge will likely be necessary. Such facilities will be located as close as practical to the new span location to avoid undo impacts that would occur as a result of the transport of such materials through the communities surrounding the facility. Raw materials for the production of concrete or other construction materials will be obtained from local sources and will be handled and used in a manner that is consistent with established regulatory requirements. No fill will be required since the entire Proposed Project consists of a bridge structure, and the only excavation necessary will be that associated with the construction of the foundations supporting the substructure elements as shown in the conceptual design plans in Appendix XX.

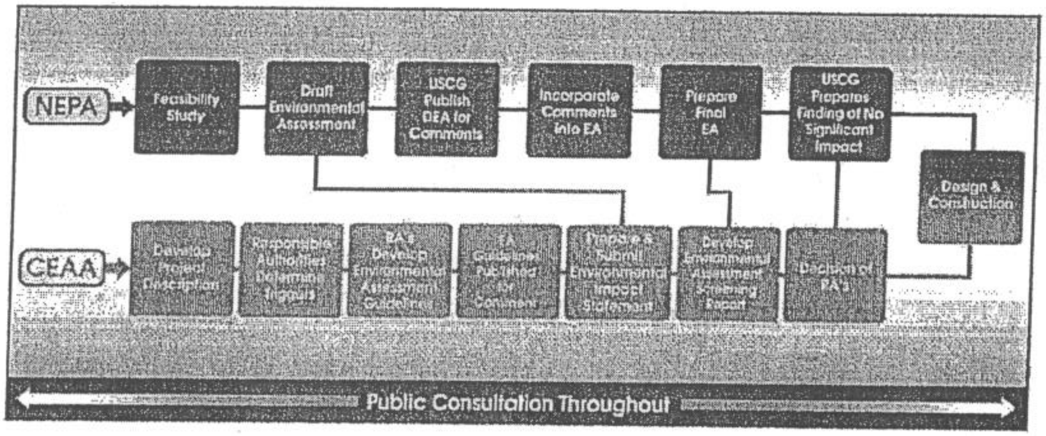
All construction activities associated with the Proposed Project will comply with the applicable regulations, standards and policies established by the responsible government agencies in the United States and Canada. Compliance includes establishment of proper spill prevention and containment measures and an approved erosion and stormwater control plan.

The sequence for construction will begin with site preparation, which includes the mobilization of construction equipment to build the foundations and substructure; utility location verification; construction of required stormwater pollution protection facilities; clearing and grubbing of the worksites; and any other site preparatory work necessary to begin the construction of the foundations and substructure. Upon completion of the necessary site preparation work, installation of drilled shafts and piles will begin. Activities, such as pile driving, that create noise and vibration will be restricted to appropriate hours to minimize impacts to residents. Once the pile and drilled shaft foundations have been installed, construction of the cast-in-place concrete footers will begin to provide a stable base foundation for construction of the piers and the towers. Once the concrete footings have gained adequate strength to support the construction of the substructure, erection of the concrete columns for the piers will begin. Construction of the base of the towers will also begin at this time and continue in phases up to the level of the bridge deck. Finally, the portion of the towers above the bridge deck will be constructed to allow for the installation of the cable stays necessary to support the superstructure.

Once the tower piers have been constructed, the cable stays will be installed incrementally with balanced erection of the superstructure on either side of the towers. Each cable will be installed in a symmetrical fashion in both the horizontal and longitudinal directions. That is, cables will be added simultaneously on each side of the superstructure and on each side of the tower bent such that the superstructure is incrementally extended from both towers in both directions. Erection of the cables will continue until the balanced cantilevers from each tower meet at midspan over the river and closure is achieved. Since the back span is being constructed simultaneously with the main span in order to balance the erection of the superstructure on each side of the tower, closure at the expansion piers adjacent to the land-based approach spans will also be achieved at this time.

completion and approval of these Environmental Assessments and completion of final design, permits will be sought and construction begun.

Figure X-X. NEPA and CEAA processes



2.2 No-Build Alternative

A total of approximately 9.4 million vehicles used the Ambassador Bridge in 2006, of which 3.5 million were trucks and buses. Canada and the United States are the largest bilateral trade partners in the world, in part due to the North American Free Trade Agreement (NAFTA). The Detroit River area is currently the busiest trade corridor between the United States and Canada. In the year 2000, the United States trade with Ontario totaled U.S. $243 billion, which is larger than total United States trade with Japan. Over $1 billion in trade crosses the United States and Canadian border each day, of which 70% is by trucks. Forty-two percent of this trade occurs in the Southeast Michigan / Southwest Ontario area.

The existing bridge is approaching 80 years of age. While it continues to function well, costly and continual maintenance will be required to extend its useful life for carrying heavy commercial vehicles on a daily basis. In order to adequately plan and conduct business operations, companies on both sides of the border need to be able to depend on the unencumbered free flow of goods across this border. It is vital to the economies of both countries that no negative impacts to the free flow of people and goods across the border occur.

When the existing bridge was constructed in the 1920's, it was a state-of-the-art five-lane structure and had the longest unsupported span in the world. By today's standards, the existing bridge currently has substandard lanes and shoulders. The four 11 ft lanes with inadequate shoulders do not provide adequate space for the continued free flow of traffic in case of a vehicle breakdown on the bridge.

The width of the existing bridge does not afford the opportunity to provide dedicated lanes to low risk truck travelers that have undergone the required background investigations and have met the other requirements necessary to be pre-approved by both the Canadian and Untied States Governments under the Free and Secure Trade (FAST) program. Without such dedicated lanes, the benefits of this program are inherently limited since the FAST trucks are restricted from movement across the border by trucks that backup on the structure while waiting to be processed through customs which have not been approved for the FAST program.

The No-Build Alternative consists of simply maintaining the existing Ambassador Bridge while only providing routine maintenance. Enhancements to the existing service plazas and customs facilities will still need to be made and are proceeding. While these types of enhancements could improve operations and efficiency in processing vehicles at the existing facilities in the short term, they will not eliminate the need for repairs to the existing 80 year old structure.

The absence of the dedicated FAST lanes and wide shoulders on the existing bridge results in major traffic backups when any impediment to traffic flow is encountered on the existing bridge. This problem will continue to grow over time and will adversely impact trade and contribute to air and noise pollution resulting from traffic congestion and idling trucks and buses. Capital costs associated with the No-Build Alternative are also increasing every year as more and more repair and maintenance is required on the existing bridge. Billions of dollars would eventually be lost each year by both the U.S. and Canadian economies in trade and economic growth due to the constraints of the existing bridge and lack of dedicated FAST lanes.

The No-Build Alternative will also fail to take advantage of the credits offered by the federal government for DIBC/CTC's private funding by DIBC/CTC of a major new river crossing, eliminating the opportunity to divert badly needed public funds to other priority transportation projects. Hundreds of millions of tax dollars would have to be used to build a crossing elsewhere at some point in the future. In addition, the No-Build Alternative would preclude any opportunity to inject a major capital investment in the regional economy and a host of new jobs.

Other environmental impacts associated with the No-Build Alternative project would be negligible. No relocations would be required.

The addition of a second span, as opposed to improving the existing span, also yields the advantages of structural redundancy. At present, should an emergency occur on the existing Ambassador Bridge where traffic is impeded, there is no another bridge within the immediate region to route the traffic. This redundancy would ensure that this vital border crossing be functional even if a major problem were created on a new structure.
Given the importance of this crossing to the people and businesses of both countries, the inability of the existing structure to accommodate the FAST trucks, the fact that the existing structure cannot be counted on to indefinitely carry heavy commercial traffic without significant costly upgrades, and the decreased level of functionality due to

narrow lanes with substandard shoulders, the No-Build Alternative did not rank high among the array of alternatives studied and did not meet the needs of this project. Therefore, this alternative was not considered further in the alternatives analysis.

2.3 Corridors under Consideration

The purpose of the Ambassador Bridge Enhancement Project is to remove traffic from an aging structure without interrupting service between the United States and Canada. The imtent is to maintain the capacity of the current crossing and to improve the efficiency of the crossing by providing dedicated lanes restricted to low risk truck travelers.

A capacity expansion study is underway in the region in which numerous alternative corridors are currently being investigated under the auspices of the bi-national Detroit River International Crossing Study or DRIC study. Unlike the purpose of the Ambassador Bridge Enhancement Project, the purpose of the DRIC study is to investigate alternatives for additional capacity needs in the future. All of the alternatives under investigation by the DRIC study carry construction costs likely to be substantially greater than the cost of using the existing corridor described below. In addition, community impacts would be much greater as a result of the substantial business and residential relocations likely to be required as a result of the introduction of a large plaza and river crossing into entirely new neighborhoods in both Canada and the United States. Substantially more environmental impacts are also likely to occur with construction of a bridge in a new corridor as compared to the existing alignment. Since little vacant, unpopulated areas exist in the region on both sides of the border, construction of an entirely new facility on an entirely new corridor simply to replace the existing lanes would be extremely costly and would disrupt communities that do not currently experience bridge traffic. For the least intrusive alternative corridor under investigation by the DRIC study, several hundred homes, churches and business would be demolished with many more experiencing line exposure to much higher than existing noise levels along with a reduction in air quality.

The Ambassador Bridge Enhancement Project simply modifies the existing crossing by replacing the lanes of an aging bridge structure that connect to existing plazas in the U.S. and Canada. As such, other alternative corridors are not being considered as they are beyond the scope of this project and would not meet the purpose and need and they would have substantial human and environmental impacts.

2.4 Comparison of Alternatives

2.4.1 Operating Scenario Alternatives

Two different operating scenarios are evaluated. These operating scenarios include either a new six lane structure with the existing bridge serving pedestrians, bicyclists and as a redundant resource or a new three lane structure serving southbound traffic while renovating and reconfiguring the existing bridge to carry traffic northbound.

2.4.1.1 New Six Lane Structure

Under this operating scenario, once the new structure is constructed on the preferred alignment, traffic would be removed from the existing bridge and relocated to the new structure. This would then allow the existing structure to be renovated without impacting the flow of traffic through the facility. Once the existing structure is renovated, it would serve pedestrians and bicyclists as well as serve as a redundant resource in case traffic was impeded on the new structure.

This scenario would provide lanes in reserve that could be made available in the case of a terrorist act or other events that would cause the new structure to be unavailable to carry traffic. Having these lanes in reserve would limit the negative impacts to the economies of both countries should the flow of trade across this vital border crossing be impeded. It would also allow for the construction of a state of the art structure for the day to day use for all traffic through the facility.

2.4.1.2 New Three Lane Structure

In this alternative, a new three lane structure with full safety shoulders would be built on preferred alignment. All traffic would then be moved to the new structure that would temporarily use the shoulders to allow four lanes of traffic to utilize the facility consistent with the lanes in use today. Once traffic is removed from the existing bridge, it would be renovated and reconfigured so that upon completion it could be placed back into service to carry three lanes of traffic in one direction with the fourth lane used as shoulders. The new bridge and the newly renovated bridge would then operate together with three lanes of traffic on each structure carrying traffic in one direction. Both bridges would contain a FAST lane for low risk truck travelers.

The width of the travel way on the existing bridge is 47'-0" (14.3 m) with an additional 8' (2.4 m) wide raised pedestrian walkway. In order to provide the necessary width to allow full safety shoulders and three lanes of traffic, the raised walkway would need to be removed and the deck reconstructed as part of the rehabilitation program. The full rehabilitation of the bridge to continue indefinitely with current and future day-to-day truck traffic is expected to require the full replacement of many of the primary load carrying structural elements of the superstructure. Full superstructure replacement may be the most cost effective solution to significantly extend the life span of the existing bridge. Under this scenario, the new project would be completed in two separate phases, the construction of the new structure, followed by the renovation of the existing structure. The construction schedule is expected to be significantly longer and the costs much greater than the construction of a single new six lane structure.

Environmental impacts of the new three lane structure would be minimal, comparable to the preferred Western Alignment Alternative described below. Visual impacts would be reduced compared to other build alternatives. The new three lane structure would have a similar width to the existing bridge and would therefore appear closer in scale to the existing structure. The significance of this narrower width for the three lane structure is somewhat diminished because the height of the towers and the cables will be much greater on the new structure in order to avoid environmental, hydraulic and navigational impacts in the Detroit River.

2.4.2 Structural Alternatives

Alternatives considered feasible for the river crossing structure include a suspension bridge similar to the existing Ambassador Bridge, a cable stayed bridge and a tunnel. Criteria used to evaluate structural alternatives include costs, navigational impacts, environmental impacts, economic impacts, functionality, impacts during construction, and security.

2.4.2.1 "Twin" Suspension Bridge

With the south tower of the existing Ambassador Bridge located in the waters of the Detroit River, the construction of a true "twin" span with a main span length of 1850' would also require the placement of the new Canadian tower in the river. This would result in numerous adverse environmental impacts and is also considered undesirable from a navigational perspective.

The superstructure for suspension bridges is supported by vertical cables connected to a main catenary cable on each side which is draped over the main towers and then anchored in a large mass anchor pier. Each of these catenary cables must be present in order to maintain the integrity of the bridge and the removal of any one of them will almost certainly result in the catastrophic failure of the superstructure. Consequently, suspension bridges have the unfavorable characteristic of containing fracture critical members which means they are inherently less secure than redundant load path structures such as cable stayed bridges.

In order to span the entire width of the river and avoid encroachment on the floodplain, destruction of habitat in the river and navigational impacts to shipping, a span length of approximately 2200 ft is required. The construction costs of suspension bridges with a main unsupported span length less than 3000 ft, are generally greater than the costs for cable stayed bridges and less than the cost for a tunnel. In addition to greater costs, a longer main span would also require that the towers be of greater height than the existing structure. However, the cable system will be similar to the geometric shape of the existing system and compliment the existing architecture.

2.4.2.2 Cable Stayed Bridge

With current technologies, cable stayed bridges are economically competitive for span lengths from less than 600 ft to up to about 3000 ft. In order to span the entire width of the river and avoid encroachment on the floodplain, destruction of habitat in the river and navigational impacts to shipping, a span length of approximately 2200 ft is required. Cable stayed bridges are extremely resilient and resistant to failure since they contain considerable internal structural redundancy. This means that such structures are very robust and can withstand failures of one or more cables without a catastrophic failure of the bridge. This represents a significant improvement in the security of the crossing when compared to a suspension bridge or tunnel.

The durability of cable stayed bridges is also superior since a very large portion of the structure is in a state of compression. Even under live loading, most of the structure does not exhibit the unfavorable aspects associated with tension in a concrete structure. This means that the reinforcing steel within the concrete is much less susceptible to the detrimental effects of moisture and other corrosive agents thereby dramatically improving the durability and life span of the bridge.

Since the superstructure for a cable stayed bridge is built from the deck level and will not require any temporary works or structures within the river or the floodplain, no negative environmental impacts associated with these activities are anticipated during construction.

Construction costs for a cable stayed structure are expected to be the lowest of the structural alternatives considered feasible.

Due to the increase in span length required to bridge the entire river and in order to effectively carry the load of the superstructure, the height of the towers for the cable stayed bridge will need to be greater than the towers on the existing bridge. In addition, the cables will be erected in a modified fan shape rather than with the catenary cables supporting vertical hangers that are present on the existing bridge and therefore have a significantly different appearance. The existing Ambassador Bridge contained the longest cable suspension bridge span in the world when it was built. A new cable stayed Ambassador Bridge will have the longest cable stayed bridge span length in North America when it is built. The two structures will provide a striking side by side visualization of what was the state of the art for the 20th century and what is the state of the art for the 21st century.

2.4.2.3 Tunnel

From an aesthetic perspective, a tunnel alternative will have the least impact on the existing structure. However, the primary disadvantages of tunnels are their significantly higher construction costs, decreased functionality and greater security concerns.

Major engineering challenges are also present for the tunnel alternative for the alignment alternative that provides the least impacts to the natural and human environment since it is not possible to maintain a maximum grade of 5% and connect to the existing plaza in the United States without significant impacts to the operations and functionality of the United States plaza during and after construction. The distance between the Detroit River and Fort Street will not allow the construction of a tunnel below the entire width of the Detroit River and still elevate to cross Fort Street and connect to the plaza as configured by the Gateway Project. Major reconstruction of the plaza would be necessary in order to facilitate the construction of a tunnel. Such reconstruction would require significant impacts to the existing operations of the plaza and the traffic that is served by the entire facility. Reconstruction of the plazas as configured by the Ambassador Bridge Gateway Project would also further increase the overall cost of the project.

In addition, environmental impacts of a tunnel are greater than those associated with the bridge alternatives. Tunnels tend to concentrate air pollution at the specific points where the tunnel is vented. The disbursement of the air pollution then takes greater distances and time to reduce the concentrations of air particulates to acceptable levels.

Further, if the existing plazas could not be used to support the tunnel, new plazas elsewhere will need to be constructed. Since little vacant, unpopulated areas exist in the region on both sides of the border, construction of an entirely new facility would be extremely costly and would divide communities that are currently united. Any new plaza arrangements would most likely require substantial intrusion into several neighborhoods on both sides of the border. Community impacts would also be much greater as a result of the substantial business and residential relocations likely to be required as a result of the introduction of a large plaza into entirely new neighborhoods in both Canada and the United States. Substantially more environmental impacts are also likely to occur with construction of a plaza in a new area as compared to the preferred alignment described here which uses the existing plazas in both the United States and Canada. Visual impacts on the existing structure would not be significant nor would navigation be impacted with a tunnel.

The cost of new plazas and the tunnel would be substantially greater than the cost of other structural alternatives studied.

2.4.3 Alignment Alternatives

Alignment alternatives available for consideration include constructing on the same centerline as the existing alignment, constructing to the east of the existing alignment, constructing to the west of the existing alignment and constructing on a completely new alignment in a different corridor. Selection of a preferred alignment alternative must consider the impacts of such a selection in both the United States and in Canada. Criteria used to evaluate alternative alignments include costs, relocations required, environmental impacts, economic impacts, functionality and impacts during construction. Each of the build alternatives will provide structural redundancy within the region in the event of an emergency or the need to shut down the proposed bridge.

2.4.3.1 Replace Existing Bridge on Current Alignment

The existing structure is a suspension bridge with two main catenary cables supporting the superstructure over the river. It was constructed largely on a tangent alignment for most of its length except for the section in the United States just north of Fort Street where an "S" curve is present. There is no economically feasible method of replacing this structure on the same alignment without disastrously impacting the flow of traffic during construction. A replacement structure along the same alignment as the existing bridge would require that the existing facilities be shut down for several months during construction. Such a shut down would have a devastating impact to commerce between the United States and Canada and is clearly not a practical option.

In addition, the existing structure is eligible for listing on the National Register of Historic Places. The removal or significant alteration of this structure would be undesirable from an historic resources perspective. By making the significant improvements needed to the existing bridge, the historic integrity of the structure would be compromised or lost altogether. Other environmental impacts of building a new bridge in the existing corridor are expected to be minimal.

The addition of a second span, as opposed to improving the existing span, also adds structural redundancy. Should an emergency occur on the existing Ambassador Bridge where traffic is impeded, there is not another bridge within the immediate region to route the traffic. This redundancy would ensure that this vital border crossing be functional even if a major problem were created on a new structure.

Since closing this corridor during construction is clearly neither desirable nor feasible, and in view of the impact on the existing span, this alternative was not considered further in the alternatives analysis.

2.4.3.2 Construct New Structure on East Alignment

In the United States Plaza, primary and secondary customs inspections for trucks bound for the United States currently take place immediately to the east of the existing span and north of Fort Street. The location of this processing will remain to the east of the existing bridge and north of Fort Street once the Ambassador Bridge Gateway Project is completed. The trucks that pass inspection and are granted access to the United States exit the inspection facilities on the south side onto a dedicated ramp connected directly to the interstate. Customs inspection for cars bound for the United States are located off the north end of the existing bridge and for cars bound for Canada, just off the south end. Construction of a new span immediately to the east of the existing bridge would require that the bridge land in the United States in the area where trucks are currently being processed and necessitate the complete reconfiguration and reconstruction of both the United States and Canadian plazas to allow processing and inspections to take place elsewhere. The East Alignment Alternative would require the acquisition of several commercial and residential properties to the east of the existing plazas and would encroach further into the neighborhoods surrounding the plazas. This alignment option would also require the relocation of Huron Church Road to the west of the existing bridge between the river and the plaza.

The East Alignment Alternative would require a major reconstruction of the plazas which were only recently reconstructed and would hinder traffic flow and operations during construction. It would also require commercial and residential acquisitions to the east of the existing plazas. By relocating the plaza closer to residential areas, air and noise pollution impacts would be greater than with other alternatives studied.

While this alternative would provide the additional span required, it would not do so in a manner which minimizes impacts to the human and natural environment relative to other alternatives. Further, as this alternative would require the alteration of the newly designed and constructed plazas in the United States and Canada, it is one of the least desirable alternatives from an economic and functional standpoint.

2.4.3.3 Construct New Structure on West Alignment

Constructing a second span immediately to the west of the existing bridge was recognized as the alignment of choice during the preparation of the Environmental Assessment for the Ambassador Bridge Gateway Project. This alignment was also taken into consideration during the planning and design for the ongoing expansion of the plaza in Windsor and will therefore require no changes, modifications or expansion to the existing plaza in Canada.

Operationally, this alternative has few negative impacts before, during and after construction. Since the construction of the Ambassador Bridge Gateway Project will provide the West Alignment Alternative a direct connection to the United States plaza without the need for any modifications, the operation of the entire facility will remain unaffected by constructing the new bridge to the west of the existing bridge. Therefore, the cost and functionality of this alternative is among the best studied.

The scope and magnitude of the environmental impacts associated with this alignment are among the least of all of the alternatives considered. Environmental impacts are expected to be minimal to none as this alternative would require the construction of only the bridge connecting the two plazas and no piers would be placed in the Detroit River. No relocations beyond those required by the Ambassador Bridge Gateway Project will be required in the United States. The only relocations required in Canada are those renters occupying short term temporary housing near the University of Windsor. These homes are already owned by the CTC and the area will be used as a buffer between the plaza and the nearby neighborhoods. Additionally, in Windsor, this alignment option would move the flow of traffic away from the University of Windsor and thus, reduce impacts to the University when compared to other alternatives.

2.5 Basis for Choice

After carefully considering the attributes of each of the alternatives, the six lane cable stayed bridge on the western alignment was selected as the preferred alternative on the basis that it provides the most benefits for the least impacts. From the standpoint of environmental and economic impacts and cost, this alignment ranks highest among all the alternatives considered (Figure X-X). The new six lane structure was selected rather than the three lane structure since this scenario provides the opportunity for the greatest national and economic security of both countries. Using the existing bridge in the daily operating scenario would continue to subject an aged structure to the negative detrimental effects associated with the traffic loading at this extremely busy crossing. The effort required for maintenance and repairs will result in an ever increasing frequency of lane closures and other disruptions to the users which would add to backups in the neighborhoods around the facility causing a decrease in air quality and an increase in noise levels. Alternatively, rehabilitation and maintenance of the existing structure can be effectively and economically conducted indefinitely once the daily stress experienced as a result of the constant stream of commercial trucks and automobiles is removed. The costs associated with maintenance and repairs are rapidly becoming less and less economically feasible to undertake and complete in a manner that provides for the best use of scarce resources. The six lane cable stayed bridge on the western alignment provides the most robust and secure structure, with the fewest environmental impacts at the lowest cost and on that basis is carried forward as the preferred alternative (Figure X-X).

Figure X-X. Ranking of Operating Scenarios

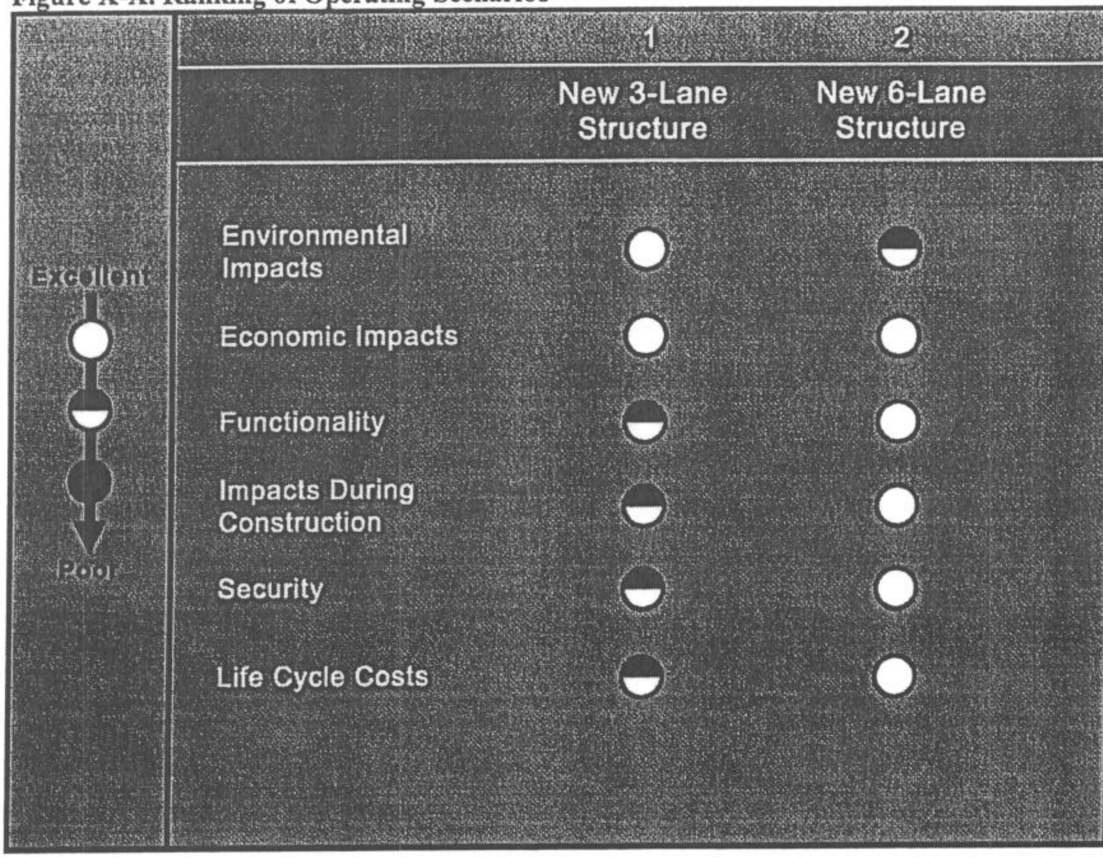


Figure X-X. Ranking of Alternative Structures

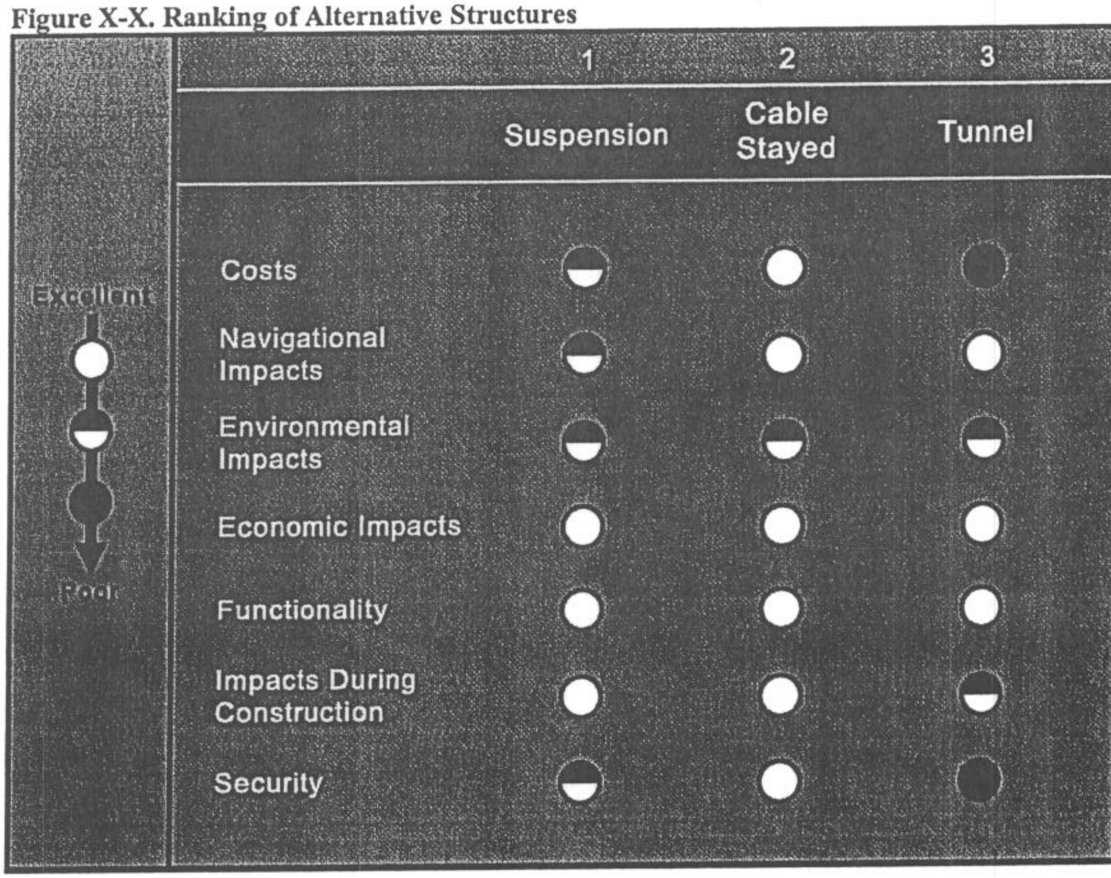
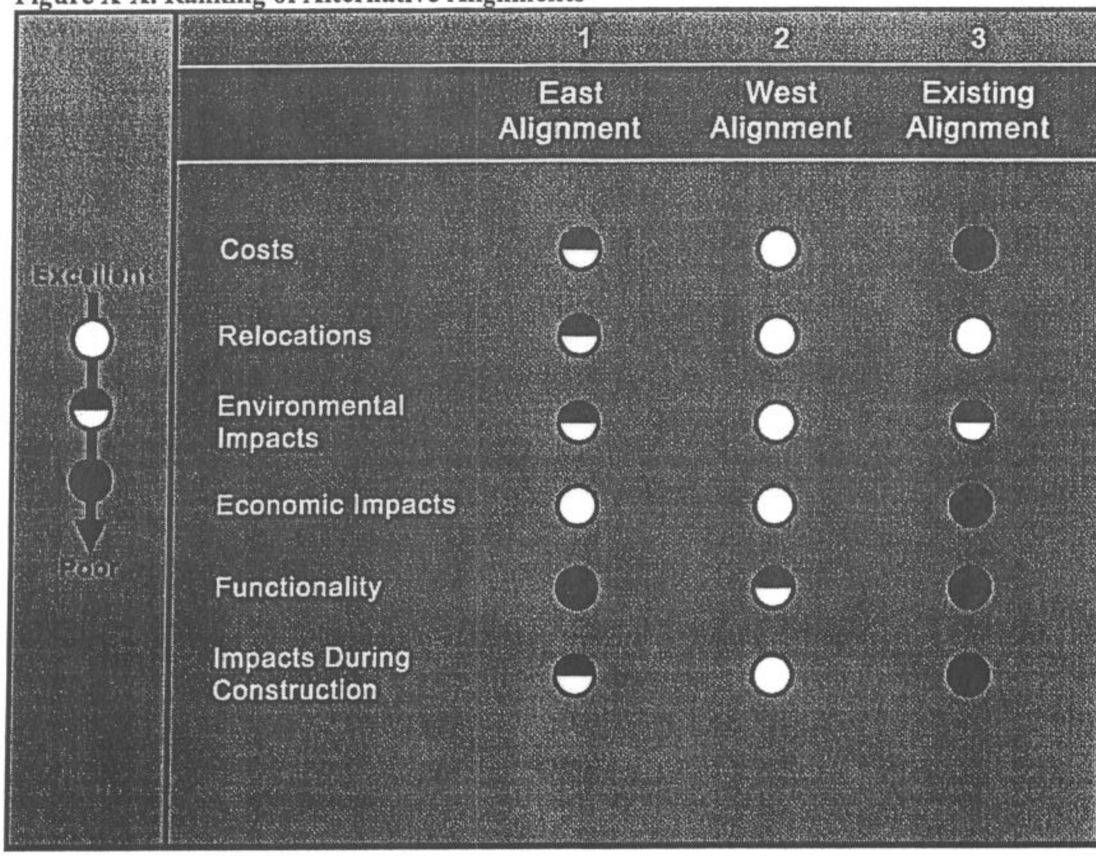


Figure X-X. Ranking of Alternative Alignments



2.6 Benefits of Preferred Alternative

The construction of a cable stayed bridge immediately to the west of the existing span will ensure secure, dependable and redundant infrastructure for the next century. It will continue to maintain and improve the free flow of trade across this critical border crossing by introducing a state of the art bridge built to current standards with full safety shoulders and internal structural redundancy. The safety shoulders planned for the new span will promote the efficient flow of traffic by allowing broken down vehicles and vehicles involved in accidents to be removed from the traffic lanes, permitting traffic to continue to flow freely. The shoulders planned for the new span thus should speed the flow of traffic across the bridge. The current structure does not have large enough shoulders to allow for their use in the event of a vehicle breakdown or accident.

The new structure will also provide dedicated lanes to connect to the existing toll booths already in place for low risk truck travelers participating in the Free and Secure Trade (FAST) Program. These lanes should significantly improve the processing of commercial vehicles and reduce backups and idling on the bridge and local streets, thereby improving air quality in the area surrounding the facility in both nations and lowering the transportation costs to shippers. By dedicating lanes to low risk travelers, it is expected that the benefits of the program will then be fully realized and an increase in participation will occur. As participation in the FAST program increases, overall processing time will decrease and backups on the bridge, on Huron Church Road in Windsor and on the interstate and connections in the United States will decrease. By constructing the bridge using private funding, only those that use the facility will pay for the costs through tolls collected in the plazas. By being so funded, the Proposed Project will create toll credits and make them available to be used as local match for federal funds for other much needed infrastructure projects in Michigan.

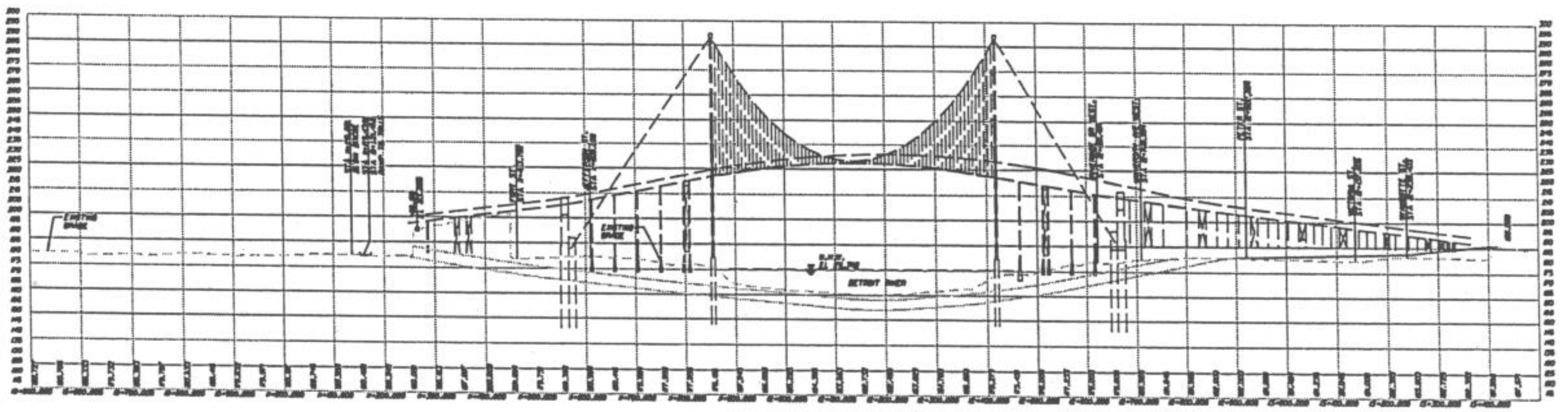
Additional expected benefits of the preferred alternative include:

- No need for relocations
- Ability to meet traffic needs as processed through the plazas
- No need to alter plazas or local roadway network
- Little to no human or environmental impacts
- No increase in traffic volumes

2.7 Consistency with Other Projects

The primary purpose of the Ambassador Bridge Enhancement Project is to maintain the existing crossing and to improve operations where possible. Higher traffic volumes are not anticipated as a result of this project and the purpose of the project is not to add capacity. The Proposed Project compliments and enhances both the Ambassador Bridge Gateway Project and the Windsor Plaza Expansion Project. Both of these projects anticipated the addition of an adjacent span to the existing Ambassador Bridge and were planned to accommodate such a new span. The Ambassador Bridge Enhancement Project will tie directly into the existing plazas without the need for any changes or expansion and will not require the closure of any local streets. The sizing of the plaza and the ramp connections to the United States Interstate System included the consideration of a second span adjacent and west of the existing structure and are consequently sufficient to accept the Ambassador Bridge Enhancement Project without need for any modification.

The Proposed Project is consistent with and will fulfill the expressed desire of the governments of both the United States and Canada to fully implement the low risk traveler program. The Ambassador Bridge Enhancement Project will provide the first real opportunity to fully implement this program and is expected to clearly demonstrate the benefits of the program to the extent that its success can then be exported to other border crossings.



LEGEND

- 6 LANE TUNNEL
- TEMPORARY BRIDGE
- PLAZA FEEDER RAMP

American Consulting Professionals of Michigan, PLLC

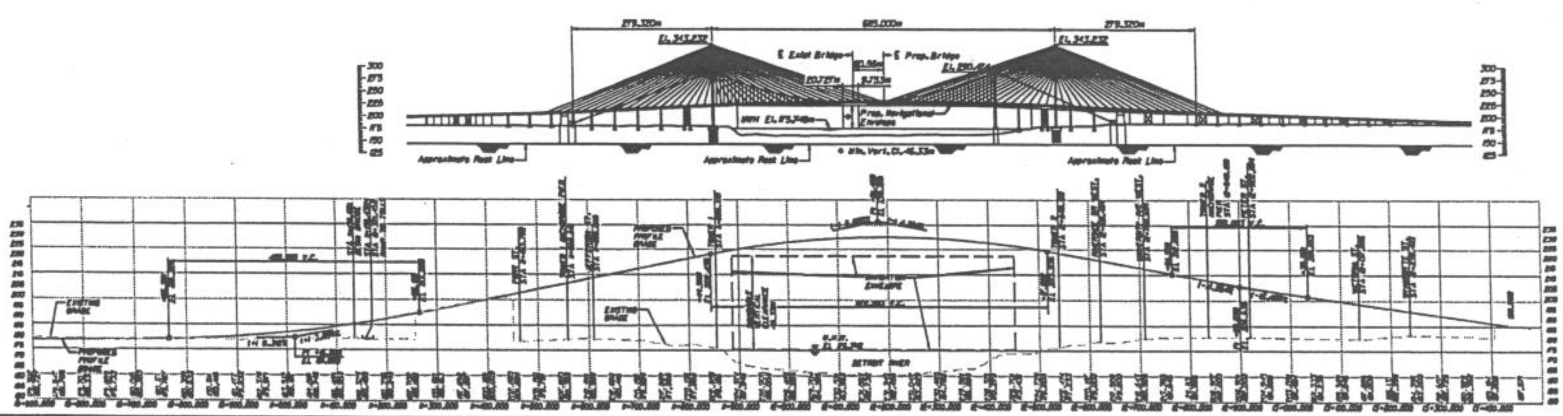
AMBASSADOR

AMBASSADOR BRIDGE ENHANCEMENT PROJECT
6 LANE TUNNEL (WEST SIDE)

SHEET NO.
ALT. 8

LEGEND

DIBC/CTC 2009



American Consulting Professionals of Michigan, PLLC

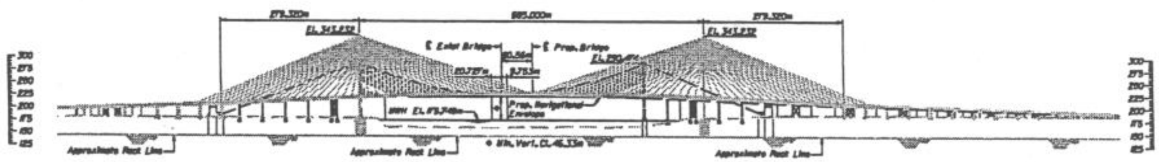
AMBASSADOR

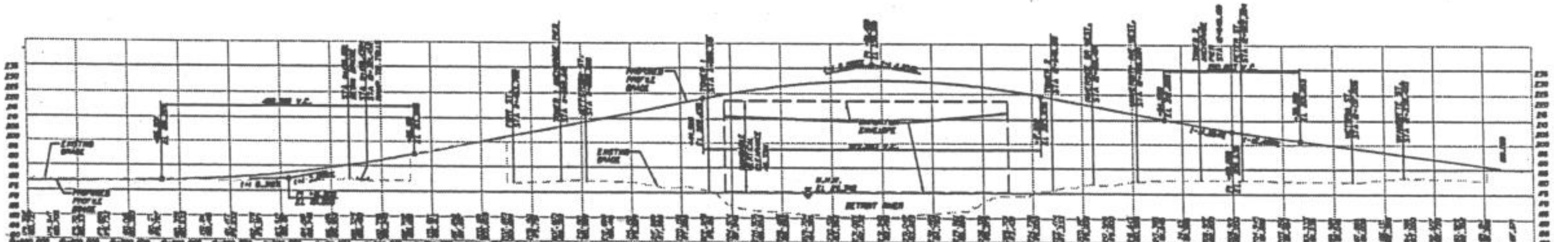
AMBASSADOR BRIDGE ENHANCEMENT PROJECT
6 LANE CABLE STAY BRIDGE (WEST SIDE)

SHEET NO.
ALT. 1

LEGEND

3 LANE CABLE STAY





American Consulting Professionals of Michigan, PLLC

AMBASSADOR

AMBASSADOR BRIDGE ENHANCEMENT PROJECT
3 LANE CABLE STAY BRIDGE (WEST SIDE)

SHEET NO.
ALT. 2

0274

Guard to extend the comment period on the permit application and hold a public hearing. I strongly believe that no one community should systematically bear the burden of the state's transportation infrastructure while the region and nation reap the benefits of international trade. There must be public accountability for these kinds of major border infrastructure and significant protections for impacted communities.

Sincerely,

[redacted]

Agency
Response Letters
to
CG Public Notice
09-03-06

American

American Consulting Engineers of Florida, LLC
4111 Land O' Lakes Boulevard, Suite 210
Land O' Lakes, Florida 34639
Tel 813.996.2800 • Fax 813.996.1908
american@ace-fla.com • www.ace-fla.com

April 13, 2005

[redacted]
Bridge Section
United States Coast Guard (OBR)
1240 East Ninth Street
Cleveland, OH 44199-2060

RE: Ambassador Bridge Enhancement Project
Preliminary Review Permit Application Version 2.0

Dear [redacted]

Enclosed please find two (2) updated copies of the Preliminary Review Permit Application for the proposed Ambassador Bridge Enhancement Project. This project consists of additional lanes over the Detroit River to the west of the existing span and connecting directly into the north side of the existing Plaza in Windsor and into the existing Ambassador Bridge in Detroit. No additional connections to the existing infrastructure are required as this project is located between the plazas in its entirety and serves only to reduce congestion on the bridge itself. The property required by this project is owned almost entirely by the Canadian Transit Company and the Detroit International Bridge Company. No negative environmental impacts are anticipated; therefore, we believe that this project qualifies for a categorical exclusion.

We request a review of this permit application by the appropriate US agencies under the provisions of the environmental regulations governing such projects while we proceed with the final design and permitting. In order to save time, these documents are being concurrently distributed to all of the agencies shown on the distribution list that you provided for concurrent review and comment. We look forward to discussing this project directly with all agencies having an interest or jurisdiction over the project at the earliest possible date.

If you have any questions or would like additional information, please call me directly at 813-996-2800 ext. 5567.

Very truly yours,
AMERICAN CONSULTING ENGINEERS OF FLORIDA, LLC

[redacted]

0214

Project Manager

cc: International Joint Commission
United States Customs and Border Patrol
United States Fish and Wildlife Services
United States Environmental Protection Agency
Federal Highway Administration
Michigan State Historical Preservation Officer
Michigan Department of Transportation
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
United States Army Corps of Engineers
[redacted] Detroit International Bridge Company
[redacted] Canadian Transit Company
[redacted] Steptoe & Johnson

f:\project\5049964\admin\050413 let preliminary review permit application to us agencies.doc

SEMCOG *. . . Local Governments Advancing Southeast Michigan*

Southeast Michigan Council of Governments • 535 Griswold Street, Suite 300 • Detroit, Michigan 48226-3602 • 313-961-4266 • Fax 313-961-4869
www.semcog.org

August 31, 2006

Rec'd
5 Sep 06

[redacted]
Commander (dpw-3)
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, OH 44199

Dear [redacted]

SEMCOG has reviewed the U.S. Coast Guard public notice 09-03-06 regarding the application from the Detroit International Bridge Company's (DIBC) request for approval of location and plans for construction of a second (twin) fixed highway bridge over a navigable waterway of the United States adjacent to the existing Ambassador Bridge.

Our overall concern relates to the U.S. Coast Guard's determination that the proposed action is a categorical exclusion for purposes of the National Environmental Policy Act (NEPA), because it satisfies criteria for such actions listed in the Coast Guard's NEPA Implementing Instructions. This determination would allow for the proposed project to move forward without the normally required Environmental Assessment or an Environmental Impact Statement. It is our feeling that the Coast Guard came to its conclusion in part as a result of how the proposed project limits were defined. The proposed project is not as site specific as the Coast Guard reports. The entire scope of the project includes the portions of the bridge that go over the Detroit River, but also include the plazas and connecting roadways on both sides of the border.

A finding by the Coast Guard that the project should be considered a categorical exclusion without any analysis of the possible human and environmental impacts of the entire project would result in an incomplete analysis and potentially underestimate impacts of the project. As you know, the Ambassador Bridge is the busiest commercial crossing between Canada and the United States. It connects two densely populated urban areas and carries over 3 million trucks a year. Given these conditions, we believe that an additional structure has the potential for significant social, environmental, and transportation system impacts. These potential impacts can only be sufficiently analyzed through a public review process.

A specific conflict appears to exist with regard to U.S. EPA regulations 40 CFR part 93 which govern projects subject to regional conformity analysis for air quality. According to the regulations, projects determined to be regionally significant are subject to this analysis. In addition to the points made earlier in this letter, the regulations further define regionally significant projects to include those projects, which provide "access to and from an area outside of the region." Clearly, the DIBC's proposed project is regionally significant and subject to conformity analysis. Ultimately, this is to be determined by the Interagency Consultation

0216

process, which includes representation from MDOT, Federal Highway Administration, Federal Transit Administration, and the U.S. Environmental Protection Administration.

SEMCOG requests that the U.S. Coast Guard work with the other impacted federal agencies, including the Federal Highway Administration (FHWA) and the Environmental Protection Administration (EPA) and conduct an Environmental Assessment to assess the potential environmental impacts of the proposed action before determining if further analysis is required.

If you have any questions or require additional information, please contact me [redacted], Director, Transportation Programs.

Sincerely,

[redacted]
Executive Director

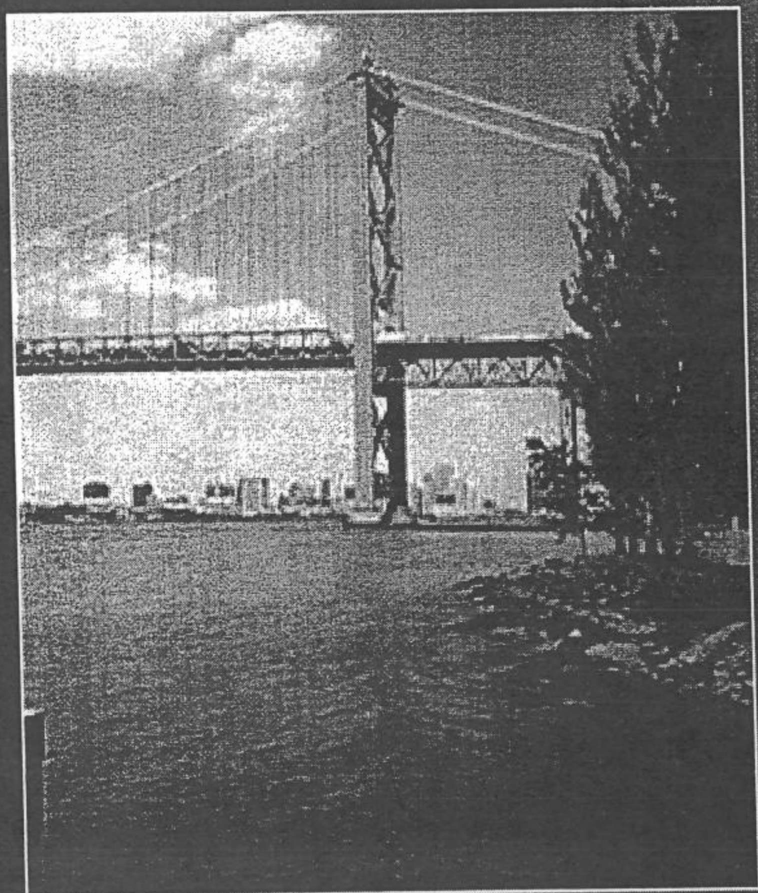
PT:tj

Cc: [redacted], FHWA
[redacted], Director, MDOT
[redacted], USEPA
[redacted]

State Historical
Preservation Officer
Letters &
applicant submission

Coast Guard letters
and notices for
meetings.

0218



Ambassador Bridge Enhancement Project – Section 106 Review

Presented by:
QUINN EVANS | ARCHITECTS
for
Detroit International Bridge Company

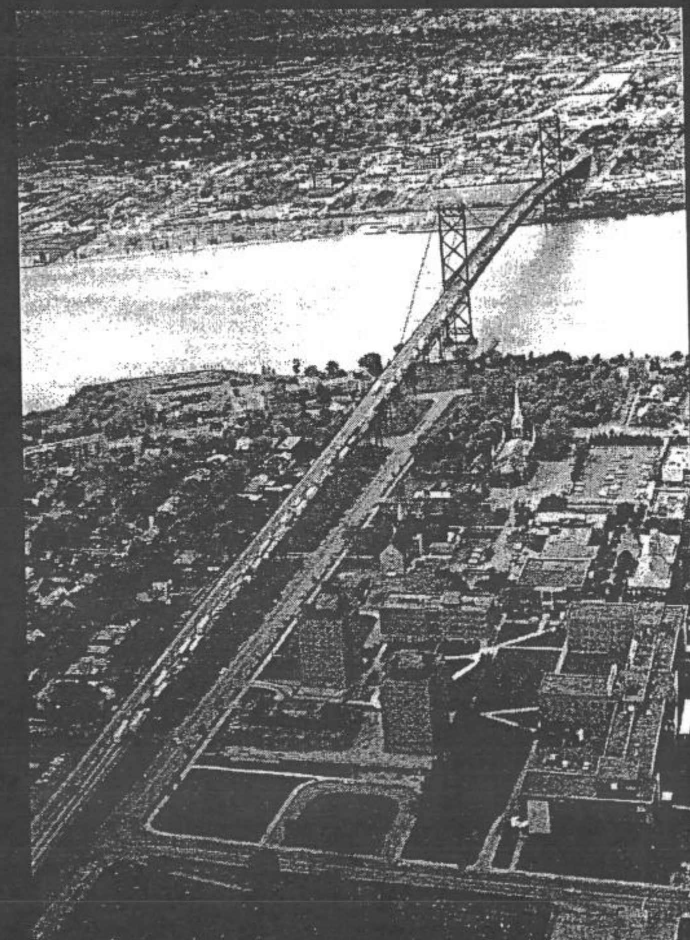
November 20, 2006

0219

Ambassador Bridge Enhancement Project

Historical Significance

Existing Bridge
Constructed in 1929



AMBASSADOR

Ambassador Bridge Enhancement Project

Historical Significance

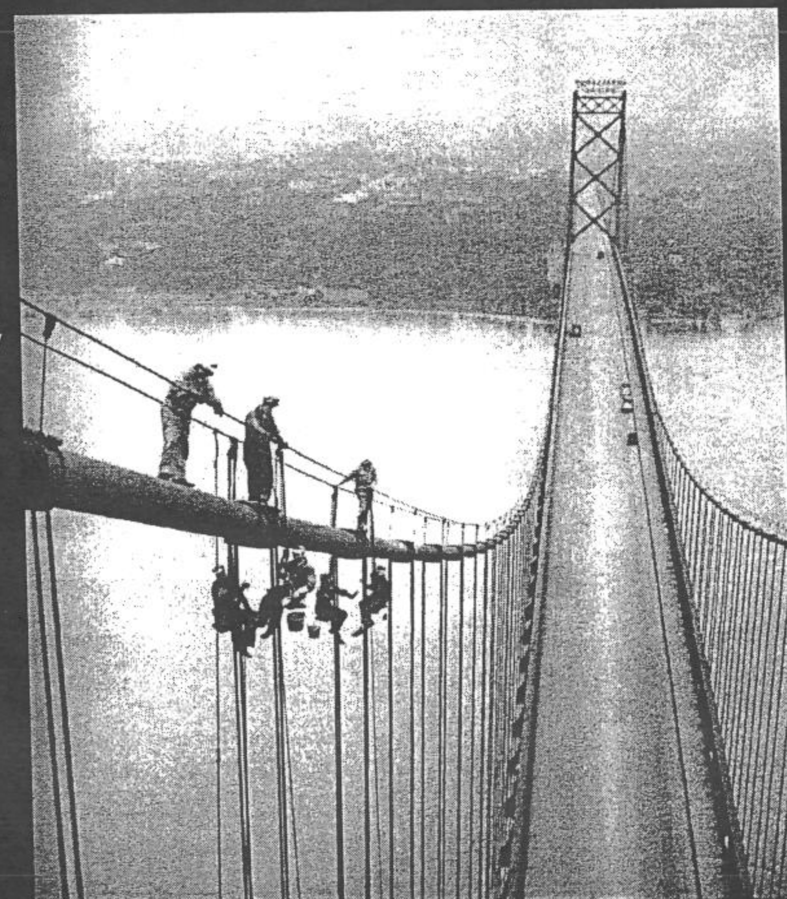
Longest clear-span structure in the world at the time of completion – 1,850’ long

AMBASSADOR

Ambassador Bridge Enhancement Project

Historical Significance

Designer: Jonathan Jones, Engineer employed by McClintock-Marshall Company



Ambassador Bridge Enhancement Project

Historical Significance

State of the Art Engineering

Ambassador Bridge Enhancement Project

Historical Significance

Symbol of Friendship between U.S. and Canada

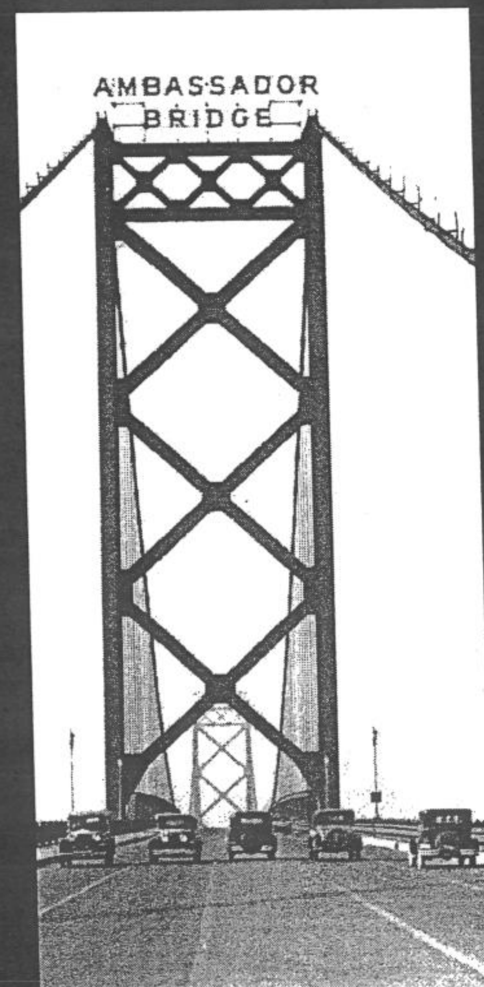
0224

Ambassador Bridge Enhancement Project

Historical Significance

Listed on National Register of Historic Places in 1980

(Structure - #80004793)



Ambassador Bridge Enhancement Project

Recent History

AMBASSADOR

Current Footprint

U.S. Canada

- Modifications to both plazas have been implemented over the years to optimize the operation and minimize travel delays

MDOT Gateway Interchange

Approved Improvements

- The Gateway Project will provide a direct connection between the US plaza and the Interstate System

AMBASSADOR

AMBASSADOR BRIDGE

DIBC Gateway Plaza

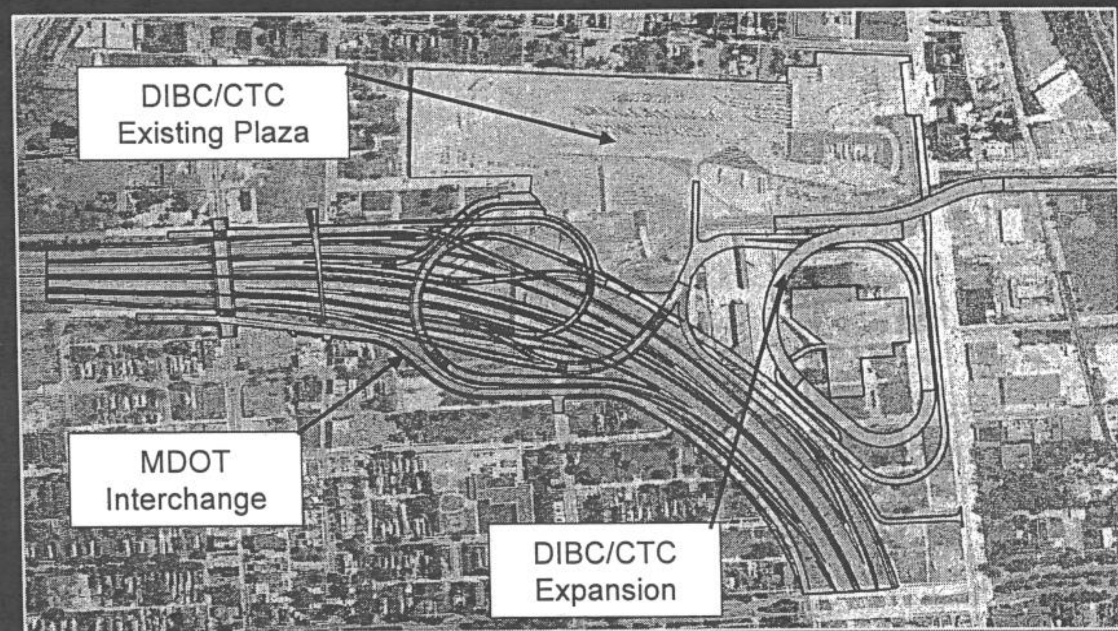
Approved Improvements

- Improvements to the plaza infrastructure will provide the necessary infrastructure that connects the gateway project to the bridge structure

Gateway Interchange & Plaza

Configuration

- MDOT is currently reconstructing the Ambassador Bridge interchange with I-75
- DIBC/CTC plaza expansion is currently underway with completion anticipated in 2009



- These improvements will provide improved access and increased capacity between I-75 and the Ambassador Bridge

AMBASSADOR

DIBC/CTC Enhancement Initiative

Project Objective

- This project simply modifies the existing crossing by replacing the lanes of an aging bridge structure that is the vital link in the most important border crossing between the United States and Canada
- Appropriate connections will have already been constructed on both sides of the border to accommodate the twin span

Ambassador Bridge

DIBC/CTC Enhancement Initiative

Submittals

- In July 2004 DIBC/CTC submitted a preliminary review permit application to the US Coast Guard and to the Canadian Environmental Assessment Agency showing a preliminary concept for a 4-lane twin span connecting to long term ultimate plaza configurations
- Based on an expressed need for dedicated FAST lanes and the need to evaluate/rehabilitate the existing bridge, DIBC/CTC has since updated the plan to construct a new 6 lane structure connecting to approved plazas configurations currently under construction
- This updated plan was integrated into an the environmental document in the form of a Project Description and a Categorical Exclusion and submitted in March 2006
- USCG has issued a public notice for this project and has accepted comments thru September 14, 2006

DIBC/CTC Enhancement Initiative

Project Need

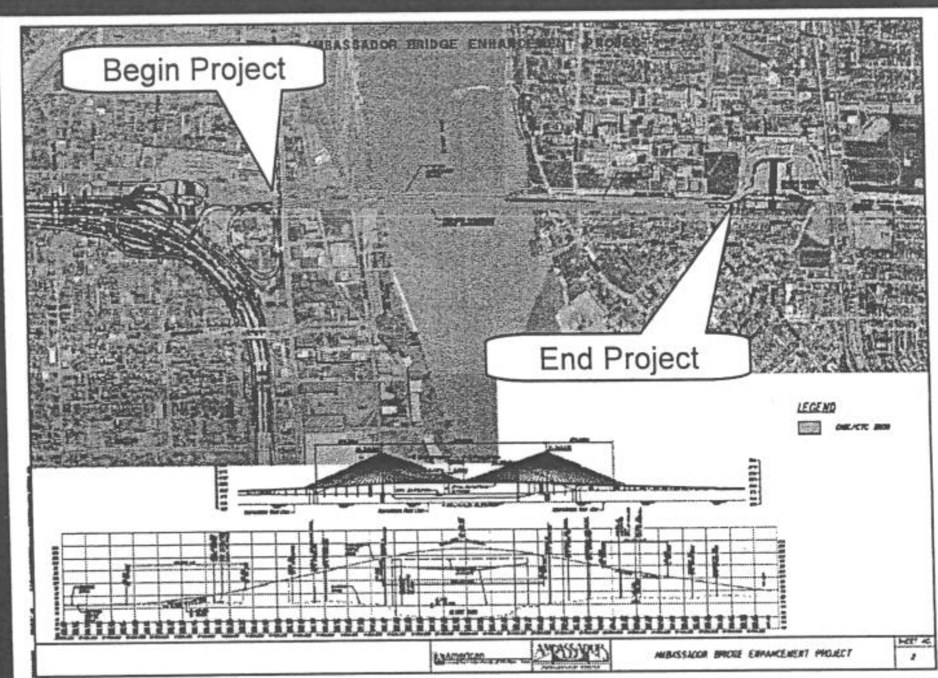
- This corridor serves 8.6 million vehicles a year including 3.2 million trucks and buses
- Any disruption in traffic flow across the structure results in significant delays and causes economic losses in both countries
- Construction of a parallel structure will provide desired redundancy
- This redundancy will allow the DIBC/CTC to take the existing structure out of service with no impact to the traffic flow

AMBASSADOR BRIDGE

DIBC/CTC Enhancement Initiative

Project Configuration

- Project length approximately 6200 ft (1890 m) of new 6 lane structure
- 2250 ft (685 m) cable stay span over the river
- No piers will be placed in the river
- 152 ft (46 m) vertical clearance above the river



- Structure will tie directly into the current plaza projects
- No changes will be made to the existing roads and streets in the US and Canada

DIBC/CTC Enhancement Initiative

Project Configuration

- New span will parallel the existing span.

DIBC/CTC Enhancement Initiative

Project Configuration

- New span will be located west (downriver) of the existing span.

AMBASSADOR
AMBASSADOR BRIDGE

DIBC/CTC Enhancement Initiative

Project Configuration

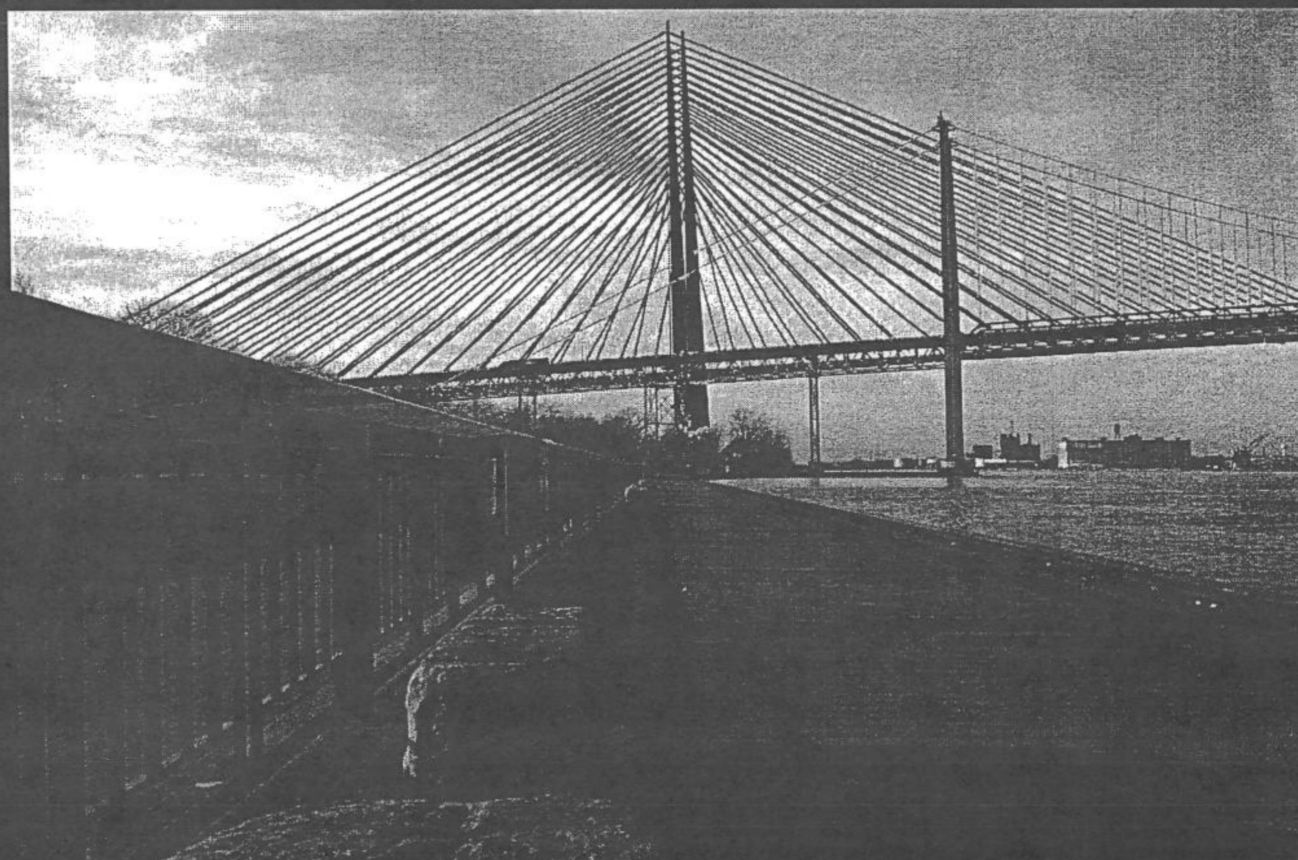
- New span will closely follow the arch of the existing span.

AMBASSADOR
AMBASSADOR BRIDGE

DIBC/CTC Enhancement Initiative

Project Configuration

- Both pylons will be located outside of the Detroit River.



Area of Potential Impact

Definition

The geographic area of area within which an undertaking may directly or indirectly cause alteration in the character or use of historic properties.

AMBASSADOR

AMBASSADOR BRIDGE

Area of Potential Impact

1. Determine and document the area of potential impacts.

AMBASSADOR
AMBASSADOR BRIDGE

Ambassador Bridge Enhancement Project

Area of Potential Impact - View

AMBASSADOR
Ambassador Bridge

Ambassador Bridge Enhancement Project

Area of Potential Impact

AMBASSADOR
AMBASSADOR BRIDGE

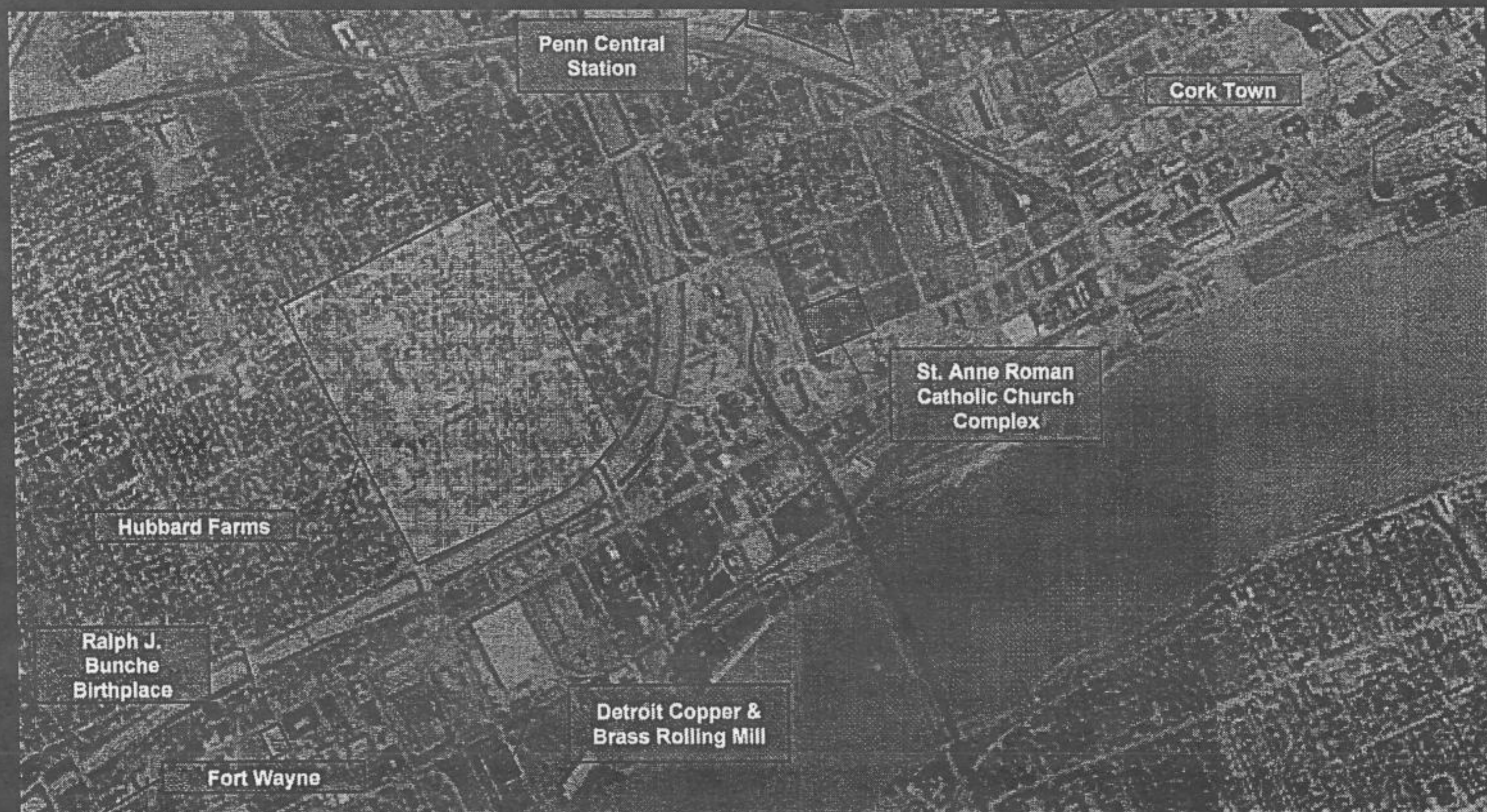
Area of Potential Impact

2. Review existing information on historic properties within the area of potential effects, including any data concerning possible historic properties not yet identified.

AMBASSADOR
AMBASSADOR BRIDGE

Area of Potential Impact

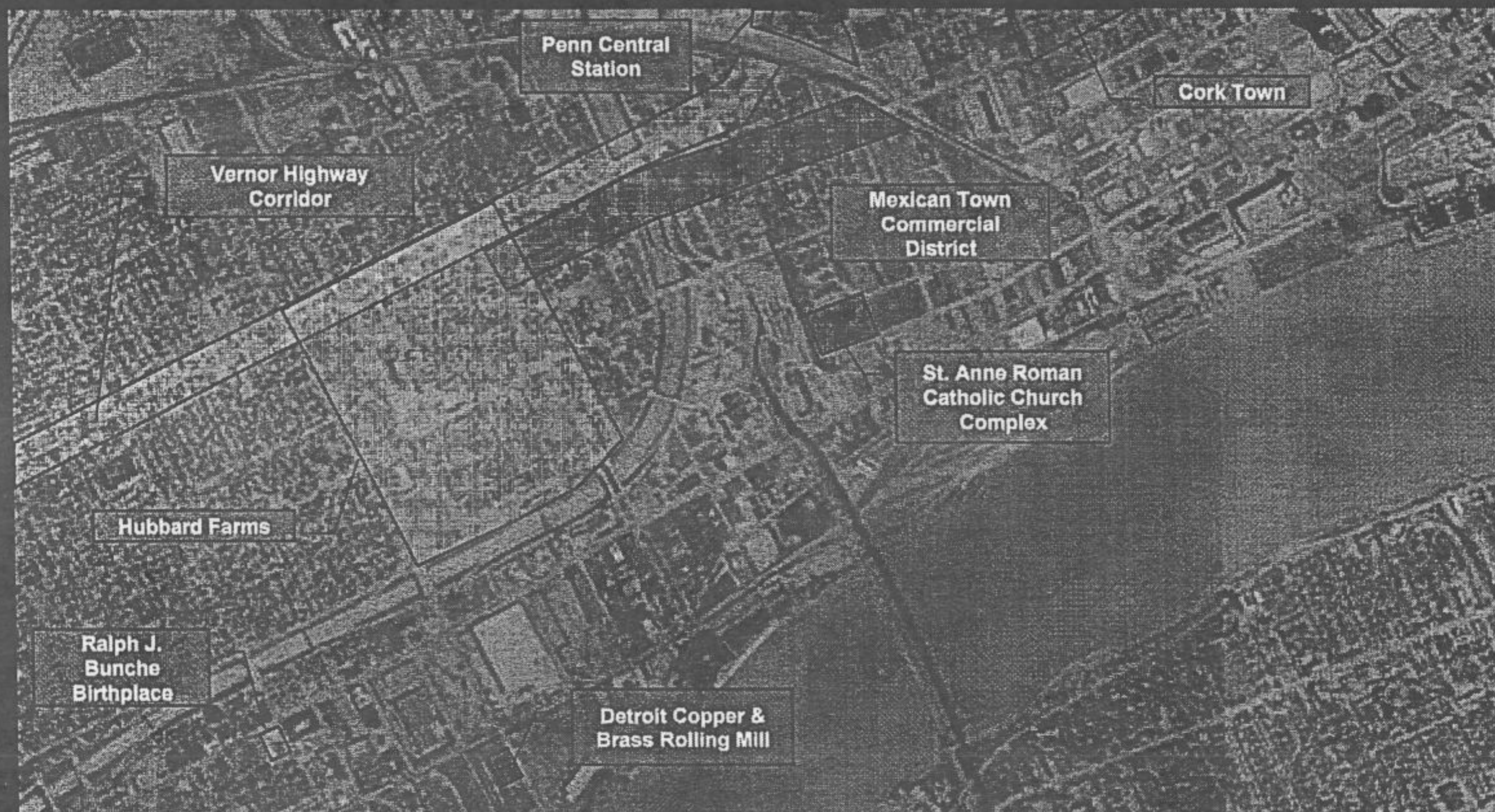
Designated Historic Districts



AMBASSADOR

Area of Potential Impact

Districts and Neighborhood Commercial Districts



AMBASSADOR

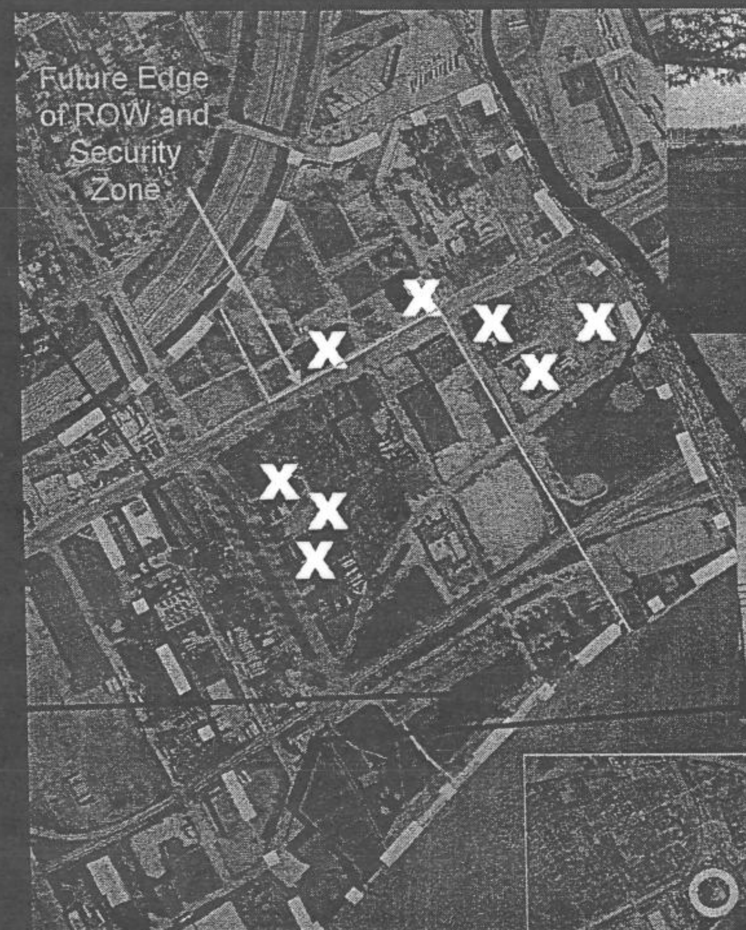
Area of Potential Impact

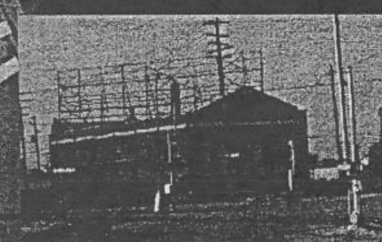
Areas of Potential Impact

AMBASSADOR
AMBASSADOR BRIDGE

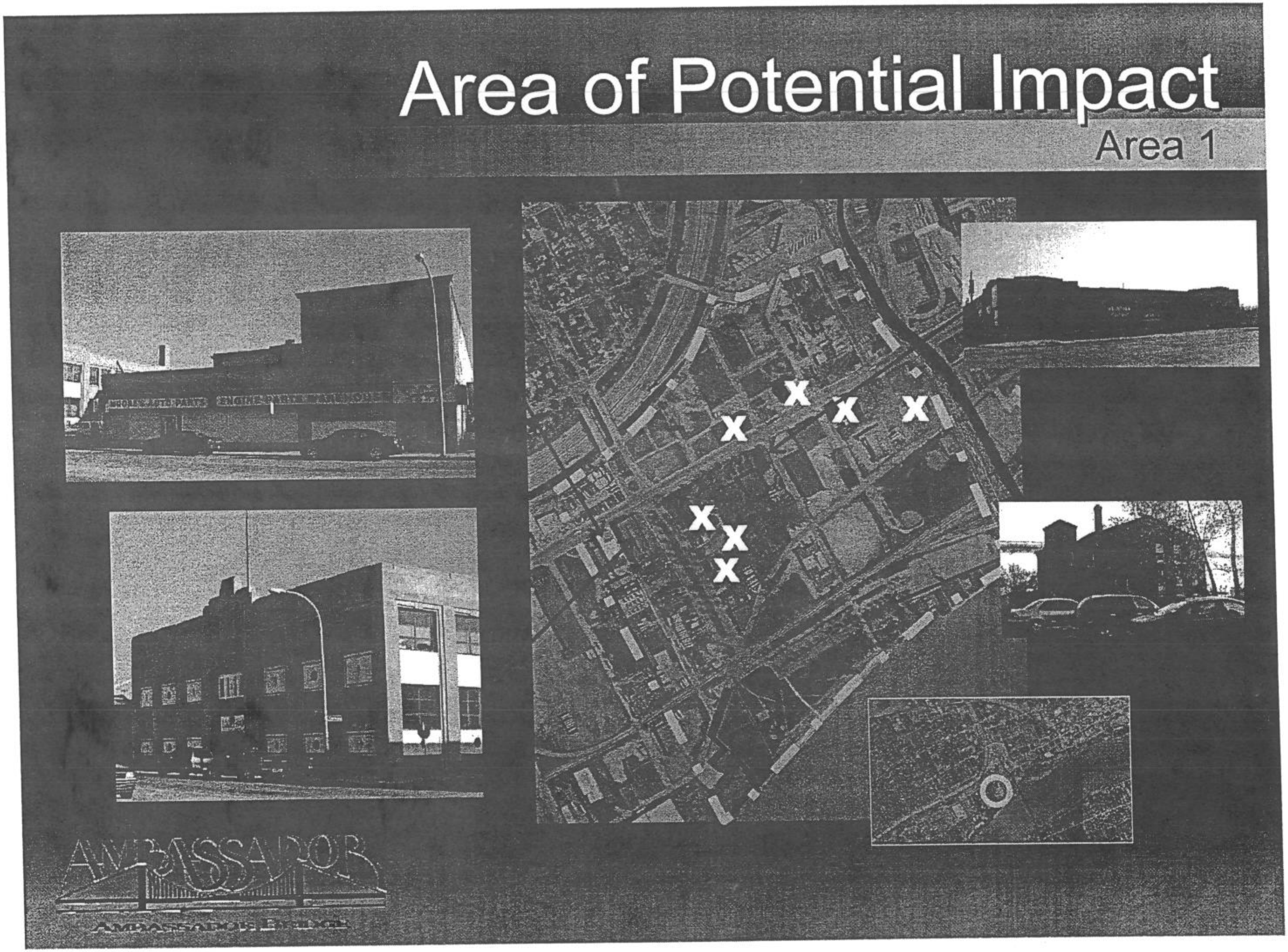
Area of Potential Impact

Area 1





AMBASSADOR


Area of Potential Impact
Area 1
AMBASSADOR
AMBASSADOR BRIDGE

United States v. 27.09 Acres of Land, 760 F.Supp. 345, 351 (S.D.N.Y. 1991) (traffic congestion can amount to a significant environmental impact requiring an EIS). We believe that the existence of these significant environmental impacts (along with other factors) preclude the USCG from using any categorical exclusion.

[redacted] lso has described the inaccuracies in DIBC's submission concerning the categorical exclusion checklist. DIBC's submission contains erroneous, conclusory and self-serving statements that cannot be relied upon to support the categorical exclusion determination. As shown, extraordinary circumstances clearly are present rendering the identified categorical exclusion inapplicable. *State of California v. Norton*, 311 F.3d at 1176 (failure to explain why extraordinary circumstances were not present rendered agency's reliance on categorical exclusion invalid); *Rhodes v. Johnson*, 153 F.3d 785 (7th Cir. 1998) (presence of one of listed extraordinary circumstances mandated environmental assessment).

In this case, the existence of significant public controversy alone is sufficient to trigger the EIS requirements where the City, on behalf of its citizens, is voicing its substantial concerns of the environmental effects of the project, particularly where there is a substantial dispute about the size, nature or effect of the action. *State of California v. Norton*, 311 F.2d at 1176; *Cold Mountain v. Garber,* 375 F.3d 884 (9th Cir. 2004) (existence of public controversy over agency action is one factor in determining whether agency should prepare EIS); *Fund for Animals v. Williams,* 246 F.Supp. 2d 27 (D.D.C. 2003), (to be highly controversial under NEPA, must be substantial dispute about size, nature, and effect of project), *amended* 311 F.Supp. 2d 1; *aff'd* 428 F.3d 1059; *Jones v. Gordon,* 792 F.2d 821 (9th Cir. 1986) (decision to use categorical exclusion unreasonable where agency failed to address applicability of exception for public controversy). The existence of significant public controversy is demonstrated by, among other things, the Canadian agencies participating in the Detroit River International Crossing Study ("DRIC") dropped a second Ambassador Bridge crossing for environmental and community impact reasons, there are substantial concerns over private ownership of the river crossing, and the long-standing community opposition to an expanded river crossing in the vicinity of the existing Ambassador Bridge.

Even if the new eight lane bridge was a modification of or a replacement for the existing bridge, the Coast Guard cannot use the categorical exclusion where a substantially different bridge is built. In this case, the new bridge is substantially larger and has a different footprint. The proposed bridge would be twice as wide and provide twice as many lanes as the current bridge. The new bridge will have substantial direct and cumulative effects on the environment. This project cannot reasonably be characterized as an "enhancement" of the existing bridge. The Coast Guard cannot exclude this project without taking a hard look at the potential effects that will be different and potentially larger than with the existing bridge. *Sierra Club v. DOE,* 255

F.Supp. 2d 1177 (D. Col. 2002) (DOE grant of easement constituted new use with new or different impacts and thus did not fall under categorical exclusion); *Ark. Nature Alliance, Inc.*, 266 F.Supp. 2d 876 (Corps violated NEPA when it did not conduct EIS for modification to low-water bridge where, among other things, new bridge was twice as large); *Pennaco Energy, Inc. v. U.S. Dept. of Interior,* 377 F.3d 1147 (10th Cir. 2004) (Bureau of Land Management's issuance of oil and gas leases was arbitrary and capricious where use of lease for extraction of coal bed methane raised significant new environmental concerns).

In summary, there is substantial evidence in the record that exceptions to the categorical exclusion apply. Thus, the Coast Guard is prohibited from using the categorical exclusion. *State of California v. Norton,* 311 F.3d at 1177 (fact that exceptions may apply is all that is required to prohibit use of a categorical exclusion).

Conclusion.

According to the U.S. Supreme Court, all federal agencies must take a hard look at the potential environmental effects of major federal actions. *Kleppe v. Sierra Club*, 427 U.S. 390. Under NEPA, the Coast Guard must take a hard look at the proposed project and identify potential impacts. If the impacts may be significant, the Coast Guard must prepare an EIS. The Coast Guard has substantial evidence before it of the numerous significant impacts from this project. The Coast Guard cannot reasonably conclude that the construction of a six to eight lane international bridge to be located in the heart of any major city would not have any potential significant impacts. Under NEPA, the CEQ rules, and the Coast Guard's Implementing Instructions, the categorical exclusion cannot be used where potential impacts exist as in this case. Moreover, the categorical exclusion referenced by the Coast Guard is inapplicable to this project based on the plain meaning of the language in the exclusion. If no categorical exclusion applies, the Coast Guard must conduct further environmental review.

Please let me know if you would like any additional information from us concerning the City's opposition to the Coast Guard's tentative NEPA determination.

Sincerely yours,

[redacted]

ALK/rjv

cc: [redacted] Gowling
Lafleur Henderson LLP

GOWLINGS

Suite 1600
1 First Canadian Place
100 King Street West
Toronto, Ontario
Canada M5X 1G5
Telephone (416) 862-7525
Facsimile (416) 862-7661
www.gowlings.com

[redacted]

September 14, 2006

Delivered by Overnight Courier
Office of Commander (dpw-3)
Ninth Coast Guard District
1240 East Ninth Street
CLEVELAND, Ohio
44199-2060

Attention: [redacted]
Bridge Program Manager

Dear Sir:

Re: Your Public Notice 09-03-06 – Detroit International Bridge Company/Canadian Transit Company
Application for Approval of Location and Plans for construction of a Second Fixed Highway Bridge Over a Navigable Waterway of the United States (Detroit River) Adjacent to the Existing Ambassador Bridge

SUBMISSION ON BEHALF OF THE CORPORATION OF THE CITY OF WINDSOR, CANADA

Introduction – The City of Windsor's Direct and Substantial Interest in This Matter

We are attorneys for the Corporation of the City of Windsor, Ontario, Canada. This letter, and the various attachments to it which are separately bound in two volumes and which are also enclosed with this letter, constitute the comments on behalf of the City of Windsor to your agency objecting to the grant of the requested permit as well as the objection of the City to the preliminary determination by the U.S. Coast Guard that this application is properly processed as a "categorical exclusion" (CE) from the *National Environmental Policy Act* (NEPA). We ask that this letter and the attachments enclosed form part of the record in this matter.

The application proposes a new international vehicle bridge across the Detroit River between Detroit Michigan and the City of Windsor, Ontario ("Windsor" or "the City").

The proponent describes this as a "new six-lane structure" to be built to the west of the existing 76 year old Ambassador Bridge. As submitted below, in fact this bridge will accommodate eight lanes of traffic and should be considered and environmentally assessed as such.

The proposed second bridge will be partially located within the United States, but a significant portion of the proposed bridge will be located within Canada, and in particular, within the City of Windsor.

The City of Windsor's northern boundary begins at the International Boundary line between Canada and the United States, which is essentially the mid-point of the Detroit River.

Approximately 50 percent of the proposed second bridge structure will be located in Canada and specifically within the City of Windsor.

The current Ambassador Bridge has a structural length within the City of Windsor of about 3,600 feet. Of that length, approximately 2,700 feet cross over the land area of the City of Windsor, not below the river.

The proposed second bridge will have approximately equal horizontal presence within the City of Windsor.

The proponent has filed plans with you for the second bridge which demonstrates that the proposed second bridge would pass over the following City of Windsor streets: Riverside Drive West, University Avenue West, Peter Street, Victoria Street and Wyandotte Street (in fact the proposed bridge would not pass over Victoria Street but instead would pass over Donnelly Street).

For an accurate plan view of how the proposed second bridge would be related to City streets and to the existing Ambassador Bridge within the land area of the City of Windsor, please refer to the enclosed aerial photograph entitled "City of Windsor Zoning By-law 8600 – Existing Zoning Adjacent to the Ambassador Bridge". This aerial photograph has been prepared by City engineering/planning staff from information taken from the plans provided by the proponent to the Coast Guard. **Attachments Vol.1, Part A, Tab 5**

As is clearly illustrated in the above-referenced aerial photograph, the second bridge will pass directly over four blocks of houses on the west side of Huron Church Road. There are approximately 218 dwellings shown on the aerial photograph in the 250 metre area to the west of Huron Church Road illustrated on the aerial photograph. These dwellings house approximately 650 people.

Also within a short distance west of the proposed second bridge, closer to the Detroit River, at 2856 Riverside Drive West, is a 145-unit building which houses almost 200 University of Windsor students.

Within 60 – 180 metres to the east of Huron Church Road, immediately opposite portions of the proposed second bridge, there are three University of Windsor residences. These provide housing for over 800 students.

0169

We are attaching to this submission a letter dated September 13, 2006 fron [redacted] MCIP, RPP, City Planner for the Corporation of the City of Windsor addressed [redacted]

Gowling Lafleur Henderson LLP, Attorneys for the City of Windsor. **Attachments Vol.1, Part A, Tab 2**

In the letter from [redacted] the City Planner details the land use conflicts and impacts that would be caused to the City and its residents by this proposed second bridge. That letter provides significant details corroborative not only of the direct interest of the City in this matter but, also, substantiation of the City's concern that this proposed second bridge will have significant adverse environmental and community impacts within the City.

A previous study carried out by the Detroit River International Crossing Project (DRIC) – the so-called "Bi-National Environmental Assessment" being undertaken by the U.S. Federal Highways Administration, the Government of Canada through Transport Canada, the State of Michigan and the Province of Ontario examined the potential environmental and land use impacts of a second Ambassador Bridge as is now being proposed by the proponent to you.

In his September 13th letter, Mr. Hayes quotes directly from the findings of the DRIC "Generation and Assessment of Illustrative Alternatives Report" (November 2005) which is also a report referenced by the proponent in its material submitted to you. **Attachments Vol.1, Part A, Tab 7**

The DRIC study rejected the viability of a second Ambassador Bridge after having carried out an assessment of traffic impacts, potential noise impacts, impacts to community cohesion and character and displacement of population.

The following quotation is taken directly from the DRIC report:

The expansion of the existing plaza at the Ambassador Bridge will have a highly negative impact on the community, particularly the neighbourhood of Sandwich. This area of Sandwich is densely populated and a mature residential area. Over 215 households will be displaced and almost 1000 households disrupted (i.e. within 200m of the plaza) within the established urban neighbourhood. Area businesses are forming an economic development corporation to promote new growth and development opportunities in the Sandwich area. The loss of over 215 households from the immediate vicinity would have a negative effect on the local businesses serving this community.

Other impacts associated with this plaza include: 2 schools displaced (J.L. Forster Secondary School and St. Francis Separate School); 4 institutional uses disrupted, including a day care centre and business school; and 5 social features disrupted, including the University of Windsor, Assumption Church and the Riverfront Park. The plaza would be situated in a residential neighbourhood (highly undesirable from the perspective of border agencies) with little opportunity for expansion to meet future needs without additional community impacts.

The twinning of the Ambassador Bridge will also have impacts on Sandwich community: approximately 75 households displaced and over 310 households disrupted; a student residence would be displaced and the riverfront part would be disrupted.

Overall, the crossing X12 alternative would have a highly negative impact to community and neighbourhood characteristics. (p.108-9)

0170

...
Expanding Huron Church/Talbot Road from Highway 401 to the plaza at Ambassador Bridge will displace approximately 135 homes and over 85 businesses, while over 2100 households and approximately 25 businesses will be disrupted (i.e. are within 250m of the centerline).

Protect Cultural Resources

The crossing X12 alternative has a high negative impact to cultural resources. The community of Sandwich includes one of the oldest settlements in Canada. The original town of Sandwich retains a number of buildings of the pre-confederation era that are of historical significance and/or which exemplify the Neo-classical and Georgian styles of architecture, which were in vogue during the first half of the nineteenth century.

A number of designated heritage properties can be found along the following streets: Russell Street, Sandwich Street, Peter Street, Detroit Street, Mill Street, Brock Street, Chippewa Street, South Street, Watkins Street, Prince Road. The Ambassador Bridge, built in 1929, is listed in the Ontario Heritage Bridge List. Expanding the plaza at the Ambassador Bridge to accommodate a twinning of this structure will affect over 40 built heritage features (disruption impacts) and 3 known archaeological sites. The alternative also impacts a sizeable area of high archaeological potential. (p.109-110)

Moreover, the City Planner's September 13, 2006 letter further documents how the proposed second bridge will conflict with the City of Windsor Official Plan as well as the City of Windsor Zoning By-law.

As the Chief City Planner's letter indicates, the second bridge is proposed to be located west of the current bridge. "This land, west of Huron Church Road, is residential and is designated as such in the City of Windsor Official Plan." Also, the Windsor Official Plan "designates portion of land near the Detroit River around the existing and proposed second bridge as Waterfront Recreation and Waterfront Residential.

Please refer to the attached map – Excerpt from Schedule D "Land Use" from City of Windsor Official Plan which shows, in yellow, how the area proposed for the second bridge and the lands to the west thereof are all designated in the Official Plan as "Residential" except for a small portion at the river which is designated as "Waterfront Recreational". **Attachments Vol.1, Part A, Tab4**

A complete copy of the City of Windsor Official Plan is being filed as an attachment to this submission (on disc). **Attachments Vol.1, Part A, Tab 3**

With respect to zoning, as the Chief City Planner's letter indicates, (page 5) the entire area of the proposed second bridge is currently zoned for residential uses.

Please refer to the above-referenced aerial photographs "City of Windsor Zoning By-law 8600 – Existing Zoning Adjacent to the Ambassador Bridge".

Filed with this submission are a binder of photographs illustrating some of the land uses in close proximity to the proposed second bridge. These photographs illustrate parks, culturally/historically significant properties, including some from Olde Sandwich Towne and the University of Windsor. **Attachments Vol.1, Part A, Tab 6**

With specific reference to impacts on City parks and recreational and cultural facilities, please refer to the letter dated September 11, 2006 from [redacted] Executive Director, Parks and Facility Operations, City of Windsor, Parks and Recreation Department to Gowling Lafleur Henderson, which is one of the enclosed and attached documents to this submission. **Attachments Vol.1, Part A, Tab 10**

The letter from the Executive Director of the City's Parks and Recreation Department establishes that there are four City parks that are directly located adjacent to or very close to the proposed second bridge.

Contrary to the proponent's assertion in its application to you that parks will not be impacted, [redacted] points out how the second bridge would have negative environmental impacts on the park in that area as well as on the recreational use and capacity of the recreationway easement under the existing and proposed bridge.

Please refer to the enclosed aerial photograph entitled "Proposed River Front Recreation Way Easement Extension". **Attachments Vol.1, Part A, Tab 18**

To quote [redacted] this area under the bridge is "vital to create a safe, continuous recreation way from Assumption Park to McKee Park to the west. This portion of recreationway is an integral part of our bicycle use Master Plan which connects Windsor by pathway from north, south, east and west … Our estimate of usage ranges from 100 – 500 per hour past this point dependant on season."

[redacted] indicates that the "increased traffic of six – eight new lanes compared to the existing four will increase the noise and air contaminants in the adjacent parkland space, which is designed for passive and active use by the neighbourhood. Clearly it is not reasonable to conclude that there will be 'no impact' on neighbourhood parkland. Clearly, there will be impacts in the form of landscape growth patterns, increase of noise and air contamination and lack of consideration for historical and cultural significance in the area of the proposed bridge expansion."

He concludes that it is the City Park Department's opinion "that approval of the project will have a significant potential impact on parks, recreation and cultural features in Windsor and we strongly advise that before any approvals are processed for this project, it is vitally important that appropriate studies of these potential impacts are carried out".

Please note that [redacted] letter has some attached pages providing further details with respect to the history and features of the nearby parks.

Also referenced in the September 13, 2006 letter from the Chief City Planner is a Memo dated September 12, 2006 to the City Planner from the Senior Policy Planner – Heritage of the City (Nancy Morand, MA, MCIP, RPP). **Attachments Vol.1, Part A, Tab 9**

That September 12th memo substantiates "there are a number of properties in the shadow of the Ambassador Bridge that are important heritage resources".

These various heritage resources are depicted on the accompanying map entitled "Heritage Properties: Sandwich Area" – a map which is enclosed with and forms part of this submission. **Attachments Vol.1, Part A, Tab 17**

[redacted] memo points out that "the land in the vicinity of the Ambassador Bridge was the site of the earliest European settlement of the south shore of the Detroit River. It is the site of the Mission of the Our Lady of the Assumption Among the Hurons, established at Detroit in 1728 and moved to this location in 1747. The Hurons established a village adjacent to the Mission and the church also attracted French and British settlers".

She also points out that:

> "Assumption Park bounded by Riverside Drive East, Huron Church Road, University Avenue and Vista Place is designated under the *Ontario Heritage Act* (in 1991) as an archaeological site. The present day church, the magnificent Gothic-style cathedral located just to the south across University Avenue, was built in 1845 … It was designated under the *Ontario Heritage Act* in 1978."

Her memo references many other designated heritage buildings in the immediate vicinity of the bridge. **Attachments Vol.1, Part A, Tab 6**

Please see the file of photographs being submitted with this submission which include pictures of heritage designated and historical buildings in close proximity to the proposed second bridge.

[redacted] memo also points out that the City of Windsor, Archaeological Master Plan (2005) "the land in the vicinity of the Ambassador Bridge has more potential to contain archaeological resources than any other land in the City. That is because of its close proximity to a major waterway (Detroit River), historic transportation routes, (Huron Church line and Riverside Drive) and the former Huron Village. It is also adjacent to known archaeological sites and unregistered burial sites.

Please note and consider the complete City of Windsor Archaeological Master Plan Study Report (October 2005). **Attachments Vol.1, Part A, Tab 14**

Also, for ease of reference, we have separately enclosed Figure 4 from the Windsor Archaeological Master Plan "Archaeological Potential" which demonstrates that all of the lands on either side of the proposed second bridge are concluded to have "high potential" in respect of archaeological significance. **Attachments Vol.1, Part A, Tab 15**

As well, please see another map which is included in the Archaeological Master Plan entitled "Windsor Archaeological Master Plan – Cultural Factors". This coloured map provides details with respect to the location of the "original Huron reserve" directly in the area proposed for this second Ambassador Bridge, as well as the same area also being the site of the "Huron Village and Jesuit Mission" as well as "unregistered burial sites". **Attachments Vol.1, Part A, Tab 16**

There will also be potentially significant noise impacts caused by the new bridge and associated increased traffic associated with it.

Please refer to the enclosed letter report dated September 12, 2006 fr[redacted] Eng., Acoustical Engineer and President of Valcoustics Canada Limited. **Attachments Vol.1, Part A, Tab 8**

[redacted] letter substantiates that there would be a significant and unacceptable increase in noise levels as a result of the operations intended to be carried out on the new bridge. Residential properties and residents residing in proximity of the proposed second bridge would be subjected to noise levels greatly in excess of permitted noise level exposure criteria established by the Ontario Ministry of the Environment.

[redacted] letter points out how the proponent has carried out no noise studies and concludes no noise mitigation is required because in its view "noise levels will not substantially increase over the existing volume as a result of the proposed bridge".

[redacted] finds that:

> "These conclusions are nonsensical. The projected future traffic volumes are understood to be future traffic demands and would materialize at any particular facility providing the capacity is made available. Clearly if the demand exists, an increased number of lanes would result in higher volumes of traffic."

[redacted]etter also points out how the proponent's consultant's statement in the materials filed with you that "the closest noise receptor is approximately 1,000 feet away" is erroneous as is the statement "businesses and vacant land immediately surround the project".

[redacted]points out that "the closest existing homes on Indian Road are about 280 feet from the centre line of the existing bridge and will be about 165 feet from the centre line of the proposed new bridge. The closest facades of the University residences are about 135 feet from the centre line of the existing bridge and will be about 200 feet from the centre line of the new bridge".

In preparing his noise assessment[redacted]ook into account the projected traffic data and demand forecasts carried out for the DRICP in their study entitled "DRIC Study Travel Forecasts, Working Paper, September 2005, prepared by the IBI Group. Please note that this travel forecast Working Paper is one of the enclosures with this submission (on disc). **Attachments Vol.1, Part A, Tab 13**

[redacted]oncludes that by averaging the yearly projected volumes over 365 days to obtain 24 hour volumes, the sound exposures at the row of houses fronting on Indian Road (west side) will be increased by about 7 dBA, from a projected 66 dBA to about 73 dBA with the new bridge in place. As he states:

> "The result is a relatively significant increase and the resulting sound exposures are well above the normal outdoor criteria 55 dBA for residential uses."

He also points out that current conditions on the bridge are often congested which results in lower travel speeds which produce reduced noise emissions. "That is, current sound exposures at the houses on the west side of Indian Road will be less than 66 dBA." Increasing the traffic speed, which would likely be the result, at least for some time, of the proposed new bridge, which would allow traffic to flow at higher speeds, would therefore increase sound exposures from <u>current conditions</u>.
As he puts it:

> "In such a case, the increased (traffic) volume capacity can result in increases in sound (noise) exposure beyond current conditions by at least 10 dBA. This change is considered very significant."

According to the MOE reference attached to [redacted] letter, a 6 to 10 dBA increase above recommended sound levels would produce a "definite noise impact".

[redacted] concludes that:

> "The proponent's conclusions, that detailed noise studies are not required, are not supported by the evidence (some of which is incorrect) and thus are not warranted."

He further concludes that:

> "Detailed noise studies should be required to address potentially significant increases in sound exposure as is the case for all major projects in Ontario with the potential to impact neighbouring land uses; examining existing, actual traffic flow conditions, as well as future projections and the need for potential noise mitigation is part of the design of the proposed new bridge."

In conclusion with respect to the interest of the City in this matter, the above-referenced documentation clearly and unequivocally demonstrates that the City of Windsor has a substantial and direct interest in the permit application filed with the Coast Guard.

The Coast Guard is Required to Consider the Potential Environmental Effects of its Action on the City of Windsor

The Coast Guard has recognized the obligation to assess the environmental impacts of its actions on the environment of other countries. Pursuant to U.S. Coast Guard Commandant Instructions M16475.1D, "National Environmental Policy Act Implementing Procedures and Policy for Considering Environmental Impacts" (November 29, 2000) it is noted that pursuant to Executive Order 1214, "Environmental Effects Abroad of Major Federal Actions", the requirements of the

Commandant's Order applies to "...(2) major federal actions significantly affecting the environment of a foreign nation not participating in the action or otherwise involved in the action".

The environment of the City of Windsor, located in a "foreign nation", will be affected by the proposed second Ambassador Bridge. The Coast Guard's obligation in addressing NEPA therefore must include an assessment of effects on the environment in Canada and in particular within the City of Windsor.

We also refer you, on this issue, to the letter dated September 14, 2006 from the law firm of Thompson Hine, LLP, American counsel for the City of Windsor. In that letter, authored by attorney Andrew Kolesar, it is further pointed out why the Coast Guard is required under NEPA to include analysis of reasonable foreseeable trans-boundary affects in its analysis of proposed actions in the United States. Those submissions are incorporated by reference in this submission. **Attachments Vol.1, Part A, Tab 1**

We refer you on this issue to the Coast Guard's own "Environmental Procedure Pertaining to Bridge Permit Applications" contained in the U.S. Coast Guard "Bridge Permit Application Guide", COMDTPB P16591.3B".

Among the Coast Guard policies are the following:

1. "Coast Guard policy ensures that efforts are made to improve the relationship between man and his environment and to preserve the natural beauty of the countryside, coastal areas and natural and cultural resources. <u>Coast Guard investigations include consultations with local, state and federal agencies and the public.</u> Recommendations and decisions are based on providing for the reasonable needs for navigation and consideration of these social, economic and environmental goals.

2. <u>Coast Guard environmental considerations extend beyond the bridge and approaches to include causally-related primary and secondary environment impacts of the proposed bridge project.</u> When the Coast Guard is the lead agency in a project involving a bridge, <u>the NEPA jurisdiction extends to the logical terminae on both sides of the bridge</u> or the bridge and road sections having independent utility." (See page 22)

It is clear that the Coast Guard policy requires "investigation" of actual facts (not just acceptance of the proponent's submissions) and "consultation" with the public and local government such as the City of Windsor about such facts and the potential environmental consequences of the proposed action at both sides of the bridge in processing an application pursuant to its own environmental policy.

The City acknowledges that in Canada, pursuant to the *Canadian Environmental Assessment Act*, a form of environmental assessment is to be carried out. In Canada, however, there are only a minimal prescribed requirements for this type of environmental examination. Under the Canadian legislation the examination is called a "screening". While a much more rigorous "comprehensive study" of a project is a defined term, this "comprehensive study" cannot jurisdictionally be applied to the proposed new bridge and therefore only the minimal "screening" level environmental examination will occur.

A screening level environmental review in Canada is not required to consider the purpose of the project, nor is it required to consider alternative means of carrying out the project that are technically and economically feasible, nor is it required to examine environmental effects of any such alternative means.

A further limitation in Canada is that potentially affected parties such as the Corporation of the City of Windsor and its residents have no ability to determine the "scope of the project" in relation to which a screening level environmental assessment is to be carried out. That decision is entirely a discretionary one in the hands of Canadian federal agencies.

Similarly, as indicated above, the scope of the assessment i.e. factors to be considered, are entirely discretionary and again, the City of Windsor and its residents have no assurance that anything but a very narrow, technically based, environmental screening will be carried out.

There is a Fundamental Factual Error in the Submission by the Proponent and in the Preliminary Determination by the Coast Guard that this Proposed Second Bridge Meets the Criteria of Categorical Exclusion No.32(a) on Figure 2 – 1 of the NEPA Implementing Instructions

This issue is substantially addressed in Andrew Kolesar's September 14, 2006 letter (Thompson Hine LLP). **Attachments Vol.1, Part A, Tab 1**

Further important facts and analysis of this issue having regard to the Coast Guard's checklist for analyzing environmental impacts for their significance are contained in the September 13, 2006 letter from the City of Windsor Chief Planner to Gowlings, which is enclosed with this submission. **Attachments Vol.1, Part A, Tab 2**

See in particular [redacted] analysis of the 10 issues on the U.S. Coast Guard Environmental Checklist Criteria.

However, one matter not addressed that this relevant to this issue either [redacted]etter or [redacted] letter is the assertion of the proponent, seemingly accepted by the U.S. State Department in its correspondence filed with you, that there is an alleged "existing corridor" in which the second bridge would be built, thereby supposedly substantiating the conclusion that the second bridge would be "on essentially the same alignment or location".

Gowlings has commissioned extensive historical and archival research with respect to the statutory and executive approvals granted by the Congress of the United States and the Parliament of Canada to the Ambassador Bridge, as well as in respect of the specific plans, drawings and rights-of-way approved by officials of the federal government in the United States and Canada for the current Ambassador Bridge.

0177

We are enclosing with this submission certified copies of original documents obtained from the National Archives of the United States and the National Archives of Canada, as well as documents filed in the Land Registry Office in the City of Windsor, all of which documents demonstrate that the original Congressional approval for the Ambassador Bridge as well as the original Parliamentary approval in Canada are confined to a single bridge. There is no contemplation in the legislation either approved by Congress or by the Parliament of Canada that there would be more than one bridge at this location. The Congressional legislation as well as the Canadian legislation both refer to "a bridge" or "the bridge". There is no contemplation of multiple bridges: See in particular **Attachments Vol.2, Part C, Tab 1** containing the 1921 Act of the Canadian Parliament "to incorporate the Canadian Transit Company" and which authorizes the company to construct and maintain a railway and general traffic bridge across the Detroit River from, at or near Windsor in the province of Ontario to the opposite side of the river in the State of Michigan".

Further, see documents listed in **Attachments Vol.2, Part E, Tabs 1 and 2** i.e. the Acts of Congress originally authorizing the Ambassador Bridge passed in 1921 and the subsequent Acts extending the time for its construction. Note that all of these Acts of Congress refer to "a bridge" across the Detroit River within or near the city limits of Detroit Michigan".

Further, both in the United States and Canada the specific plans for the Ambassador Bridge were required to be approved by senior officials in both countries.

In Canada, pursuant to the Act Incorporating the Canadian Transit Company, the Canadian Cabinet was required to approve the specific plans for the Ambassador Bridge. That approval was finally granted on August 11, 1927 by Order in Council PC1601 which approved "the annexed set of plans of a bridge and of the site thereof" which are then described further in the documents accompanying the Order in Council. Please refer to **Attachments Vol.2, Part B, Tabs 1 -- 11** which list the various plans approved by the Canadian Cabinet and provide surveys and Crown leases from the Province of Ontario and the current lease between the Windsor Harbour Commissioners to the Canadian Transit Company in respect of the strip of land which the Ambassador Bridge is entitled to occupy for the purposes of its bridge.

The various materials being filed with you clearly and unequivocally substantiate that the Canadian Transit Company is entitled to use only a 70-foot wide right-of-way under the Detroit River within the City of Windsor to the International Boundary for the purposes of its bridge. It has no other land under the Detroit River within the City of Windsor or in Canada (except for a slightly wider 100-foot portion near the Canadian shoreline on which a supporting pier for the existing bridge has been erected).

This 70-foot wide strip of land which is leased to the Canadian Transit Company for the purposes of the existing bridge in Canada is most clearly shown on the following documents and plans annexed to them which are found in Part B of our attachments:

- Licence of occupation issued by Province of Ontario, April 30, 1927 for a 70-foot wide strip of land under the Detroit River to the international boundary **Attachments Vol.2, Part B, Tab 8**

0178

- Crown lease from the Province of Ontario to the Canadian Transit Company signed October 7, 1932 in respect of a 70-foot right-of-way under the Detroit River for the purposes of the Ambassador Bridge. **Attachments Vol.2, Part B, Tab 9**

- 1962 Lease between the Windsor Harbour Commissioners of the City of Windsor to the Canadian Transit Company in respect of the 70-foot strip of land and a second smaller parcel under the Detroit River previously leased by the Province of Ontario to the Canadian Transit Company, the major piece of property being a parcel comprising "a strip of land under water 70 feet in width, having a distance of 750 feet more or less from the first parcel to the international boundary". There is a survey/sketch attached illustration these two parcels. **Attachments Vol.2, Part B, Tab 10**

- Plan of survey prepared by Verhaegen Stubberfield Hartley et al, Ontario Land Surveyors (1994) illustrating lands on the Canadian shoreline and under the Detroit River that are leased to the Canadian Transit Company and substantiating that the corridor of the leased lands under the Detroit River have a width of 70 feet to the international boundary. **Attachments Vol.2, Part B, Tab 11**

- Letter report dated September 12, 2006 from Heritage Research Associate[redacted] confirming that, as an expert archivist and research historian, his full search of the Library and Archives of Canada and the certified copies of documents and plans from the Archives of Canada and Orders in Council (included in the City Attachments) approving the plans of the Ambassador Bridge confirm that there is only a "70-foot wide corridor of land" under the river that was approved for occupancy by the Ambassador Bridge. **Attachments Vol.2, Part B, Tab 12**

Any second bridge would also require specific approvals and easements for a new corridor within the City of Windsor.

Please see the Canadian Act of Parliament from 1921 found in Part C in the documents/attachments being filed with the Coast Guard "An Act to Incorporate the Canadian Transit Company" which in Section 10 provides that:

> "The company shall not construct or operate any of the works mentioned in section 8 of this Act along any highway, street or public place without first obtaining the consent, expressed by by-law of the municipality having jurisdiction over such highway, street or other public place, and upon terms to be agreed upon with such municipality …"

In other words, before construction can begin for any bridge in this area, the consent of the City of Windsor is expressly required by this Canadian Act of Parliament.

No application has been made to the City of Windsor for such consent and of course no such consent has been granted.

When the original bridge was constructed the Canadian Transit Company did apply to the then Towne of Sandwich (now incorporated into the City of Windsor) for the specific approvals that it was required to obtain by the Act of Parliament.

Please see the documents/attachments filed with you under Part D of our document book which provides the specific by-law approval of the Towne of Sandwich and granting permission to the Canadian Transit Company to cross over a number of streets within the then Towne of Sandwich, (now the City of Windsor) for the specific structure then being built.

Those documents again corroborate that the Towne of Sandwich Council was approving a very specific structure, having certain specified heights above City streets and that certain very specific locations for anchors and piers were also being approved by Town Council.
Further, the agreement reached between the Canadian Transit Company and the Towne of Sandwich provided for the legal protection and indemnification of the municipality from materials that might fall off the bridge as well as damages caused by smoke and other emissions from the bridge.

The Canadian Transit Company/Detroit International Bridge Company have not applied to the City of Windsor, or even discussed their second bridge proposal with the City of Windsor and therefore until such applications are received and considered by City Council it is again clear that the proponent has no required statutory approvals under which it can assert it would be able to construct a second bridge at any specific location, let alone the location proposed and in respect of which the Coast Guard is being asked to give an approval.

In short, the application pending in front of the Coast Guard is premature. Until the proponent can demonstrate it has obtained the necessary approvals of the City of Windsor to pass through the air space of the City of Windsor and occupy lands within the City of Windsor, it cannot formulate plans for which the Coast Guard should be providing approval.

The City of Windsor asks that the Coast Guard suspend processing of the application made by the Detroit International Bridge Company/Canadian Transit Company until such time as these companies have sought and obtained specific approval for such a bridge both from the Parliament of Canada as well as from the City of Windsor.

In the United States, the specific plans for the Ambassador Bridge were approved both by the Assistant Secretary of War and the Acting Chief of Engineers on March 4, 1921 as well as by an ordinance.

We include in the Attachments to this submission the March 4, 1921 approval issued by the U.S. Assistant Secretary of War and the Acting Chief of Engineers approving the "plans and specifications" for the bridge between Detroit and Windsor "together with such drawings and map of locations thereof as may be required for a full understanding of the subject", which approval was issued pursuant to "an Act to Regulate the Construction of Bridges Over Navigable Waters". This approval was issued to the American Transit Company of Detroit Michigan.

The enclosed document is certified under the seal of the National Archives of the United States. **Attachment Vol.2, Part E, Tab 3**

The document consists of a two-page order approving the location and plans of the bridge and attached general plan, as well as this more specific plan and profile of the proposed bridge.

While no plan of the land area under the river is specifically shown on this plan, the plan does illustrate that the distance between supporting piers on either side of the proposed bridge was approximately 100 feet.

It is clearly beyond doubt that the proposed second bridge could not be constructed within the 1921 approval granted by the Assistant Secretary of War and Acting Chief of Engineers.

Further, the Ordinance passed by the City of Detroit in 1927approved the construction of the approaches to the Ambassador Bridge within the City of Detroit. That ordinance specifically gave approval for the bridge to pass over certain streets within the City of Detroit and refers specifically to a right-of-way width of 75 feet. **Attachments Vol.2, Part E, Tab 4**

In conclusion on this issue, the specific plans approved by federal officials in Canada and the United States by the City of Windsor, as well as by the City of Detroit do not authorize land to be occupied for a second bridge. The approved corridor in Canada under the river is no wider than 70 feet and in Detroit is 75 feet.

Clearly the proponent will be required to obtain federal, state, City of Windsor and City of Detroit approvals for a second corridor before it is entitled to build a new bridge. It has offered no proof that it has even applied for, let alone obtained, such approvals.

There is therefore no "existing corridor" and certainly no "existing approved corridor" for a second bridge.

Clearly this is another reason why a "categorical exclusion" cannot be processed in this matter.

Accordingly, it is imperative that the full rigour of the *National Environmental Policy Act* be applied to this project in order to ensure that, both in Canada and the United States, the full environmental implications of this proposal are examined and to ensure that an alternatives analysis i.e. an analysis and study of alternative locations and the environmental effects of alternative locations, is carried out.

Why an Environmental Impact Statement (EIS) is Required in this Matter

NEPA places an obligation on the USCG to consider every significant impact of its proposed action. *Baltimore Gas and Electic v. NRDC*, 462 U.S. 87, 97 (1983). NEPA and the CEQ regulations unambiguously require the Coast Guard and other federal agencies to prepare an EIS or environmental assessment/finding of no significant impact ("FONSI") for all major federal actions that are not categorically excluded as in this case as discussed above. *Anacostia Watershed Society v. Bobbit,* 871 F.Supp. 475, 481 (D.D.C. 1994). In this case, where there are

0181

clear environmental impacts and the action will generate significant controversy, an EIS is necessary. COMDTINST M16475.1D, Section B, Para. 5, pg. 2-8. *See*, *also*, USCG, Office of Civil Engineering, "Tools for Decision-making: Environmental Considerations" (undated), p.21 (generally should proceed to an EIS if know or suspect proposed action will have significant impacts); *Audubon Soc. of Cent. Arkansas v. Dailey*, 977 F.2d 428 (8th Cir. 1992) (affirming district court's order of EIS for bridge project where increased traffic and impacts on parks could not support the issuance of an environmental assessment/FONSI); *Mullin v. Skinner*, 756 F. Supp. 904 (D.N.C. 1990) (bridge replacement project had significant environmental effects that required an environmental impact statement, not just an environmental assessment).

As you are aware, when Congress passed NEPA, it determined that one of the primary functions of the legislation was to ensure that "alternatives to the proposed action" be studied and considered.

The proponent's submission would clearly avoid the need for alternatives to a second Ambassador Bridge to be considered. That, however, is clearly inappropriate, particularly given the specific role of U.S. federal agencies, including U.S. Coast Guard, in respect of the on-going Detroit River International Crossing Project Study (DRIC). That Bi-National Environmental Assessment has examined various alternative crossings of the Detroit River and already determined that it would be inappropriate from an environmental and community impact perspective for a second Ambassador Bridge to be pursued.

While it is acknowledged that the Ambassador Bridge as a private company is not strictly speaking bound by that determination of the DRIC study process, nevertheless the Coast Guard, as a federal agency which is required to address the requirements of NEPA, is bound to ensure that alternatives to the proposed action <u>are</u> studied, examined and considered.

Obvious alternatives to constructing a second Ambassador Bridge include the construction of a bridge somewhat downriver from the current Ambassador Bridge in areas of both the City of Detroit and of the City of Windsor where approach roads and traffic accessing that location would cause substantially less environmental and community impact than at the proposed second Ambassador Bridge location.

It is incumbent upon the Coast Guard to ensure that this downriver location identified by the DRIC study, which is similar to the location identified by a study carried out by an internationally renown transportation engineer, Sam Schwartz for the City of Windsor identified as a preferred location for a new crossing. We are enclosing in that regard the Schwartz report (Border Crossing Issues) January 2005 (on disc). **Attachments Vol.1, Part A, Tab 20**

Clearly, this downriver crossing location, sometimes referred to as the "central crossing" area, is required to be examined by the Coast Guard as a reasonable alternative. Another obvious reasonable alternative that must be considered is the rehabilitation of the current bridge for the purposes of extending its life and its continued use in conjunction with a bridge at another location.

0182

The Coast Guard Should Ensure that it Has Carried Out an Independent and Rigorous Examination of Facts in this Matter Before Making any Final Determination as to Whether or Not a Categorical Exclusion is Applicable

The Coast Guard has stated in its public notice that it has made a preliminary determination that a Categorical Exclusion is appropriate based on "the information presented by the proponents". Unfortunately that information is in some cases clearly erroneous, and in other places misleading and inaccurate. (We are referring to the proponent's document "Project Description and Type II Categorical Exclusion Environmental Documentation, Ambassador Bridge Enhancement Project" prepared for the Detroit International Bridge Company and Canadian Transit Company, March 31, 2006.)

Pursuant to the Coast Guard's "Bridge Permit Application Guide" the Coast Guard District Commander is required to make a "rigorous, independent examination to determine the possible impacts of the proposed project on navigation and the human environment". (Page 14) Similarly, the Coast Guard Bridge Administration Program Policy provides that "the Coast Guard is also required by law to ensure that environmental considerations are given careful attention and importance in each bridge permitting decision". (*ibid* Page 4) That careful attention cannot be provided if the Coast Guard relies only on information presented by the proponent, especially where that information is seriously misleading.

The most fundamentally inaccurate and misleading aspect of the proponent's material is its argument that this proposed second bridge is really only an "enhancement" or a "modification" of the current bridge. That argument is clearly specious in that no "modification" of the present structure is in any way proposed in the plans filed with you. Rather, what has been proposed is a completely new structure with a completely different architectural design on a completely new right-of-way (although at either end of the structure the new bridge would connect with the plazas that now exist).

For the reasons indicated elsewhere in this submission, there is no existing "approved corridor" for that second bridge and a completely new right-of-way must be acquired in Canada and the United States for it. This alone substantiates why a second bridge cannot be considered a mere "modification" or "enhancement" of the existing bridge.

A careful reading of the August, 2005 State Department letter in your file that pertains to this issue indicates that the State Department itself was relying on information provided to it by the proponent. There has apparently been no research carried out by the State Department, such as that provided to you with this letter, substantiating that the Act of Congress approving the Ambassador Bridge referred only to the current bridge and that the approval issued subsequently by the Secretary of War approved only a very specific plan and not any expanded corridor. The same situation pertains to the Canadian approvals as indicated elsewhere in this submission.

In short, approvals given by Congress and Parliament, as well as by the City of Detroit and the City of Windsor (former Town of Sandwich) are very site specific. They authorize very specific plans and engineering drawings by which the current structure exists. Therefore the legal approvals pertaining to the Ambassador Bridge allow it only to be built and only to exist as it is today. There is no "approved corridor" other than the existing bridge as it currently exists.

Any widening of the current bridge and certainly any new bridge, requires an approval in the United States under U.S. Code Title 33, Section 535, referencing the *International Bridge Act* of 1972, under which Congress delegated its consent to the construction of such bridges subject to conditions, including "the approval of the proper authorities in the foreign country concerned".

The Parliament of Canada has not been asked to grant nor has it granted consent to a second bridge across the Detroit River between Detroit and Windsor.

Other Misleading and Erroneous "Facts" Submitted by the Proponent to You

The proponent describes its proposed second bridge as having six lanes. In fact, the proposed new bridge will have a total width of 102 feet. Each of the six lanes would have a 12-foot width. However, there would be two outside shoulders, each with a six-foot width, and two inside shoulders, again each with a six-foot width. It can quickly be appreciated that in fact the new bridge could carry eight lanes of traffic, even assuming all lanes were 12 feet in width.

Therefore it is clear that the proposed second bridge is for a structure that is twice as wide than the current bridge (which has a 55-foot wide deck) and will provide twice as many lanes as the current Ambassador Bridge.

Our opinion in this regard is substantiated by the U.S. Department of Transportation, Federal Highway Administration, June 7, 2006 letter to you on this matter, specifically in **Attachment No.2, Item E** to that letter, where it is stated that:

> "The document cross-section shows six through lanes with shoulders, but the shoulders could potentially be converted by the owner to through lanes at some point in the future thereby resulting in an eight-lane cross section. What impact does this have on capacity of the inter-state system at the bridge location?"

Moreover, the proponent does not commit to ensuring that the new eight-lane bridge will be its ultimate goal. It has not committed to taking the existing Ambassador Bridge out of service. As such, what the proponent is proposing is to add a new bridge, having the capacity of ultimately eight lanes to the four lanes on the existing bridge for a total capacity of 12 lanes of bridge traffic.

Although the proponent states that once the new structure is completed the existing bridge would be taken out of service "for some period of time" to effect repairs that are deemed necessary, it goes on to state that: "Once any necessary repairs are completed, the existing structure will be used to provide redundancy and back-up support when necessary to ensure the free flow of traffic between Windsor and Detroit at all times."

This means that the City of Windsor is faced with the proposition that instead of four lanes of international truck traffic on the Ambassador Bridge, with the proposed second bridge in service, there may well be a total of 12 lanes of traffic passing through the City of Windsor.

This is of obvious concern to the City. The Coast Guard needs to ensure that its Environmental Impact Statement considers the project as having that significant capacity and associated environmental impacts.

0184

Another misleading aspect of the proponent's submission to you is that there is no need to be concerned about traffic that will be generated and associated with the new bridge because that is not a matter over which the private sector proponent has jurisdiction.

Of course, that proposition is preposterous. It would be arbitrary and capricious for the Coast Guard to purport to carry out an environmental analysis of this proposal with the blinders suggested by the proponent. This private sector proposal could only be financed based on the tolls from the substantial increase in vehicle traffic that has been projected to use a second crossing in this area when such is built. That additional traffic will in turn create significant adverse environmental effects within the City of Windsor. The addition of eight new lanes would obviously and necessarily exacerbate the critical congestion problems that exist on City of Windsor streets as documented in the Schwartz report (see copy of which is enclosed) as well as documented by the DRIC in its needs assessment for a new crossing. **See Photo, Attachments Vol.1, Part A, Tab 12.**

Other Information Provided to you by the Proponent Which is Misleading and Unreliable

- In the March 31st covering transmittal letter from American Consulting Engineers of Florida LLC addressed to Robert Bloom at the United States Coast Guard and Cathy Hainsworth at the Canadian Environmental Assessment Agency, the statement is made that the new structure "will connect directly to the existing plazas in both Windsor and Detroit without the need for modification to these recently-enhanced plazas".

  However, that is not the case.

  Please find as an Attachment to this submission a letter dated June 6, 2006 from the Director General of the Canada Border Services Agency to Mr. Dan Stamper, President, Canadian Transit Company regarding "Ambassador Bridge Development Plans". **Attachments Vol.1, Part A, Tab 19**

  In this letter the Canada Border Services Agency expresses substantial concerns that new infrastructure will be required on the Canadian side of the border in order to accommodate the proposed Ambassador Bridge second bridge.

  The CBSA points out its concern that:

  > "There are few details around the plans to provide adequate and functional installations for the port of entry functions over an appropriate long-term planning horizon. Implementing the plans as described will result in immediate additional capacity at this location: from the existing four lanes to six lanes with dedicated lanes for trusted travelers, up to possibly ten lanes should you decide to rehabilitate the existing structure rather than demolish it.
  >
  > ....
  >
  > The port of entry facilities are integral to the transportation system and its planning must be integrated in the systems overall planning. Otherwise, as you pointed out, the port of entry and not the bridge company becomes the system's

> bottleneck and capacity constraint with related impacts of trade. Consequently it would be short sighted to plan enhancements to the international crossing in abstraction of the port of entry installations necessary to support it." (emphasis added)

The CBSA letter goes on to point out that it sees it necessary for the proponent to incorporate "a strategy to secure the necessary land and zoning changes" for the further port of entry facilities it requires.

The CBSA also points out it has security concerns with respect to Huron Church Road "dissecting the proposed plaza expansion". As it is put in the letter:

> "This compromises the security and the sterility in the point of entry... . It is essential that adequate measures be taken to secure the plaza and ensure that all traffic from the U.S. cannot co-mingle with local traffic. Further, it splits our operations within the port, an undesirable feature, complicating our management of the site."

The Canadian government's letter also states:

> "There are significant security problems with the current off-site arrangements that jeopardize our ability to discharge adequately the border management mandate.
>
> ...
>
> This issue will be exacerbated in the future with the advent of the additional bridge capacity and the traffic growth at the gateway.
>
> ...
>
> Consequently, the importance that the bridge's enhancement plans incorporate the provision of functional secondary commercial examination installations integral to the port of entry."

Fourthly, the Canadian government's letter points out its concerns in respect of the adequacy of current travelers secondary examination installations.

> "We have concerns over the capacity of the facility and the configuration of the traffic flows around this element of the existing installations."

The letter ends with the observation that:

> "The Windsor-Detroit Gateway is the busiest trade corridor in North America. The aggregate capacity of the transportation system within the gateway has a significant impact on the trade between both partners and their economies. It is crucial that in improving an element of the system, such as the Ambassador

Bridge, that an end-to-end solution be formulated and implemented such that system-wide improvements are realized." (emphasis added)

The letter concludes that the Canada Border Service Agency is "unable to fully support enhancement plans for the Ambassador Bridge that do not fully integrate the minimum essential operational requirements necessary to discharge the agency's mandate at the border now and in the future". (emphasis added)

These comments must be critically considered by the U.S. Coast Guard in that they indicate that the proponent's plans are again premature. They must change before they are finalized. This again substantiates why the Coast Guard should put processing of this application on hold. This letter also refutes the statement made by the proponent that the proposed construction of the second bridge can proceed "without the need for modification" to the plaza, particularly that in Canada.

- Another highly misleading statement made by the proponent in its March 31st transmittal letter is that:

> "The property required by this project is owned entirely by the Canadian Transit Company and the Detroit International Bridge Company."

However, as indicated elsewhere in this letter and as substantiated by the various plans, leases, title deeds and other documentation attached, the proponent has no property rights under the Detroit River allowing it to occupy any area above the river for the proposed second bridge.

Moreover, the proponent will be required to obtain property easements from the City of Windsor over five City streets, and no application has been made to the City for that purpose. The bridge cannot exist without those property easements.

Similarly, there will be 14 support piers/abutments located within the City of Windsor as drawn on Sheet 8 of the plans submitted to you. The proponent will require permission from the City of Windsor in order to install such piers/abutments even if they are located entirely on private property (which is not clear). Building permits and zoning approvals will be required before any such piers/abutments can be erected.

Although it is not stated, the proponent's plans would require the demolition of a large number of houses to the west of Huron Church Road in order for this proposal to proceed. Again, the proponent has no approval to demolish such houses, which approval must be sought from the City of Windsor. No application has been made.

At page 7 of its submission the proponent makes the statement that it has determined that:

> "The Ambassador Bridge enhancement project is a preferred alternative. Conceptual designs have been completed in accordance with the long-term needs of the Region and consistent with ongoing initiatives in both countries." (Page 7)

This misleadingly implies that the Ambassador Bridge project is consistent with the DRIC study and that it meets "long-term needs of the Region" consistent with that study. However, a careful consideration of the November 2005 Alternatives Analysis Report by the DRIC (excerpted in Mr. Hayes' letter of September 13th enclosed with this submission) makes clear that a second Ambassador Bridge at this location is clearly not consistent with the DRIC analysis and is not consistent with the "long-term needs of the Region" or with "ongoing initiatives in both countries".

- The proponent has also made misleading submissions to you in respect of land use issues. For example, in its discussion of "land use" at pages 8 – 9 of its submission to you, there is no statement acknowledging that the land on which the proposed second bridge would be built is designated for residential use only in the City of Windsor Official Plan and is also zoned residentially in the Windsor Zoning By-law. (Further elaboration and substantiation of this is contained in the September 13th letter from the Chief Planner, Robert Hayes, filed with this submission and the various zoning maps and Official Plan documentation filed with this submission.)

- Further, a highly misleading and inaccurate statement is made at page 9 of the proponent's submission that:

> "The neighbouring parks, schools and neighbourhoods or industries will not be affected by the project." (Page 9)

As demonstrated by the letters from the Chief Planner of the City of Windsor, from the Executive Director of the City of Windsor's Parks and Recreation Department and the documents referenced in their letters, that statement by the proponent is entirely misleading and wrong. There is a university, schools, parks, historic and cultural amenities as well as the neighbourhood of Sandwich that all will be significantly affected by the second bridge.

- Another misleading statement by the proponent is:

> "The land use of the area would not change by the proposed action because the location is within the existing corridor of the similar facility, the Ambassador Bridge." (Page 9)

Again, that is entirely misleading for the reasons already set out: There is no "existing corridor" that is approved or exists beyond the actual structure of the current Ambassador Bridge. Any widening or addition to that existing corridor would require approval by the Parliament of Canada, approval under U.S. statutes, as well as the approval of the City of Windsor and likely also the City of Detroit.

Moreover, land use will in fact be changed by this proposed second bridge. A large number of houses will necessarily be demolished in order to accommodate the new bridge and its supporting structures. Land use in the remaining residential part of the area would indeed be affected by noise, emissions and hazards associated with the second bridge. The demolition of houses will obviously have a negative effect on neighbourhoods and housing stock within the City of Windsor.

- Another misleading statement is made by the proponent under the sub-heading 3.2 "Neighbourhoods":

> "Neighbourhoods will not be negatively impacted by the proposed action".

In fact, quite the opposite is obviously going to occur. Houses will necessarily be required to be demolished in order to accommodate the new bridge. Instead of four lanes of traffic there will be a potential total twelve lanes of traffic which would cause much greater air and noise pollution as well as exposing nearby residents to higher accident rates and spills of toxic contaminants from the aerial right-of-way associated with the new lanes of traffic over their houses.

The proponent acknowledges there is existing congestion on Huron Church Road but it is not proposing to improve that situation nor is any other level of government considering doing so north of the E C Row Expressway. Therefore to add up to eight new lanes to the bridge crossing, linked to wider facilities in the United States, all of which would allow more trucks to funnel through the City of Windsor, would only increase the amount of congestion and therefore increase the amount of air pollution and noise pollution in the surrounding Windsor neighbourhoods as well as exacerbate safety and planning issues.

At page 31 of the Proponent's submission to you, the Proponent further attempts to mislead you and the public about the benign nature of its undertaking.

In addressing a check list question "Is the action likely to have results that are inconsistent with locally desired social, economic or other environmental conditions" the response provided is that:

> "No… . The proposed action would not change traffic patterns or increase traffic volumes. The proposed action is consistent with future land use plans in both Detroit and Windsor."

The September 13, 2006 letter from the Windsor City Planner demonstrates this conclusion is clearly wrong.

Again, the Proponent misleads in answering check list question (e) "Is the action likely to adversely affect a significant aspect of the socio-cultural environment?"

The answer to that question provided is:

> "No. The proposed action consists entirely of a bridge… no churches, or cultural institutions will be affected. … The university would be materially unaffected. …The proposed action would not cause changes in the way members in the surrounding community or neighbourhoods live, work and play." (pages 32-33)

Again, this is an incredible misapprehension and speculation on the part of the proponent which has no semblance of reality.

0189

Similarly, in Sections 3.5 "Cumulative Impacts", 3.6 "Visual Quality and Aesthetics", 3.7 "Parklands" and 3.9 "Cultural Resources and Other Protected Areas" the Proponent makes further misleading statements which ignore both fact and statutory requirements. For example, it purports to speculate that "cumulative impacts are not expected to be significant" as the proposed action "is enhancing an existing transportation facility rather than adding a new facility in a new area". (Page 10)

Again, that is a completely improper way of addressing cumulative impacts and fundamentally undermines the whole rationale for how that issue is to be addressed in the carrying out of an environmental assessment, as pointed out by the U.S. EPA on page 6 of its August 30, 2006 letter to you.

Moreover, it ignores the way a cumulative effects analysis is to be done under the *National Environmental Policy Act* and under the *Canadian Environmental Assessment Act*.

As pointed out in the handbook published by the U.S. Council on Environmental Quality: "Considering Cumulative Effects Under the *National Environmental Policy Act*" (January 1997):

> "Although past environmental impact analyses focus primarily on project-specific impacts, NEPA provides a context and carries the mandate to analyze the cumulative effects of federal actions. ... The range of actions that must be considered include not only the project proposal but all connected and similar actions that could contribute to cumulative effects. For example, the expansion of an airport runway that will increase the number of passengers travelling must address not only the effects of the runway itself, but also the expansion of the terminal and the expansion of the roadways to provide access to the expanded terminal. If there are similar actions planned in the area that will also add traffic or require roadway extensions (even though they are non-federal) they must be addressed in the same analysis." (Pages 1-2)

This whole aspect of cumulative effects has been totally ignored in the submission filed with you. The proponent seeks to ignore the fact that roads will have to be widened and neighbourhoods destroyed in order to accommodate the functioning of its proposed new bridge.

Similarly with respect to its "Parklands" analysis the proponent admits that it must address compliance with so-called Section 4(f) of the *DOT Act* providing that the Secretary of Transportation shall not approve any program or project which requires the use of publicly-owned land from a public park, recreation area or land of an historic site of a national, state or local significance unless there is no feasible and prudent alternative for the use of such land. (Page 10)

The proponent admits that two parks exist along the Detroit River in Canada: The Ambassador Park and Assumption Park, both are pedestrian/bicycle parks that follow the river.

The proponent argues that neither of these parks will be impacted by the proposed project as the piers will not be placed within the parks.

However, this is clearly contradicted by the September 11, 2006 letter from Don Sadler, Executive Director, City of Windsor Parks and Recreation, previously referenced and attached.

In Section 3.9 of its submission "Cultural Resources and Other Protected Areas" the proponent refers to the Section 106 of the *National Historic Preservation Act* and the Executive Order "Protection and Enhancement of the Cultural Environment", which require that impacts of federal licensed projects be examined for their impact, particularly on historic districts and structures, particularly and specifically those included in the National Register of Historic Places.

The proponent acknowledges that in 1980 the Ambassador Bridge was added to the National Register of Historic Places but goes on to argue that "the existing Ambassador Bridge will be slightly impacted by the proposed project, but not negatively impacted".

However, the proponent has not complied with the requirements of the *National Historic Preservation Act* or the Commandant Instructions issued by the United States Coast Guard in respect of addressing NEPA which, as you know, requires very specific findings and facts on this issue before you are in a position to authorize any permit having regard to the stringent requirements of that national historic preservation legislation.

In Section 3.12 "Traffic and Circulation" again, an incredible statement is made that "the proposed project would not have a negative impact on traffic and circulation … the vehicle hours of cars and trucks should likewise decrease with the addition of additional capacity over the river. Pedestrian safety and circulation would not be negatively impacted." [page 15]

Again, this ignores the fact that no new access roads are to be built as part of the proposed Ambassador Bridge project and therefore congestion will be obviously increased with horrifically negative impacts on traffic and circulation, as well as severely negative impacts on pedestrian safety.

The discussion offered by the proponent in conjunction with the Categorical Exclusion checklist contains erroneous and misleading statements.

For example, in response to checklist question (a) "Is the action likely to be consistent with any applicable … local law, regulation or standard designed to protect any aspect of the environment?" the proponent answers "No" but offers absolutely no reference to Ontario laws or Windsor laws. Both of these regulate air quality and noise as well as land use planning which, as you are aware, is considered part of the "environment" considerations.

Again, with respect to check list question (b) "Is the action likely to have results that are inconsistent with locally desired social, economic or other environmental conditions?"; the Proponent answered the question: "No, … the proposed action would not change traffic patterns or increase traffic volumes. The proposed action is consistent with future land use plans in both Detroit and Windsor."

We have earlier commented on the incredibly misleading nature of that response.

Checklist question (c) reads: "Is the action likely to result in the use, storage, release and/or disposal of toxic, hazardous or radioactive material, or in the exposure of people to such materials?"

0191

The proponent answers: "No … the proposed action would not cause people to be exposed to hazardous or toxic materials."

Again, this is a misleadingly untrue statement. There are toxic and hazardous substances carried in vehicles every day in many vehicles across highways and these will include the proposed bridge, an elevated structure over and near many houses and institutions, therefore posing the potential for exposing a wide segment of the population to such toxic/hazardous materials in the event of an accident.

We are attaching a CD ROM containing a Detroit TV new program in which Dan Stamper, President of the Canadian Transit Company, acknowledges his company permits hazardous materials to be transported over the Ambassador Bridge contrary to Michigan laws, in that he takes the position "private property" is not subject to such laws. **Attachments Vol.1, Part A, Tab 21**

Check list question (i) reads: "Is your action part of an ongoing pattern of actions (whether under the control of GSA or others) that are cumulatively likely to have adverse effects on the human environment?

The Proponent answers:

> "No. The proposed action is not part of an ongoing pattern of actions that are expected to have adverse effects on the human environment. The proposed action is in response to, but not a contributor to, on ongoing pattern of increased traffic, population and development in the Detroit – Windsor area and increased trade between the United States and Canada. The proposed projects is meant to alleviate traffic congestion on the existing bridge itself, aid in trade between the United States and Canada and create safer driving conditions in the Detroit – Windsor area."

Obviously the above answers are far from reality. The proposed action will indeed contribute to increased congestion, safety hazards and pollution in the City of Windsor, absent any appropriate new infrastructure required to connect the new bridge to Highway 401. The proposed project will not "alleviate traffic congestion" but rather exacerbate it and exacerbate safety and hazardous driving conditions in the Windsor area.

The proponent, however, continues to have blinders on this issue. In its correspondence dated March 13, 2006 addressed to Kaarina Stiff at Transport Canada, on page 2, item 3, where Transport Canada raises the issue that the documentation submitted, while identifying access road capacity as a key issue, indicates that access to the Ambassador Bridge from Huron Church Road:

> "is expected to reach capacity in the next five years. To establish the scope of the project, we [Transport Canada] need to determine what other physical works are likely to be carried out in relation to your proposal. In particular, we require information concerning any other infrastructure work that may be planned to address these access and capacity issues, or that may be required as a result of the project modifications to bridge access on Huron Church Road will be proposed or considered necessary because of the proposed second span."

0192

Incredibly, the Proponent makes the response that:

> "This project simply involves the connection of two plazas that have already been permitted and approved... Additional lanes across the river are expected to have no negative impact on the approach roadways. ... The new six-lane bridge over the river will ensure the traffic can continue to flow clearly across this vital border crossing. No additional work is anticipated to be required as a result of this project. Huron Church Road currently has and will continue to have more capacity than the proposed bridge crossing."

As you will recognize, this conclusion is patently absurd.

<u>Approval Under U.S. *International Bridge Act* is Required Before Coast Guard Processes Navigable Waters Permit</u>

Chapter 2 of the Coast Guard Bridge Permit Application Guide states that a proponent must include in its application package the legislative authority for international bridge construction.

Specifically, with respect to "international bridges" the following requirement is stated under Section A3E "International Bridges":

> "1. The *International Bridge Act* of 1972, or a copy of the *Special Act of Congress* if constructed prior to 1972, should be cited as the legislative authority for international bridge construction.
>
> 2. Presidential approval should be obtained from the State Department prior to issuing a Coast Guard bridge permit under the *International Bridge Act* of 1972.
>
> **<u>NOTE</u>**: A copy of State Department approval for international bridges must be included in your application package for a Coast Guard permit."

The City of Windsor submits that should the proponent wish to build a second bridge it must present a Presidential approval to the Coast Guard under the *International Bridge Act* of 1972 – and without such approval being presented, it is contrary to the Coast Guard's own procedure for the Coast Guard to be processing any permit application under the *Rivers and Harbours Act*.

<u>The Coast Guard Permitting Guide Requires that Section 4(f) of the *Department of Transportation Act* of 1966 as Amended, Now 49 USC303 be Addressed</u>

Your own Guide states that:

> "A special effort must be made to preserve the natural beauty of the country side, public parks and recreational lands, wildlife and water fowl refuges, and historic sites."

Section 4(f) further states that a project requiring the use of Section 4(f) lands shall not be approved unless:

> "1. There is no feasible and prudent alternative to the use of such lands; and

0193

2. Such use includes all possible planning to minimize harm to such lands resulting from the project."

Pausing here, the proponent has submitted no information whatsoever as to what alternatives, if any, have been canvassed and certainly not substantiated or even attempted to document "no feasible and prudent alternatives to the use of such lands" or that the use "includes all possible planning to minimize harm to such land resulting from the project.

Moreover, the proponent has failed to acknowledge that it will in fact require "taking land" from such protected areas within the City of Windsor, which is prohibited under that legislation unless feasible alternatives have been carefully examined and none have been shown to exist.

Moreover, your guidance document reiterates that "all bridge actions also require compliance with the *National Historic Preservation Act* of 1966, Section 106 – again, the impacts of the new bridge on the historically protected and designated Ambassador Bridge have not been complied with.

Moreover, the requirements Item (k) of Chapter 3 state that with respect to air impacts "the Coast Guard must ensure that projects under its jurisdiction meet the National Ambient Air Quality Standard before issuing a bridge permit".

It goes on to state that:

> "During the bridge permitting process, early coordination and consultation with the state and local air quality agencies is important to determine whether your project is consistent with an approved federal state implementation plan governing the ambient air quality of the proposed bridge project location."

Pausing here, the proponent has not demonstrated it has had any such consultation and has carried out no studies, taking the somewhat incredible position that this project will not increase air pollution.

Similarly, Item (l) of Chapter 3 requires that the Coast Guard ensure that appropriate noise studies be undertaken. As your own guidance document puts it:

> "All authorized bridge construction work must comply with the provisions of the *Noise Control Act* of 1972. Under the *Noise Control Act*, the adverse impacts on existing activities for land uses that may result from the bridge, its related highway sections, or its construction must be considered."

Your guidance document indicates that the information package regarding noise must include such matters as:

> "(a) The anticipated design noise levels for the proposed project;
>
> (b) A description of all possible measures to minimize noise impact if there is no alternative to avoid the adverse effects."

0194

Pausing here, the proponent has taken again the incredible position that it is not required to do any noise studies – a complete flaunting of the requirements of the Coast Guard and of U.S. federal legislation.

Finally, it is relevant to note in considering the requirements of the Coast Guard Bridge Permitting Guidance requirements that the term "bridge", as found in the "glossary" is defined as including "approaches":

> "The term "bridge" includes all integral bridge elements: approaches and appurtenances, regardless of materials used, whether natural or manufactured, or the construction methodology."

Further Elaboration as to Why a "Categorical Exclusion" Cannot be Applicable

In Commandant Instruction M16475.1D, November 29, 2000, being NEPA Implementing Procedures and Policy for Considering Environmental Impacts, Chapter 2 is entitled U.S. C.G. Implementing Instructions, indicates in Part B "Environmental Documentation", indicates that this instruction "applies to all U.S. C.G. actions including the decision to … grant permits … ." [page 2 – 4]

It then proceeds to discuss "Categorical Exclusions" (CEs). It states that a "CE" is meant to be a "category of actions which do not individually or cumulatively have a significant effect on the human environment and for which, therefore, neither an EA nor an EIS is required…. A list of current CEs can be found in Figure 2 – 1".

Pausing here, we have reviewed Figure 2 – 1 entitled "Coast Guard Categorical Exclusions".

There are 35 items listed.

The only one which could possibly be relevant to an application to construct a new international bridge would be Item 32 "Bridge Administration Program Actions" as specifically described as one of the following:

> "(a) modification or replacement of an existing bridge on essentially the same alignment or location. Excluded are bridges with historic significance or bridges providing access to undeveloped barrier islands and beaches."

It is, however, obvious that the application to build a new six-lane bridge while leaving up the current existing four-lane Ambassador Bridge is neither a "modification" nor a "replacement" of an existing bridge.

Nor is it a proposal to do a modification or replacement "on essentially the same alignment or location".

As we have pointed out earlier, the Ambassador Bridge has been given specific approval as it exists today and there is no further alignment or other location for it that has been approved.

Moreover, the Categorical Exclusion, even if it were for a "modification" or "replacement" of an existing bridge, excludes "bridges with historic significance". That certainly applies to the National Register Designated Ambassador Bridge.

Accordingly, the proposed new Ambassador Bridge cannot qualify as a CE in accordance with the Coast Guard's own regulations and policies.

Moreover, Chapter 2 of the Commandant Instructions for Implementing NEPA specifically indicates that there are "limitations on using Categorical Exclusions" even if one was applicable.

Your own policy requires that "responsible personnel should be alert for circumstances that dictate the need to prepare an EA or EIS" or some actions that would be normally categorically excluded in Figure 2 – 1.

Your policy states that:

> "The potential environmental consequences must be evaluated in their context (whether local, state, regional, national or <u>international</u>) and in their intensity by considering whether the action is likely to involve one or more of the following: …
>
> 2. a site that includes or is near a unique characteristic of the geographic area, such as a historic or cultural resource … or property requiring special consideration under 49 USC 303(c) [commonly referred to as Section 4(f) of the *Department of Transportation (DOT) Act* which includes any land from a public park … or historic site.
>
> 3. The quality of the human environment that is likely to be highly controversial in terms of scientific validity or public opinion ….
>
> 7. A district, site, highway, structure or object that is listed in or is eligible for listing in the National Register of historic places …
>
> 9. A potential or threatened violation of federal, state or local law or requirement imposed for the protection of the environment."

Your policy requires that "the determination of a CE is inappropriate and more environmental analysis is needed, or that an EA or EIS is needed, must be based on the potential significance of the proposed actions affect on the environment. The proposed action must be evaluated in its context (whether local, state, regional, tribal, national or <u>international</u>) and in its intensity by considering the level of possible effects as listed in (1) – (10) above". [page 2-5]

Your policy also states that:

> "However, a CE <u>may not be used</u> if the proposed action is likely to involve any of the circumstances set forth in Section 20.B(2) of DOT Order 5610.1 (enclosure 1). The 10 listed circumstances and those in the DOT Order are addressed in the Environmental Analysis Checklist (enclosure 2). If a CE is not appropriate, an EA or an EIS must be prepared."

0196

Accordingly, your own Commandant Instruction requires that a CE may not be used if the proposed action is likely to involve one of the circumstances set forth in that Environmental Analysis Checklist.

The Environmental Analysis Checklist which is enclosure 2 to the Commandants Order is a different checklist from the one used by the DIBC/CTC in its March 31, 2006 submission to you.

On that "Checklist" there are a number of relevant questions which, if the appropriate facts are addressed, would have to be answered "yes" which in turn would mean that even if there was a CE applicable to this proposed project (which there is not) a CE cannot be used in this particular situation.

In particular, we refer you to Question 1 of the Checklist: "Is there likely to be a significant effect on public health or safety?"

The guidance document requires addressing potential release of toxic materials, accidental spills of oils, hazardous or toxic materials and compliance with the *Clean Air Act* and the *Noise Control Act*.

In this case the Proponent has chosen to ignore the fact that the new bridge would carry vehicles containing hazardous and toxic materials over and adjacent to numerous houses and institutions, and has carried out no noise or air studies.

However, in the absence of such studies indicating no impacts, it is prudent to assume there will be impacts and therefore "there is likely to be significant effect on public health or safety".

Question 2 reads: "Does a proposed action occur on or near a unique characteristic of the geographic area such as a historic or cultural resource, parkland … or property requiring special consideration under 49 USC 303?"

This in turn requires a consideration of whether or not it is located near a "national historic landmark" or "designated open space, or a designated conservation area, or potentially have "adverse visual, social, atmospheric, traffic or other effects on such a critical area even though it is not located at or near the area; or change the use of parklands.

Again, it is clear from the Proponent's own materials that the proposed bridge is located adjacent to a national historic landmark, that it will have adverse visual, atmospheric and traffic effects in the area, that it will change the use of parklands by putting a new eight-lane bridge through parkland etc. and therefore the answer to that question again is "yes".

Checklist Question 3 reads: "Is there a potential for effects on the quality of the environment that are likely to be highly controversial in terms of scientific validity or public opinion?"

The guidance document indicates that:

> "Environmental controversies can be about a host of things: impact on historic buildings, archaeological sites, and other cultural resources; impacts on traffic or parking on a

0197

> community or neighbourhood; … to avoid missing a controversial issue that should be addressed under NEPA be sure not to interpret the word "environmental" too narrowly."

Again, the answer to Question No. 3 must be "yes". **See Attachments Vol.1, Part A, Tab 11.**

This project is very controversial.

Question 6 reads: "Are the actions, impacts individually insignificant, but cumulatively significant when considered along with other past, present and reasonably foreseeable future actions?

The guidance on this question states that in order to accurately respond to the checklist the Coast Guard must consider "whether the action is related to other actions (by USCG or others) with impacts that are individually insignificant but that may, taken together, have significant effects.

A specific example provided is relevant:

> "For example, is the action part of an ongoing pattern of pollutant discharge, traffic generation (vehicle or vessel) economic change or land use change in its locality that could collectively affect human health or the condition of the environment?"

Again, the answer to question 6 would be "yes".

Question 7 on the Checklist is: "Is the proposed action likely to have a significant impact on a … structure … that is listed in … the National Register of Historic Places…?"

Clearly, the new bridge will have an impact on the existing historically designated Ambassador Bridge, and therefore the answer to question 7 is "yes".

Similarly it has the potential to have impact on "a place with traditional cultural value in the eyes of a native American group or community" as well as on "the historic/cultural character of communities or neighbourhoods".

Again, the answer to this question must be "yes".

The Proponent acknowledges that there are likely to be native Indian burial sites in the area where the piers and support structures for the new bridge are to be located and that it is to be located nearby the historic old Sandwich part of the City of Windsor.

Again, the answer to question 7 on the Checklist must be "yes".

Question 9 is also relevant: "Is there a potential or a threatened violation of federal, state or local law or requirement imposed for the protection of the environment?"

The guidance on this requires that issues that need to be considered include whether the project is or action is likely to:

- adversely affect the ambient air quality due to dust, vehicle or equipment emissions …

0198

- result in toxic or unusual air emissions
- adversely affect the ambient air quality due to the operation and/or maintenance of vehicles …
- significantly increase the ambient noise levels of the area."

Again, clearly the answer to question 9 is "yes".

Finally, Question 10 on the Checklist is as follows: "Is the action likely to have other significant effects on public health and safety or on any other environmental media or resources that are not specifically identified in this checklist?"

The additional concern under question 10 is "socio-economic impacts and environmental justice".

The guidance on this indicates that if the action is likely to:

- change traffic patterns or increase traffic volumes
- require the re-routing of roads, waterways or traffic
- be located near any existing bottleneck in vehicle or vessel traffic (e.g. a bridge intersection …)
- have access constraints
- affect a congested intersection
- be inconsistent with existing zoning, surrounding land use or the official land use plan for the specific site and/or the delineated area
- be inconsistent with surrounding architecture or landscape
- relocate private residences or businesses
- intrude on residential or business uses in the affected area
- be regarded by burdensome by local or regional officials

then it may well have significant impacts on the socio-economic environment and issues of environmental justice.

Again, in this situation the answer to the question is the action "likely to have other significant effects on public health and safety and on any other environmental media or resources i.e. environmental justice and socio-economic impacts as set out, is "yes".

0199

Please see for substantiation of why "yes" is correct the September 13, 2006 letter from City of Windsor Planner, Robert Hayes at pages 9 – 20. **Attachments Vol.1, Part A, Tab 2**

For all of the above reasons it is clear that the Coast Guard cannot grant a Categorical Exclusion even if the proposed bridge was on the CE list, which it is not.

We refer you also to enclosure 3 to COMDTINST M16475.1D, this enclosure being the form entitled "USCG Categorical Exclusion to Termination".

This form requires certification that the action is "not expected to result in any significant adverse environmental impacts as described in NEPA". Further, it further requires you to certify that the proposed action":

> "..has been thoroughly reviewed by the USCG, and the undersigned have determined this action to be categorically excluded under the current USCG CE(s) No.________. **[indicate specific CE number]** from further environmental documentation in accordance with Section 2.B.2 in Figure 2.1 of NEPA Implementing Procedures and Policy... Since implementation of this action will not result in any:
>
> 1. significant cumulative impacts on the human environment
> 2. substantial controversy or substantial change to existing environmental conditions
> 3. impacts which are more than minimal on properties protected under 4F of the *DOT Act*, and Section 106 of the *National Historic Preservation Act; or*
> 4. inconsistent with any federal, state or local laws or administrative determinations relating to the environment.

The City of Windsor submits that it would be clearly arbitrary and capricious if such a Categorical Exclusion determination was to be made by the USCG at this time based on the information presented by the proponent for the reasons set out above.

With respect to the certification that is required with respect to a "4(f) statement", enclosure 10 to the Commandant Instruction, Document M16475.1D elaborates that under Section 4(f) "the Secretary of Transportation (Commandant) shall not approve any program or project which requires the use of 4(f) lands unless:

> (a) there is <u>no feasible and prudent alternative to the use of such lands</u>; and
>
> (b) such program includes <u>all possible planning</u> to minimize harm to 4(f) plans resulting from such use."

In other words, it is incumbent upon the Commandant not to approve any program or project unless the proponent has demonstrated it has objectively met these criteria. These criteria clearly have not been met in this case as there have been no studies of feasible and prudent alternatives.

0200

It is noted that Section 4(f) lands include "any publicly owned land from a park" and that publicly-owned land includes "fee simple or land subject to public easement or other interest in the land by a federal, state or local agency or entity".

Further, "use of land" under Section 4(f) generally means the acquisition of title to "or an easement in land for a transportation program or project".

Further, in unusual circumstance, serious adverse impacts such as severe increases in noise or air pollution, or access disruption may constitute a "constructive use, even where no acquisition is involved and Section 4(f) would apply".

Under the material required to properly address Section 4(f), the proponent must, "include the acreage needed for permanent surface easements, aerial easements, drainage and utility easements etc." – none of which has been done in this particular case by the Proponent DIBC/CTC.

Furthermore, adverse impacts of the project on 4(f) lands must be discussed and should include "detailed information concerning the effects of the project on natural views, local historical values, pedestrian and other access, recreational use, vegetation, wildlife, etc. Care should be undertaken to include a rigorous analysis of aesthetic, air and water pollution and noise impacts on 4(f) lands near and adjacent to the project."

Again, none of this has been submitted by the proponent and therefore the USCG is not in a position to make any determination that Section 4(f) has been complied with.

Further, in order to properly address 4(f) requirements:

> "A statement of the local, state or national significance of the 4(f) lands should be presented. This statement should come from the officials having jurisdiction over the lands when at all possible and should address the significance of the entire area involved and the actual land affected or taken by the project ... Any statement of insignificance from whatever source is subject to review by the USCG for caprice."

Further, Section 10 of this guidance document regarding 4(f) requires:

> "Evidence of concurrence, or a description of efforts to obtain concurrence of officials having jurisdiction of Section 4(f) lands regarding the proposed action and plan to minimize harm should be presented."

In this case there has been no consultation let alone concurrence obtained from the City of Windsor with respect to the impacts and use in taking of the City of Windsor park lands.

Finally, the City submits that the required certification to comply with Section 4(f) cannot be granted by the Coast Guard in this case as set out in Section 11 of the guidance document which requires that the certification provide that:

0201

"Based on this 4(f) statement, I have determined no feasible and prudent alternative to the use of this 4(f) land(s) and that all possible planning to minimize harm to this land(s) has been accomplished."

Closing

The Corporation of the City of Windsor has provided as much documentation, reports and other information as well as legal analysis as it could in the time available to respond to the Coast Guard Public Notice in respect of the application filed by the proponent for a second bridge permit.

Obviously the City of Windsor considers the proposed bridge to be a proposal fraught with significant and adverse environmental consequences for the City and its residents. We believe the materials submitted substantiate that concern.

We close by emphasizing both the desirability and necessity of the Coast Guard ensuring that full consideration of all these facts and information are carefully considered so that its initial preliminary determination is reversed: This project must be processed not by a categorical exclusion but rather only following a full Environmental Impact Statement.

However, for the reasons set out above, it is premature for the Coast Guard to process this application at all, and we ask that its processing be suspended.

We would be please to respond to any supplementary questions you may have.

Yours sincerely,

GOWLING LAFLEUR HENDERSON LLP

[redacted]

0202

Certified Environmental Law Specialist

DE:tp

TOR_LAW\ 6390735\1

[redacted]

October 13, 2006

BODMAN LLP
6TH FLOOR AT FORD FIELD
1901 ST. ANTOINE STREET
DETROIT, MICHIGAN 48226
313-393-7579 FAX
313-259-7777

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East North Street
Cleveland, Ohio 44199-2060

Re: Proposal For New Detroit/Windsor Bridge
Public Notice 09-03-06

bodman
ATTORNEYS & COUNSELORS

[redacted]

I have enclosed a letter from USEPA's Clear Air Scientific Advisory Committee (issued after the public comment closing date) that expresses the Committee's concern that the new USEPA PM 2.5 air quality standard is not sufficiently protective of public health. As you know, one of the most significant impacts of a new Detroit River crossing, wherever located, will be diesel truck traffic, a major source of PM 2.5 emissions. This further underscores the need for an EIS for any new Detroit River crossing to make sure that the air quality impacts of PM 2.5 emissions are identified and evaluated.

Very truly yours,

[redacted]

RCH/cmf

cc: [redacted] Gateway Community Development Collaborative
Delray Community Council
U.S. Senator Carl Levin
U.S. Senator Deborah Stabenow
U.S. Representative John Dingell
U.S. Representative Carolyn Cheeks-Kilpatrick
USEPA
[redacted], FHWA
[redacted] MDOT

0203

FAXMAIL

BODMAN LLP
6TH FLOOR AT FORD FIELD
1901 ST. ANTOINE STREET
DETROIT, MICHIGAN 48226
313-393-7579 FAX
313-259-7777

710

RECIPIENT:	[redacted]
COMPANY:	United States Coast Guard
FAX:	216-902-6088
PHONE:	216-902-6085

FROM:	[redacted]
DATE/TIME:	SEPTEMBER 14, 2006 -- 4:02:54 PM
PHONE:	[redacted]
TOTAL PAGES:	3

MESSAGE

bodman
ATTORNEYS & COUNSELORS

Original Will Be Sent By Mail	Client/Matter: 1-3145	User ID: 0138

TO BODMAN FACSIMILE OPERATOR: Please sign and note time of completion in spaces below and return this form to the sender along with other pages transmitted.

Time Transmission Completed ______________ Facsimile Operator ______________

0204

[redacted]

VIA FACSIMILE

September 14, 2006

BODMAN LLP
6TH FLOOR AT FORD FIELD
1901 ST. ANTOINE STREET
DETROIT, MICHIGAN 48226
313-393-7579 FAX
313-259-7777

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East North Street
Cleveland, Ohio 44199-2060

Re: DIBC Bridge Permit Application, Detroit, Michigan
Public Notice 09-03-06

bodman
ATTORNEYS & COUNSELORS

Dear [redacted]

We have prepared and are submitting these supplementary comments on behalf of the Gateway Communities Development Collaborative and the Delray Community Council with regard to the pending international bridge permit application filed by the Detroit International Bridge Company as described in USCG, Public Notice 09-03-06 (July 28, 2006). Our principal comments were transmitted by Federal Express delivery yesterday.

The Detroit International Bridge Company appeared before the Detroit City Council today to provide an update on its proposal to build a second "twin" bridge. It was forced to make two concessions which strongly support a determination that an EIS is required.

During questioning by the City Council of its assertion that the proposed bridge does not increase crossing capacity, a DIBC representative stated that, "If this were a project to increase capacity, we would have agreed to an EIS." Yet, very clearly, the proposed bridge does increase crossing capacity. It will be a six-lane bridge. Even if the Ambassador Bridge is permanently removed from use (under questioning from Council, DIBC refused to commit that it planned to take the existing bridge out of use permanently) , those six lanes would be a 50% increase in roadway capacity over the present four-lane bridge. While the present crossing capacity is limited today by the number of toll booths and inspection facilities, after planned plaza improvements are made, the limiting capacity of the crossing will be determined by the roadway capacity on the bridge itself. According to the DRIC study, cited in our main comments, regardless of plaza capacity, traffic will reach bridge roadway capacity by 2020, with extensive roadway congestion occurring in the years before absolute capacity is reached. The extra two lanes on the new bridge will accommodate that traffic demand. Thus, DIBC has really conceded an EIS is required.

In addition, DIBC representatives told City Council that an EIS would be performed if they decided to take the Ambassador Bridge out of service

0205

[redacted]
September 13, 2006
Page 2

permanently. We find it curious that DIBC would agree that an EIS is appropriate when a bridge is taken out of service but not when a new bridge is placed in service.

Thank you for considering our comments.

Very truly yours,

[redacted]

RCH/cmf

cc: Gateway Community Development Collaborative
Delray Community Council
U.S. Senator Carl Levin
U.S. Senator Deborah Stabenow
U.S. Representative John Dingell
U.S. Representative Carolyn Cheeks-Kilpatrick
[redacted] USEPA
[redacted] FHWA
[redacted] MDOT

September 18, 2006

BODMAN LLP
6TH FLOOR AT FORD FIELD
1901 ST. ANTOINE STREET
DETROIT, MICHIGAN 48226
313-393-7579 FAX
313-259-7777

VIA HAND DELIVERY

Honorable City Council
City of Detroit
1340 Coleman A. Young Municipal Center
2 Woodward Avenue
Detroit, Michigan 48226

bodman
ATTORNEYS & COUNSELORS

Re: Second "Twin" Ambassador Bridge

Dear Council Members:

I represent the Gateway Communities Development Collaborative and Delray Community Council, I attended the presentation of the Detroit International Bridge Company on Thursday morning, September 14. The GCDC and Council support both of Council's resolutions on the new, second Ambassador Bridge.

In its presentation, the DIBC made several statements which were significantly incomplete or inaccurate. They can be quickly addressed.

DIBC Does Plan To Expand Crossing Capacity.

DIBC claims that its bridge proposal will not be an increase in crossing capacity. Not so.

Council was suitably suspicious as to what DIBC's real plans for bridge capacity are. In the face of your persistent questioning, DIBC refused to state whether it would permanently retire the Ambassador Bridge.

Here is what it has told the Coast Guard.

DIBC told the Coast Guard in its own cover letter to its bridge permit application that "The construction of this new six lane structure will allow traffic to continue to flow unimpeded while the existing bridge is evaluated and rehabilitated if found to be economically feasible. The existing bridge could then continue to provide reserve capacity for any unforeseen event until the end of its useful life." In other words, the Ambassador Bridge will continue in service as long as economically viable.

0207

In the *Project Description and Categorical Exclusion Environmental Documentation*, p.1 (submitted to USCG as part of the permit application), DIBC acknowledged that one purpose of the bridge was to increase crossing capacity. "This project adds new lanes across the Detroit River to provide redundancy as requested by the Binational Partnership . . . in their 'Detroit River Crossing Study.' It also affords additional capacity against a day when increased traffic volumes may require this." The new bridge can only be described as "redundant" only if the existing bridge continues in use.

DIBC may actually have larger plans. In the cover letter from DIBC's attorneys to the USCG transmitting DIBC's application, they described the bridge as consisting "of a total of *no less than* six lanes . . . " The draft bridge design has very wide shoulders that could be converted into two more travel lanes. Hence, DIBC's ultimate plan may very well be a new eight-lane bridge.

When you put all of DIBC's statements together, DIBC's plan appears to be to own and operate two bridges so long as it is profitable to do so.

DIBC's representative told the Council that, "If this were a project to increase capacity, we would have agreed to an EIS." Well, clearly this is a project that will increase bridge capacity. DIBC should be willing to live up to its statement and support the preparation of an EIS.

DIBC representatives told Council an EIS is being performed with regard to GSA/Customs plans to expand their facilities. They also told City Council that an EIS would be performed if they decided to take the Ambassador Bridge out of service permanently. We find it curious that DIBC would agree that an EIS is appropriate when Customs facilities are expanded or when a bridge is taken out of service but not when a new bridge is placed into service.

Increased Bridge Capacity Will Permit Increased Traffic.

DIBC claimed that the volume of crossing traffic demand is independent of bridge capacity. Not so.

Crossing capacity in simple terms is the lower of the capacity of the bridge, the bridge plazas (i.e., toll and inspection facilities), or the access roadways. *Today*, the limiting capacity is the bridge plazas. Therefore adding lanes to the bridge crossing will not increase crossing capacity *today*. The Gateway Project and DIBC's plaza improvements in Canada will expand plaza capacity within a few years and plaza capacity will not longer limit crossing capacity. Then, the limiting capacity will indeed be the bridge itself. Two lanes in each direction can only carry so many cars and trucks.

DRIC has studied the capacity of the present Ambassador Bridge four-lane roadway. Given the present mix of cars and trucks, maximum capacity in each direction is 3,500 vehicles per hour. DRIC, *Travel Demand Forecasts*, Working Paper (2005). One-way peak hour demand will exceed that maximum capacity by 2020. Unless new lanes are added to the crossing before that time, the border crossing capacity will hit a ceiling, preventing further traffic growth - regardless how many toll booths and inspection booths are added to the bridge plazas. A new six-lane bridge will be able to handle traffic volumes in 2020 and beyond because it has more roadway capacity than a four-lane bridge. Therefore, after 2020, a direct effect of the new bridge will be increased traffic, particularly truck traffic.

A Project Given a Categorical Exclusion Is Exempt From NEPA Environmental Review.

Mr. Korpi, the DIBC's spokesperson at the meeting, said that DIBC would have to do some environmental assessment, even if granted a Categorical Exclusion. Not so.

NEPA applies only to federal actions "*significantly* affecting the quality of the human environment." 42 U.S.C. §4332(C). A "Categorical Exclusion" is granted to those classes of projects determined to have no significant impacts on the human environment. Therefore, when a project falls within a Categorical Exclusion, no assessment is done to determine if it has significant impacts because it has been determined in advance that none will occur. Hence, if USCG's determination of a Categorical Exclusion stands, no environmental review of the bridge project will be required.

When is it not clear whether an action will have a significant impact, an Environmental Assessment is performed. An EA consists of the kinds of preliminary environmental analyses Mr. Korpi described to Council in his presentation. It was only after an EA was performed that it was determined the Gateway Project would not have a significant impact. But, DIBC has told the USCG that the EA process should be skipped here.

While there is a Categorical Exclusion for replacement bridges, USCG Exclusion Category 32 (USCG, *NEPA Implementing Procedures and Policy for Considering Environmental Impacts* (2000), Figure 2-1), that does not apply here for three reasons. First, Category 32 expressly does not apply to historical bridges and the Ambassador Bridge is on the National Register of Historic Places. Second, the proposal is for an additional bridge, because DIBC clearly would not commit that the existing bridge would be taken out of service permanently and obviously actually plans to keep it in service. Third, even if the Ambassador Bridge were taken out of service permanently, the new bridge would replace four lanes but also add two (or maybe four) more. That makes it an expansion project, not a replacement project, and ineligible for the Categorical Exclusion.

The Gateway Project EA Did Not Address the Bridge.

DIBC claims that the Environmental Assessment for the Gateway Project Addressed the Second Bridge. Not so.

We have attached the Federal Highways Administration's recent letter of August 18, 2006 to USEPA that states expressly that the Gateway EA did not address the impacts of a new bridge but only the impacts of a larger toll plaza and better access roads. Further, the Gateway EA only looked forward to 2015 and did not address traffic impacts after that time. It did not address the doubling of truck traffic which is expected to occur between 2015 and 2030, and that can only occur if new bridge capacity is constructed. Hence, the Finding of No Significant Impacts (FONSI) for the Gateway Project has no application to the current proposal.

Thank you for your attention to this matter.

Very truly yours,

[redacted]

RCH/cmf/ttv

c: [redacted]

0210

276 W. Grand Blvd.
Detroit, MI 48216

September 5, 2006

[redacted]
U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

Re: Public Notice 09-03-06

Dear [redacted]

As a resident in the Hubbard Farms neighborhood adjacent to the Ambassador Bridge, I am writing to express my deep concerns about the permit application of the Ambassador Bridge to build a second span. The Detroit International Bridge Company (DIBC) has an extensive history of misrepresentation and appears to be following this tact in its recent application. I respectfully request a public hearing on the permit application.

I am extremely disturbed that construction of a second span of the Ambassador Bridge would even be considered without any environmental review. The DIBC has made no mention of the current bridge being in need for repairs before this application. How is it that suddenly it needs to build a second span in order to shut down the Ambassador Bridge for these studies? Even if true, the Gateway Project, while allegedly designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the DIBC has well-documented plans to significantly expand its plaza far beyond what was anticipated in the Gateway study and even beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications, including adding primary inspection booths and the reconfiguration of Fort Street. There has been no environmental analysis of those impacts. Therefore, the Coast Guard's preliminary recommendation that the project be granted a categorical exclusion must be revised.

I am also concerned about the environmental consequences of building a second span of the Ambassador Bridge. The southwestern portion of the City of Detroit is an area that has seen significant residential and commercial revitalization and is the only part of the city experiencing population growth. This community has born the burden of the region's transportation and industrial infrastructure without any community benefits. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will surely only grow if the bridge's capacity was to be expanded.

Before any new or enhanced border infrastructure is considered, the need must clearly be determined in an open and participatory bi-national process. Given the Detroit River International Crossing Study and a parallel permit application in Canada, I encourage the Coast

The NEPA implementing regulations, 40 C.F.R. 1500 *et seq.*, define "Categorical Exclusion" to be a category of actions which an agency through formally adopted procedures has determined will have no significant effect on the human environment and therefore no environmental assessment or environmental impact statement is required. 40 C.F.R. 1508.4. If a proposed action does not fall within a category or actions classified under adopted agency procedures as a "Categorical Exclusion," either an EA or an EIS is required. 40 C.F.R. 1501.4. The USCG has adopted procedures in compliance with § 1508.4 that define categories of actions that are deemed Categorical Exclusions. *NEPA Implementing Procedures and Policy for Considering Environmental Impacts*, COMDTINST M16475.1D (series) ("M16475.1D"), Figure 2-1. Figure 2-1 "contains a list of categories of actions that the USCG has determined, both individually and cumulatively, not to have significant environmental impacts." USCG, Office of Civil Engineering, "*Tools For Decisonmaking: Environmental Considerations*"(undated), p. 19. "In order to categorically exclude your proposed action, it must fit into one or more of the categorical exclusions listed in [M16475.1D]." *Id.* Even if a project falls within one of the categories on that list, "you should look for circumstances that would make a CE inappropriate." *Id.* Finally, "all aspects of the proposed action must be covered by one or more Categorical Exclusions in order to Categorically Exclude the action." *Tools For Decisonmaking*, p. 20.

The USCG standard CE form makes this same point because it requires the Environmental Reviewer to specifically identify which CE category from Figure 2-1 covers the proposed action. USCG, Categorical Exclusion Determination Form, Enclosure (3) to M16475.1D.

Figure 2-1, the Coast Guard's list of 35 categories of Categorically Excluded projects and actions, does not include any kind of bridge, much less a 6-lane mile long international bridge capable of carrying up to 50,000 vehicles per day. Accordingly, the action does not qualify as a Categorical Exclusion.

It is clear from the foregoing, that even if a proposed action will have no significant impacts (an erroneous conclusion on the facts of this proposal), it can not be exempted from environmental review as a Categorical Exclusion because it is not one of the actions which the USCG has formally defined as qualifying for a Categorical Exclusion. Thus the statement in the Public Notice that the proposed new 6-lane international crossing "is a Categorical Exclusion for the purposes of NEPA because it satisfies criteria for such actions" is incorrect as a matter of CEQ regulations and USCG procedures.

Even if an action falls within a category of actions defined as a Categorical Exclusion, an environmental assessment or environmental impact statement must be prepared if the action will have a significant impact on the human environment. The proposed action here will certainly have very significant impacts on the environment.

The Proposed Action, A New 6-Lane International Border Crossing, Will Have Significant Impacts on the Human Environment, Requiring the Preparation of an Environmental Impact Statement.

An USCG implementing manual advises:

> "HOWEVER, if your proposed action:
>
> > does not fit into a USCG Categorical Exclusion;
> >
> > has, or might have, extraordinary circumstances; or
> >
> > has, or might have, individual or cumulative significant environmental impacts
>
> then you must proceed to a more detailed level of environmental evaluation.... Generally, you should proceed to an EA if you are unsure of the potential for significant impacts from your action and proceed to an EIS if you know or suspect your proposed action will have significant impacts." *Tools For Decisonmaking*, p. 21 (capitalization as in the original).

The CEQ regulations include a list of factors that justify an EIS where significant impacts were expected. 40 C.F.R., 1508.27(b). They include:

- Significant impacts on public health or safety
- Impacts on the quality of the human environment that are likely to be highly controversial in terms of scientific validity or public opinion
- An effect on the human environment that is highly uncertain or involves unique or unknown risks
- Future precedent setting actions with significant effects or a decision in principle about a future consideration
- Individually insignificant, but cumulatively significant, impact when considered along with other past, present, and reasonably forseeable future actions
- The action involves a structure that is eligible for listing in the National Register of Historic Places
- The action involves an impact that may be both beneficial and adverse. A significant impact may exist requiring an EIS even if it is believed that, on balance, the effect will be beneficial.

Even without considering the above factors, it is clear that a new 6-lane international bridge project will have significant direct traffic, land use and air quality impacts flowing from the additional traffic capacity provided by the bridge and it will generate enormous cumulative indirect impacts because of the economic and community impacts which will flow from a new border crossing with Canada. Common sense dictates that a project with those impacts is exactly the kind of project for which an EIS should be prepared.

The Federal Highway Administration ("FHWA") and the Michigan Department of Transportation ("MDOT") have independently determined that new international bridges, even if adjoining existing bridges, requires a full EIS. An EIS was required for the twin span of the Blue Water Bridge and the Detroit River International Crossing study is currently performing an EIS for alternative bridge crossings of the Detroit River in the vicinity of the Ambassador Bridge.

A discussion of the above factors as applied to the present bridge proposal reveals that an EIS is required.

1. Significant Effects On Public Health And Safety

(a) Immigration and Customs.

New crossing capacity for 3,000,000 trips per year will have a significant impact on immigration and customs facilities in Detroit and Windsor. Plaza space limitations in Windsor today will require either an expanded bridge plaza or an expanded offsite secondary inspection facility, either which has significant impacts both from a customs and immigration view but also in terms of land acquisition and neighborhood impacts near expanded plazas and inspection areas. DRIC, Alt. Anal. VI, p. 5-49. The DRIC study in consultation with border inspection agencies determined that general plaza space requirements to handle forecast volumes all 80 to 100 acres, DRIC Alt. Anal. VI, p. 5-43, but the Ambassador Bridge plaza is only about 30 acres. *Id* at 5-41.

(b) Issues related to the prevention of terrorism need to be addressed.

As in the case of customs and immigration, border security and terrorism concerns will be greater as traffic increases. An EIS should analyze both how these concerns will affect the bridge plazas and any offsite security areas and how requisite changes to bridge plazas to accommodate border security will affect the surrounding communities.

(c) Redundancy of a crossing if there is catastrophic damage or disruption to one bridge or a plaza serving a bridge.

With every increase of international trade through the Detroit bridge and tunnel crossings, the negative impacts flowing from the disruption of one or both of these crossings becomes more severe. This is particularly true of the Ambassador Bridge because most trucks cannot detour to the tunnel. Under a twinned bridge alternative, all truck traffic must funnel through a common plaza at each end of the pair bridges. Something as commonplace as a major traffic accident or a severe weather event like a tornado, could stop international trade for an indefinite period. At the Canadian end, the limited access via the Huron Church Road likewise represents a major bottleneck if there is a major accident or fire or other event along that road. Compound these scenarios with a terror threat or action and the impacts of lack of crossing redundancy are clear.

This redundancy concern, in addition to neighborhood impacts, is what prompted the Canadian agencies participating in the DRIC study to remove the twinned bridge crossing from the list of alternatives for further study.

A river crossing alternative consisting of a new bridge located elsewhere with its own plazas and access roads would provide a crossing to which traffic could divert in the event that the Ambassador Bridge crossing is shut down.

(d) Traffic Safety and Operations

The significant increase in traffic which additional border crossing capacity will bring to Windsor and southwest Detroit will have significant impacts on traffic operations and safety. The traffic studies for DRIC show that access roads in Canada are congested now with Ambassador Bridge traffic. If no new capacity is provided to accommodate traffic growth, congestion will become severe. A new Canadian freeway connection would greatly improve traffic conditions but at a significant community cost due to home and business property acquisition for right-of-way and attendant disruptions to the community. Because of the Gateway Project on the U.S. side, access traffic impacts will be less. But, the Gateway Project did not look past 2015. MDOT/FHWA, Environmental Assessment & Programmatic Section 4(f) Evaluation, Ambassador Bridge Gateway Project (January, 1997). Accordingly, it did not address access issues and impact beyond what is now the short term horizon. Access issues after 2015 must be addressed in an EIS.

(e) Air Quality

USEPA has identified six priority MSATs, including benzene, formaldehyde, diesel particulate matter/diesel exhaust organic gases and acrolein. Burbank, C., FHWA, Interim Guidance on Air Toxic Analysis in NEPA Documents (Feb. 3, 2006). Most of these are associated with diesel engine emissions. The Interim Guidance identifies projects with the potential for meaningful MSAT differences among project alternatives including major intermodal freight facilities that have the potential to concentrate high levels of diesel particulate matter in a single location. The Interim Guidance recommends that environmental analyses for such a project should include a quantitative analysis that attempts to measure the level of emissions forth six priority MSATs for each alternative.

MDEQ, Detroit Air Toxics Initiative, Risk Assessment Report, Public Summary (Nov. 2005), reports on a one-year air toxics monitoring study including several monitors in southwest Detroit and several more in nearby communities. Benzene and formaldehyde were identified for risk reductions efforts at each of those locations. Further, although monitoring data was not collected, the Public Summary identifies diesel particulate and acrolein as being of concern at those same locations because they are associated with mobile source emissions. The proposed bridge lies within the area of concern identified in MDEQ's air toxic study.

Research indicates that diesel vehicle emissions are substantially affected by the variability of driving behavior, and that stop-and-go activity produces higher emissions compared to free-flow travel. Clark N et al. Factors Affecting Heavy-Duty Diesel Vehicle Emissions. J. Air & Waste Manage. Assoc. 52, pp. 84-89 (2002). Recent research suggests that the particulate fraction of diesel exhaust is the dominant contributor to urban air toxic-related health risks (e.g., South Coast Air

Quality Management District ("SCAQMD"), Multiple Air Toxics Exposure Study in the South Coast Air Basin: MATES-II. Final Report (and appendices) (2000). Other studies observe that ultra fine PM may be even more toxic than larger size PM, when comparing PM of identical mass and composition. E.g., Zhu Y. et al,. Study Of Ultrafine Particles Near A Major Highway With Heavy-Duty Diesel Traffic. Atmos. Environ. 36, pp. 4323-4335(2002); .Zhu Y. et al. Concentration And Size Distribution Of Ultrafine Particles Near A Major Highway, J. Air & Waste Manage. Assoc. 52, pp. 1032-1042 (2002). "Diesel-powered vehicles produce far more PM, including $PM_{2.5}$, than gasoline-powered vehicles (on a g/mi basis). The degree to which these factors produce microscale problems is a function of the number of heavy-duty vehicles operating in the affected area, the distance to receptors, and the unit risks associated with exposure to diesel exhaust." Tamura, T., et al., Sonoma Technology, Inc. *Transportation-Related Air Toxics: Case Study Materials Related to US 95 in Nevada*, § 6.5.2. (2003)(prepared for FHWA, Office of Natural Environment).

Clearly an international bridge where thousands of semi-trucks stop, idle, crawl forward, stop again and finally slowly accelerate up the grade to the bridge will be a hotspot of diesel emissions requiring detailed air quality analyses. There have been a number of documented cases in which more that 400 trucks have exited from the Bridge in one hour. The Corradino Group, Ambassador Bridge/Gateway Project, Re-evaluation Report, p. 15 (August, 1999) (Prepared for MDOT and SEMCOG). This number will increase with improvements in the plaza on the U.S. and as truck traffic more than doubles over the next 30 years. That is a tremendous amount of stop-and-go truck traffic.

Diesel emissions are a particular concern with regard to a second bridge crossing because southwest Detroit is within the PM2.5 nonattainment area. USEPA recently filed environmental objections to the draft EIS for the proposed Detroit Intermodal Freight Terminal which is close to the Ambassador Bridge and requested that the draft EIS be revised to better address fine particulate matter associated with diesel emissions (as well as environmental justice issues) and requested "that the Final EIS more fully describe localized impacts of PM2.5 and commit to air quality mitigation strategies." 70 Fed. Reg. 53657 (Sept. 9, 2005). The DIFT, Air Quality Analysis Protocol, Detroit Intermodal Freight Terminal, Environmental Impact Statement (March 2005) (included on Attachment A), is an example of the kind of comprehensive analysis which should be performed for the proposed actions here.

(f) Impacts on numerous nearby schools, churches and other institutions have not been considered.

There needs to be an analyses of this crossing alternative for both the United States and Canadian sides of the Detroit River identify schools which will be affected by increased traffic associated with a second river crossing.

2. Potential for Controversial Effects - There is no more controversial issue in Southwest Detroit than the environmental and economic impacts of the future location and ownership structure of additional border crossing facilities to be built in this densely populated neighborhood. In fact, I have attached a letter sent by the

Detroit International Bridge Company to Detroit City Council dated today, that helps to document the level of controversy associated with the proposed facility. Additional controversial elements of the proposal include:

(a) The application conflicts with recommendations of DRIC Study which has dropped a 2nd Ambassador Bridge crossing for environmental and community impact reasons.

Although a second bridge crossing at the Ambassador Bridge is an attractive alternative from a number of aspects, as noted elsewhere the affected Canadian agencies dropped it from further consideration in the DRIC study as the result of both adverse community impacts and the fact that the crossing does not address redundancy concerns. Permitting a bridge at a location opposed by the Canadians is by any definition controversial.

(b) Issues over public or private ownership of the river crossing.

There is substantial concern in many quarters with granting a private company a virtual monopoly of border crossings in Detroit. This is not the time and place to decide the merits of that issue, but it is exactly the type of issue which will have substantial potential impacts on the human environment, justifying an environmental impact study.

The GCDC's testimony to the State Joint Transportation Committee states the issue well:

"The fundamental underpinning of this success is the public sector's leadership and involvement – and this must continue. The GCDC firmly supports public ownership and oversight of the next border crossing. The interests of the private sector, while important, are simply too narrow to fully achieve all that the DRIC study sets out to accomplish. The greatest threat to achieving the DRIC study mandate is allowing one party – whether public or private – to wield undue influence and control. The Gateway Communities Development Collaborative has had decades of experience with the challenges of working in an area that hosts the only privately-owned international crossing along the northern U.S. border and know first-hand of the inherent conflicts between the private interest to maximize profits and the public interests of community development, community cohesion, and security. We ask the joint committees to consider that the company that owns the Ambassador Bridge owns an entire transportation conglomerate of shipping, trucking, and freight handling interests, many of which are also located in southwest Detroit. We ask you to consider that this conglomerate has an extensive concessionaire privilege on all transportation-related projects of the Detroit Wayne County Port Authority. We ask that you consider the proposal, announced last October, to lease the Detroit interests of the Detroit-Windsor tunnel to this conglomerate. Finally, we ask you to consider the motivation and implications of criticisms raised by this conglomerate of the DRIC study. We have considered these issues and have concluded

without reservation, that providing a monopoly to a private entity on the control and operations at the Detroit Windsor international border will not result in a more efficient and secure border system, local community and economic development, or mutually beneficial international relations."
GCDC Testimony to the Joint House and Senate Transportation Committee
DRIC Study – March 30, 2006

It has been the experience of Mexicantown Community Development Corporation that the profit motivated goals and objectives of any private company operating and maintaining such an important asset are often in conflict with the public goals of maintaining a safe and efficient border. A private border facility operator is simply not empowered to make the kind of operational decisions and investments that are needed to ensure that these goals are met. This is demonstrated clearly by the fact that we do not now have a safe and efficient border in Mexicantown and there is no clear and agreed upon plan as to how to create one.

The Detroit River International Crossing Study is the first international, fully transparent and complete attempt to develop a plan that can be supported at all levels of government, industry and community in both the United States and Canada. And as you know, it is currently being challenged by the private owner of the Ambassador Bridge and the private investors of the Detroit River Tunnel Partnership. It is easy to conclude that any private owner of such an international facility is only in a position to support those plans and projects for the border crossing and host communities that increase its own bottom line.

Just as importantly, any private owner of border crossing infrastructure is generally motivated to reduce operational and maintenance costs at the expense of the local host communities. As such, local communities have been allocated a disproportionate share of the burdens that are associated with international freight and trade. The current air quality and land use environment in Southwest Detroit raises serious environmental justice issues and highlights the need for properly planned development of border crossing facilities. To date, private ownership of the border crossing in Mexicantown has not resulted in mitigating the environmental hazards associated with such crossings.

The point here is not whether DIBC or the community is right or wrong with respect to the issues of ownership and operation – rather that an action permitting a new bridge to be owned and operated by DIBC will generate the level of controversy which requires an EIS.

(c) AASHTO guidance recognizes that toll facilities raise issues which must be addressed in an EIS.

Any new international bridge will be supported by tolls, just as all existing bridges are. Toll financing of transportation facilities raise a variety of issues which must be considered in the NEPA process. See, AASHTO, Practitioner's Handbook 03: Managing the NEPA Process for Toll Lanes and Toll Roads (July 2003)(attached).

We request USCG review the handbook and incorporate its recommendations into the scoping and conduct of the EIS.

(d) Long standing community controversy and opposition to an expanded river crossing in vicinity of the existing Ambassador Bridge.

"[S]trong controversy over the environmental impacts of a proposed action can arise among the general public. Again, the EIS should be considered due to the possible significant impacts perceived by the public." Tools for Decision-Making, p 36.

The GCDC and its member organizations have attempted to work cooperatively with DIBC to minimize the impacts of the present bridge on the community and have supported the MDOT Ambassador Bridge Gateway Project for that reason. However, the GCDC and the Council and their members and constituencies have gone on record numerous times as being opposed to increasing bridge and crossing capacity at this location and by any private company.

In critiquing DIBC's draft application in 2005, FHWA noted, "The answer to this checklist question F was that no controversy is expected from the new bridge and there will be no negative environmental impacts. The bi-national partnership conducted several public meetings in April of this year...There was substantial controversy demonstrated at these meetings by the public over the twinned bridge proposal." Letter, FHWA to Mr. Korpi of ACE of Florida (June 21, 2005) (ACE is DIBC's consultant).

(e) No effort has been made to work with a broad base of the affected community or its citizens or businesses.

DIBC has made no showing of community support or involvement related to a new bridge. In fact, its application is counter to the present community involvement effort in support of the DRIC Study. The DRIC Study has had in-depth community participation during the process. The DRIC Local Advisory Committee has reviewed and scored all of the river crossings evaluated by DRIC. Although the DIBC may wish to avoid this kind of citizen involvement by submitting its "go-it-alone" application, NEPA requires that USCG have the benefit of significant community involvement through the EIS process before it makes its decision on DIBC's permit application.

3. Uncertain and Unknown Effects on the Human Environment

(a) Difficulty in evaluating mobile source air quality impacts from diesel trucks, where diesel emissions are believed to be the predominant contributor to adverse health effects from mobile source emissions.

"If there is scientific controversy concerning any aspect of a proposed action, then the occurrence of significant impacts is questionable and an EIS should be considered. Tools for Decision-Making, p. 35.

0145

The MSAT issue related to diesel emissions is just such an issue. This issue was the motivation behind FHWA's recent guidance on mobile source air toxics. Burbank, C., FHWA, Interim Guidance on Air Toxic Analysis in NEPA Documents (Feb. 3, 2006). The proposed action clearly falls within the guidance and is the type of issue which merits a full EIS so that all of the ramifications of this difficult issue can be fully addressed.

4. Precedent For Future Actions With Significant Effects Or A Decision In Principle About A Future Consideration

   (a) Action would preempt the ongoing DRIC Study.

   (b) Need to consider results of General Services Administration's ongoing master plan study of future customs, immigration and DHS facility needs associated with future border crossings. [

5. Significant Cumulative Impacts When Considered With Other Foreseeable Future Actions

   (a) Need to consider the interrelationship and impacts between a new river crossing and the proposed Detroit Intermodal Freight Terminal.

   (b) Interrelationship between a new river crossing and redevelopment plans for southwest Detroit.

6. Impacts on Historic Resources

   During the Blue Water Bridge EIS, the original structure of that bridge was considered an historical structure and the visual impact of a new bridge on the existing bridge was addressed in the EIS. The Ambassador Bridge, which has dominated the downriver skyline for many years, will require the same consideration.

7. Other Significant Impacts

   (a) Any bridge crossing in southwest Detroit will affect low income and minority neighborhoods, requiring consideration of environmental justice and other considerations which may vary substantially depending on where a new crossing is located.

   (b) DIBC has made proposals for plaza configuration and construction different from that which is part of the MDOT Ambassador Bridge Gateway Project plans. No environmental impacts or considerations arising out of those plans has been considered.

   (c) Irreversible and Irretrievable Commitments of Resources. When a proposed action may cause environmental damage that cannot be reversed or mitigated, such damage is likely to be considered significant. Tools for Decision-Making, p. 35. Here there will be but one new bridge crossing for the foreseeable future. Once built, its impacts will continue for a hundred years. USCG must make the best informed decision on this permit application because there will be no going back. An EIS is required to inform that decision.

Transboundary Impacts Require Preparation of an EIS.

The Council on Environmental Quality has directed that:

> "[T]he entire body of NEPA law directs federal agencies to analyze the effects of proposed actions to the extent they are reasonably foreseeable consequences of the proposed action, regardless of where those impacts might occur. Agencies must analyze indirect effects, which are caused by the action, are later in time or farther removed in distance, but are still reasonably foreseeable, including growth-inducing effects and related effects on the ecosystem, as well as cumulative effects." Council of Environmental Quality, Guidance on NEPA Analyses For Transboundary Impacts (July 1, 1997)
>
> "[F]ederal agencies should use the scoping process to identify those actions that may have transboundary environmental effects and determine at that point their information needs, if any, for such analyses. Agencies should be particularly alert to actions that may affect ... air quality ... as well as to interrelated social and economic effects." *Id.*

In fact, the DRIC study has undertaken just such an analysis and it makes clear that a twinned Ambassador Bridge will have significant impacts in Canada and the United States, for better and for worse. This is strong support for the need to conduct an EIS for this permit application.

The transportation analyses performed as part of the DRIC Study found that the principal access route to the Ambassador Bridge (Huron Church Road and Highway 3/Talbot Road) now suffers from congestion during the day, which congestion would increase significantly as traffic grows to reach the existing capacity of the Bridge, and then would be even worse after a second span is constructed because of the additional millions of vehicles flowing as the result of the increase in capacity. DRIC, Travel Demand Forecasts, § 6.1.2. "The current situations where trucks drive through the heart of Windsor's west end community is unsustainable. It's not good for Canadian and U.S. economies, it's not good for the trucks that carry that trade, and it's not good for the local community" Joint Press Release, Ontario Trucking Association, APMA and Ontario Chamber of Commerce (December 7, 2005).

The DRIC process spent a great deal of time considering the impacts which this increased traffic flow would have at each of the alternative locations for a new bridge crossing, including a new bridge next to the Ambassador Bridge (Alternative X-12 in the DRIC study). The increased roadway and plaza needs to accommodate future crossing traffic made possible by new crossing capacity would require the acquisition of many homes and businesses in Canada. It would have significant impacts on the neighborhoods in Windsor near the bridge. These impacts are made clear in the Canadian study of impacts, Generation and Assessment of Illustrative Alternatives

0147

Report – Canadian Side § § 3.5, 3.6 (Draft November 2005), relevant excerpts of which are attached to the Gateway Communities Development Collaborative's comments. The second Ambassador Bridge "is eliminated because, in Canada, the plaza and freeway connection leading to a second span would have unacceptable community impacts and the constructability of a six lane freeway along Huron Church Road is doubtful in light of intensity of the surrounding development" DRIC, Alt. Anal., VI, 5-56. It was eliminated because "maintaining the existing crossing and connections in the border transportation network does not address redundancy needs and, regardless of plaza site selected, it would cause high impacts to neighborhoods." DRIC, Alt. Anal. VI, p 5-50. A representative of MDOT met with Canadian representatives on May 16, 2006 and then testified at a Joint Transportation Committee meeting, "I am authorized to advise you the Canadians had previously rejected the second span of the ambassador Bridge and see no need to change that position." Testimony of M. Alghurabi, DRIC Project Manager for MDOT, Testimony to Joint Transportation Subcommittees of the Michigan Legislature, May 18, 2006.

Cumulative Impacts

In assessing the environmental impacts of a proposed action, the USCG must consider the cumulative impact of the proposed action. That is, the "impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions..." 40 C.F.R. 1508.7. As interpreted by CEQ this refers to "the cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present and reasonably foreseeable future actions." Memorandum, CEQ to Heads of Federal Agencies, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (June 24, 2005), p. 2. See generally, CEQ, Consideration Cumulative Effects Under the National Environmental Policy Act (January 1997).

(Note that the concern with the segmentation of actions (discussed above) arises in part because segmentation tends to undercut the consideration of the cumulative impact of a proposed action.)

With regard to the DIBC's permit application for a new bridge crossing, there are a number of past, present and future circumstances which must be considered in evaluating the impacts of this proposed action.

The past actions which need to be considered include the prior expansion of facilities associated with the Ambassador Bridge over the last 30 years and the associated traffic increases. Steadily over time the presence of the Ambassador Bridge and its impacts on the community have expanded. The Gateway Project is just the latest installment. The adverse impacts of a new bridge will come on top of prior adverse impacts. The totality of these impacts must be considered.

In terms of present projects, obviously the impacts of the Gateway Project must be considered as part of the cumulative impact.

0148

In terms of reasonably foreseeable impacts from future actions, the proposed Detroit Intermodel Freight Terminal will cause the greatest impact. Its adverse impact - traffic, noise and diesel-related air pollution- are the same as the impacts of the existing Ambassador Bridge and the proposed bridge. These projects are only a mile or so apart. An EIS is needed to determine if they will have overlapping impacts and how such impacts will affect the southwest Detroit community. As another example the City of Detroit is planning a pedestrian-way from Belle Isle to the Ambassador Bridge. How will the impacts of that project be factored in? In addition, as noted above, DIBC has already begun discussions with MDOT about access improvements beyond those in the Gateway Project.

A comprehensive scoping effort will undoubtedly identify other past, present and future actions that have direct and indirect impacts which may be cumulative with the impacts of the proposed new bridge.

The Environmental Assessment for the Gateway Project Is Not a Substitute For an EIS for a New Crossing

In 1994, an environmental assessment was performed for roadway improvements between the bridge plaza and connecting state trunkline highways in Michigan (the "Gateway Project"). That project did not consider the environmental impacts of a second bridge nor of the increase traffic capacity which such a facility would provide.

Ambassador Bridge Gateway Project Memorandum of Understanding, July 26, 1996 does not include the certain construction of a second span of the current bridge or a new bridge adjoining the current bridge. It describes the purpose of the Gateway Project as:

- Provide direct access to and from the Ambassador Bridge to and from the trunkline system and provide improved access to local community (roads).
- Accommodate access to meet future border crossing capacity needs and project plans by the DIBC for improvements to the Ambassador Bridge, including the future possibility of a new span.
- Accommodate access to the proposed Travel Information Center ....
- Obtain planning and environmental approvals needed to proceed with transportation improvements to improve access to the Ambassador Bridge.
- Facilitate future project development of an easy and convenient connection from the Ambassador Bridge to Mexicantown and downtown Detroit.....

The report, itself, is clearly limited to access improvements. MDOT & SEMCOG *Environmental Assessment & Programmatic Section 4(f) Evaluation* (January 1997)

> "The action proposed by MDOT is the improvement of access between the Ambassador Bridge and Michigan's trunkline system, notably I-75 and I-96." Preface and p. 6-1.

> "These studies are required to determine the best alternative to improving access at the United States end of the Ambassador Bridge...." p. 1-1.

Figure 1-1, "Project Location" delineates a project location which excludes the bride and is limited to the environs of the current plaza.

"This study; began in September 1995, addressing a broad range of alternatives for access to an egress from the bridge." p. 1-5.

The description of the preferred alternative includes new traffic lanes and a bridge deck built "in such a way that it could align with a future second span to the west of the existing plan." p. 1-7. Notably, that future span which might be built is not part of the preferred alternative which is described in detail on pp 1-7 & 1-8.

The FHWA has been absolutely clear that the EA for the Gateway Project did not include a second bridge at that location. "For the record, the Gateway EA did not clear a future second span near the existing Ambassador Bridge. This was never the intent of the study of the Gateway EA." Letter, Kirschensteiner (FHWA) to Westlake (USEPA) (August 22, 2006) (Attachment I). Mr. Kirschensteiner's letter then explains in detail the limited scope of the Gateway Project. Accordingly, USCG cannot rely on the EA or the associated FONSI to support a finding that an EIS is not required for a new bridge next to the Ambassador Bridge.

Lack of Present Authority To Construct and Operate

Lack of Local Approvals

DIBC is presently in litigation with the City of Detroit over the City's ability to regulate the DIBC and its facilities like any other business in Detroit under the City's zoning and building ordinances. *Detroit International Bridge Company v. City of Detroit*, Court of Appeals Docket No. 257369. DIBC claims it is immune from the City's zoning and building ordinances. Not until that litigation is resolved and then only if it prevails, will DIBC be able to demonstrate that it has all of the City approvals required in order to construct a new bridge.

The DIBC plan appears to call for a new or expanded connector road involving Mill St. and Huron Church Road in Windsor, but the permit application states that "Presently, the DIBC/CTC has no authority or jurisdiction allowing for the construction of connecting roads from the Ambassador Bridge to Highway 401." Permit Application, p. 4. Because such access roads will clearly be required in order to accommodate the traffic with the new bridge capacity will generate, it is questionable whether the USCG can find that the DIBC has all of the permits and authorizations needed to proceed with a new bridge.

Lack of Presidential Permit

We understand that there has been a preliminary determination that a new bridge adjacent to the Ambassador Bridge is not required to obtain a Presidential Permit under the procedures required by 33 U.S.C. § 535a and Executive Orders 11423,12847 and 13337. We do not agree with such a conclusion and are unaware of any basis for it. The enabling legislation for the original Ambassador Bridge clearly is limited to a single bridge whose construction was to be completed within seven years after the legislation. Statutes at Large, 66th Cong., Sess. III, ch. 167 (March 4, 1921). On July 19, 2006, the Gateway Communities Development Collaborative submitted a Freedom of Information Request to the Department of State for its file on the issue. The Department has been untimely in responding to our request. We reserve the right to comment further on this issue once we have possession of the relevant State Department record and determine the Department's position and are able to frame an appropriate comment.

Thank you for your consideration of these comments.

[redacted]

Vice President for Real Estate and Development

Cc: Cassandra Woods, State Director, Senator Carl Levin

0151

Fax Cover Sheet

To:
Bridge Program Manager
Ninth Coast Guard District

From: Community Residents and Workers in Hubbbard-Richard Community in Southwest Detroit, MI

Re: DIBC Permit Application

Fax No: 216-902-6088

Pages (including cover): 3

August 21, 2006

[redacted]
U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

Re: Public Notice 09-03-06

Dear [redacted]

As a resident in the Hubbard Richard neighborhood, which is adjacent to the Ambassador Bridge, I am writing to express my concerns about the permit application of the Ambassador Bridge to build a second span. I respectfully request a public hearing on the permit application.

I am extremely concerned about the environmental consequences of building a second span of the Ambassador Bridge. The southwestern portion of the City of Detroit is an area that has seen significant residential and commercial revitalization and is the only part of the city experiencing population growth. This community has born the burden of the region's transportation and industrial infrastructure without any community benefits. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will surely only grow once the bridge's capacity is expanded.

I am extremely concerned that a second span of the Ambassador Bridge will be built without any environmental review. The Gateway Project, while designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the Ambassador Bridge has well-documented plans to significantly expand its plaza beyond what was anticipated in the Gateway study and beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications. There has been no environmental analysis of those impacts. Therefore, the Coast Guard's preliminary recommendation that the project be granted a categorical exclusion should be revised.

Before any new or enhanced border infrastructure is to be built, it must be determined in an open and participatory bi-national process. Given the Detroit River International Crossing Study and a parallel permit application in Canada, I encourage the Coast Guard to extend the comment period on the permit application and hold a public hearing. I strongly believe that no one community should systematically bear the burden of the state's transportation infrastructure while the region and nation reap the benefits of international trade. There must be public accountability for these kinds of major border infrastructure and significant protections for impacted communities.

Sincerely,

0153

Please see attached List of Supporters

List of Supporters – DIBC Public Hearing
(Residents and Workers in the Community)

[redacted]

0154

[redacted]

September 13, 2006

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060

PUBLIC NOTICE 09-03-06
DETROIT INTERNATIONAL BRIDGE COMPANY

This letter is being sent in response to Public Notice 09-03-06. The Detroit Ambassador Bridge Company (DIBC) has submitted an application for the construction of a second highway bridge. This new bridge would be a fixed bridge over the Detroit River; would extend between the city of Detroit and the city of Windsor; and would be adjacent to and south of the current existing Ambassador Bridge.

I live in the Fort and Schaefer area, zip code 48217, between Fort Street and Jefferson Avenue and which runs to the end of the city limits at Outer Drive. My community is downwind from the existing Ambassador Bridge. The 48217 community is adjacent to the 48209 Delray Community. We are all considered Southwest Detroit. Also, as an officer of the Original United Citizens of Southwest Detroit (OUCSWD), the following comments and concerns are mine and those of my 48217 community. The OUCSWD, a fifty plus year organization, is the parent body of 48217 block clubs that have united to share and present information that concerns our area. For the past two years, the erection of a bridge in the area has been a monthly topic.

For the past year and a half, I have attended Detroit River International Crossing (DRIC) meetings. This is the proposed Michigan Department of Transportation (MDOT) crossing between Detroit and Windsor and have become involved in the DRIC community and local advisory council meetings.

In reading the section of the public notice identified as Environmental Considerations, my interpretation of that is that no environmental impact statement (EIS) will be required; that DIBC will receive a categorical exclusion. My understanding is that NEPA does require an environmental impact statement (EIS). The Coast Guard's tentative determination of exclusion is made based upon information supplied by the DIBC. As I have not seen the documents, although they were made available for public viewing at the Cleveland, Ohio office, I am curious as to what information was (or was not) supplied to the Coast Guard that would nullify and void a direct requirement in the NEPA?

Did DIBC receive such an exclusion from the Environmental Protection Agency? Is an EIS no longer being required by EPA? It is my understanding the Michigan Department of Transportation (MDOT) was required to submit an EIS for a second span for the Blue Water Bridge. What is the difference between MDOT being required to submit an EIS and DIBC not being required to submit an EIS? When the existing Ambassador Bridge was built, NEPA did not exist. An EIS was not required. Environmental issues and awareness were not prevalent during that period. The environment is a major concern for my community. What additional pollution will

0155

filter into my community? To me, as a new structure, the proposed DIBC bridge should come under the jurisdiction of the existing and current laws governing such permits being issued.

The Gateway Project, currently under construction, uses public funding to accommodate the current, private Ambassador Bridge. Public funds will be required for road repairs near entry/exit traffic throughout community streets and major throughways.

Also, as I have read and heard, the Gateway EIS did not include the environmental impact of a new bridge being built by the DIBC.

Information that has circulated within my community is that in 1921 the United States Congress gave the Ambassador Bridge authorization to build. In 1927 the city of Detroit passed an ordinance to establish the Ambassador Bridge. Has the Ambassador Bridge (DIBC) received or been required to receive a new ordnance/authorization from the city of Detroit?

As these are international waters, Detroit River, I assume the DIBC must receive U.S. Coast Guard approval and the Canadian counterpart agency approval.

The public notice indicates no homes nor businesses will be relocated. What will be the proximity of the new bridge to the existing inhabited property? A new bridge will require it to be extended /suspended over either private or public property. If the piers of the proposed bridge will not be in the water where will they be located? How many homes/businesses will eventually be needed to complete the <u>full</u> DIBC project? Data presented by DRIC suggests approximately 300 families will need to be relocated should their project be accepted by the legislators. DIBC has said there would be no families that need to be relocated.

In March 2006 I attended two state of Michigan joint legislative transportation committee hearings in Lansing, Michigan where representatives from the DRIC, DIBC and others presented their bridge proposals before the joint committees. What became painfully clear during those hearings is that the senators and representatives focused on what seemed to me to be how a crossing would be financed—what monies would need to be appropriated and who would do it. When the DIBC said private money, it was as if the legislators stopped listening. They did not appear to focus on the fact that households would be affected regardless who builds a crossing; that people would be dislocated; that these people have lived in their homes for numbers of years, are primarily seniors, at the poverty level and will not be able to afford new housing wherever they are eventually required to relocate.

Slowly, I came to recognize a bridge will be built in this area of Detroit. If you look at the city of Detroit website for the City Planning Commission and City Planning Department for my community, Cluster 5, there is a descriptive paragraph that states this Southwest Detroit area will become the transportation hub of the city. We are close to the Detroit River; there are major interstate expressways nearby; we are across from Canada; and the Detroit Intermodal Freight Terminal (DIFT) is underway.

Several weeks ago I attended a meeting initiated by the state representative for my district, Mr. Steve Tobocman. The two speakers-a member of the Canadian Parliament and the manager of the Peace Bridge in Buffalo, New York- presented their positions and experiences about bridges. The Peace Bridge does have a community oversight committee as well as it is publicly owned. Revenues from the bridge are invested in the community that bears the inconvenience of the bridge. It is my understanding the Canadian Parliament has developed legislative laws that will require protocols for the maintenance of a crossing.

When a new bridge is built, my community would prefer it come under the jurisdiction of the federal and state governments where the tolls are regulated, maintenance protocols would be established and a citizens advisory council would be established such that the community would benefit from the revenues from the bridge. To do otherwise, the community is bearing the burden

0156

of private industry reaping profits at the expense of the health and inconvenience to the community. As much as possible, the community must be made whole.

Currently, along the interstate transportation corridors, there are two secondary schools, four to five elementary schools and a middle school in the area. Many of our children are testing below grade levels. Much is related to poverty levels; some is related to the impact upon children's health and air quality. (Yi-Chen Wu and Stuart A. Batterman, Proximity of schools in Detroit, Michigan to automobile and truck traffic, University of Michigan, 2006). This is an older section of Detroit. Ethnically it is comprised of African Americans, Latinos and Caucasians. It has a high poverty rate. One of the high schools has an extremely high drop out rate and a high asthma rate. This entire area is approximately 45% senior citizens. The homes here have been encircled by industry. Also, this is considered a non-attainment zone and is noted for high levels of asthma among adults and children. It is in this area that DIBC proposes to erect a new bridge.

I have never attended a community meeting that the DIBC has called. They may have held them, but my community was not notified of such meetings. We are less than five minutes drive time away from the Ambassador Bridge. Therefore, to my community, it appears as though the DIBC shows lack of or no regard for all persons who will be affected by the building of a new bridge.

In my immediate area, I am concerned about additional truck traffic exiting expressways when there are backups and will exit the bridge, taking shortcuts, coming down Jefferson to Schaefer to enter Interstate 75 or Interstate 94. The damage to the county road will increase which will increase our county taxes. The additional diesel fumes will pollute increasing the already high levels of asthma and respiratory conditions in our neighborhoods. It is my understanding, once a crossing is built, truck, and car traffic will increase from 50% to 150% over the next 30 years.

There is a new study conducted at Harvard University that found an association between reduced ambient levels of particulate matter and people living longer. The study was conducted in six cities and found a scientific correlation (relationship) between PM levels and health and consequently longevity. My and my neighbors' quality of life will greatly diminish when the winds send the diesel fumes down our direction

Standing on the street and looking at the traffic flow on the Ambassador Bridge, the traffic moves smoothly once it gets on the bridge. The backups occur at the toll booths and the inspection areas on the plazas. In the print media, I read of proposed toll booth plans by the DIBC. It was proposed that Canadian toll booths be closed, transfer the Canadian toll officers onto American soil to collect tolls, have truck and car traffic enter an area one to two miles away from the bridge as an entry way (similar to a Michigan loop). Do the DIBC plans address toll booth and inspection areas?

Also, in print media, several statements have been made as being quotes from current DIBC workers as to how they have been told to speed up the cars and get them off the bridge when there are heavy backups. Homeland security is a concern for citizens living in this area as is immigration. We are concerned about drugs coming into our communities as well as illegal aliens.

Additionally, I am concerned that a single company will be able to monopolize the transportation industry in this area. The parent company of DIBC has been given control of the Port of Detroit. As I understand it, they have a number of trucking companies in the area and lease the city of Detroit portion of the Detroit/Windsor tunnel.

If the DIBC is awarded the Coast Guard approval, does this mean the DRIC becomes redundant and unnecessary?

0157

At some point, legislators, government agencies and companies need to understand that without human, live, people, there will be neither commerce nor advancement. It appears the very persons who should be protecting us have totally failed to recognize we too wish to enjoy and participate in the American dream.

[redacted]

Original United Citizens of Southwest Detroit

0158

September 14, 2006

[redacted]

Commander (dpw-3)
Ninth Coast Guard District
United States Coast Guard
United States Department of
Homeland Security
1240 East Ninth Street
Cleveland, OH 44199-2060

Attn: [redacted]
Bridge Program Manager

Re: City of Windsor Objection to U.S. Coast Guard Tentative NEPA Determination Concerning the Application of Detroit International Bridge Company/Canadian Transit Co. to Permit a Second Ambassador Bridge; U.S. Coast Guard Public Notice 09-03-06

Dear [redacted]

We are submitting these comments on behalf of our client, the Corporation of the City of Windsor, Ontario, Canada ("Windsor" or the "City"), in response to the U.S. Coast Guard's ("Coast Guard's") tentative determination that the above-referenced proposed action is categorically excluded from NEPA review. This letter supplements the letter, dated September 14, 2006, submitted by [redacted] Gowling Lafleur Henderson LLP, on behalf of the City.

[redacted] as provided a detailed summary of the relevant facts and substantiating materials as to why there will be significant adverse environmental impact on the City of Windsor as a result of the proposed second bridge and therefore why the Coast Guard's tentative NEPA determination is improper and I will not repeat that discussion in this letter. Rather, I will narrowly focus on the inappropriateness of the Coast Guard's use of the categorical exclusion. As explained in more detail below: (1) The Coast Guard's determination is improper because the Coast Guard's action will have significant impacts in the U.S. and Canada and, thus, an EIS is required. (2) The Coast Guard has inappropriately determined that the action falls under categorical exclusion number 32(a) identified in the Coast Guard's Implementing Instructions where the proposed project is neither a "modification" or a "replacement" of an existing bridge. (3) Even if this action fell under this categorical exclusion (which it does not), the Coast Guard must conduct an EIS where it is demonstrated that the project may have significant environmental impacts.

0159

Discussion.

The Detroit International Bridge Company/Canadian Transit Co. (collectively "DIBC") proposes to construct a new six lane bridge (with sufficient shoulder space to create two additional lanes) across the Detroit River between Detroit and the City. DBIC has requested approval from the Coast Guard of the location and plans for construction for the new bridge. Please see [redacted] letter for a more detailed discussion of the background information, which is incorporated herein by reference.

In its July 28, 2006 Public Notice, the Coast Guard stated that it has made a tentative determination that the proposed action meets the criteria for one of the categorical exclusions listed in the Coast Guard's NEPA Implementing Instructions (Nov. 29, 2000). Based on information received on August 23, 2006 from Nick E. Mpras, Chief, Office of Bridge Administration, Coast Guard Headquarters, we understand that the Coast Guard determined that the action meets the criteria of categorical exclusion number 32(a) on Figure 2-1 of the NEPA Implementing Instructions. Number 32(a) excludes Bridge Administrative Program actions which can be described as a "[m]odification or replacement of an existing bridge on essentially the same alignment or location. Excluded are bridges with historic significance or bridges providing access to undeveloped barrier islands and beaches." [redacted] indicated that the Coast Guard considers the proposed project to be a modification of the plans for the existing Ambassador Bridge. As set forth in [redacted] letter, the City believes that this tentative determination is unreasonable, arbitrary and capricious. We have provided below some additional comments to supplement those in [redacted] letter.

1. <u>NEPA is Starting Point of Analysis</u>. The starting point for the Coast Guard's NEPA determination must be NEPA itself. Under NEPA, federal agencies are mandated to assess the environmental impacts of major federal actions significantly affecting the quality of the human environment. 42 U.S.C. § 4332(C). NEPA places an obligation on federal agencies to consider every significant aspect of the environmental impact of a proposed action and to inform the public that it had considered environmental concerns in the decision making process. *Baltimore Gas and Electric v. NRDC,* 462 U.S. 87, 97, 103 S. Ct. 2246, 2252, 76 L. Ed. 2d 437, 446 (1983).

This mandate is incorporated in the CEQ regulations set forth at 40 C.F.R. § 1500 *et seq.*, which are binding on the Coast Guard. 40 C.F.R. § 1507.1. The CEQ regulations provide for categorical exclusions to be determined by the respective implementing agencies for categories of actions which do not individually or cumulatively have a significant effect on the human environment. 40 C.F.R. § 1508.4. The CEQ regulations provide that the implementing agencies must provide for extraordinary circumstances in which a normally excluded action may have a significant effect. This is simply a recognition by the CEQ that an agency may not use a categorical exclusion in compliance with NEPA if the specific action may have a significant environmental effect.

While it is appropriate for the Coast Guard to identify categorical exclusions which it has predetermined will not normally have a significant environmental effect, reliance on the categorical exclusion in this case without taking a "hard look" at the environmental consequences of the proposed action will not survive scrutiny by a reviewing court. *Kleppe v. Sierra Club,* 427 U.S. 390, 410, 96 S. Ct. 2718, 2730, 49 L. Ed. 2d 576, 590 (1976); *State of California v. Norton,* 311 F.3d 1162, 1168 (9th Cir. 2002). Otherwise, the Coast Guard will not satisfy the NEPA purpose of fostering informed decision making and informed public participation. *Sanluis Obispo Mothers for Peace v. NRC,* 449 F.3d 1016, 1035 (9th Cir. 2006); *Highland Cooperative v. Lansing,* 492 F.Supp. 1372, 1380 (W.D. Mich. 1980) (holding insufficient "hard look" and invalidating action that created four lane highway and stating impropriety of relying "on bald conclusions."). The City, the U.S. EPA, and other commenters have identified significant potential environmental effects of the proposed project. Thus, the Coast Guard cannot apply its categorical exclusion. *See Sierra Club v. Bosworth*, 352 F.Supp 2d 909, 927 (D. Minn. 2005).[1]

The Coast Guard is required under NEPA to include analysis of reasonably foreseeable transboundary effects in its analysis of proposed actions in the U.S. 42 U.S.C. § 4332(F) (requiring agencies to "**recognize the worldwide and longrange character of environmental problems** and, where consistent with the foreign policy of the United States, **lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation** in anticipating and preventing a decline in the quality of mankind's world environment" (emphasis added)). Furthermore, the *CEQ Guidance on NEPA Analysis for Transboundary Impacts* (July 1, 1997) states that "NEPA requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions" in their analysis of proposed actions in the United States. The CEQ's conclusion is entitled to "substantial deference." *Andrus v. Sierra Club*, 442 U.S. 347, 358 (1979); *see also Executive Order 12114, Environmental Effects Abroad of Major Federal Actions* (Jan. 4, 1979); *Association of Pub. Agency Customers v. Bonneville Power Admin.*, 126 F.3d 1158 (9th Cir. 1997) (holding that agency did consider transboundary effects, thus there was no violation of NEPA or the executive order); *Government of the Province of Manitoba v. Norton*, 398 F.Supp.2d 41 (D.D.C. 2005)

---

[1] The USCG has not considered the cumulative impacts of the proposed action as required under NEPA. 40 C.F.R. § 1508.7 (must consider the "impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions …"). In addition, the USCG's analysis of DIBC's application on a stand-alone basis violates NEPA's prohibition on project segmentation. The USCG must consider the impacts of the overall project, including, without limitation, the expansion and improvements to the bridge plazas, access improvements to U.S. and Canadian roadways and construction of additional bridge capacity. The USCG must assess the impacts from the entire system as part of the NEPA review.

(looking to, among other facts, transboundary effects along river to invalidate agency action under NEPA).

The Coast Guard has recognized the obligation to assess the impact of its actions on a foreign nation. *See, e.g., Implementing Instructions*, Enclosure 1, at pp. 5, 16. This obligation does not depend on whether Canada will or will not conduct its own environmental impact study of the project. We object to the extent that the Coast Guard fails to consider the significant transboundary impacts of this action as part of its NEPA determination.

2. <u>The Action Does Not Fit Any Categorical Exclusion</u>. The Coast Guard has tentatively determined that the proposed action fits within categorical exclusion number 32(a). This determination is clearly erroneous on its face. Number 32(a) applies to the "[m]odification or replacement of an existing bridge on essentially the same alignment or location."

DIBC seeks approval to construct an entirely new six lane bridge. DIBC does not intend to terminate the use of the existing bridge. DIBC does not intend to alter the existing bridge. As such, the proposed project is neither a modification or replacement of the existing Ambassador Bridge under any reasonable definition of those terms. Nor can this project be construed as a modification or replacement "on essentially the same alignment or location." The USCG's list of categorically excluded projects simply does not include the construction of a new bridge, and certainly not a new six lane, mile long international bridge capable of carrying up to 50,000 vehicles per day. The Coast Guard's use of the categorical exemption in this case would be unreasonable, arbitrary and capricious. *See State of Mississippi, ex rel. Moore v. Marsh*, 710 F.Supp. 1488 (S.D. Miss. 1989) (Corps of Engineers characterization of river maintenance activity as within categorical exclusions was clear error where project did not fit under definition in regulations); *West v. Secretary of the DOT,* 206 F.3d 920 (9th Cir. 2000) (holding use of DOT's categorical exclusion for "highway interchanges" was intended for small scale projects and not "an entirely new, $18.6 million, four-lane, 'fully-directional' interchange ... requiring 500,000 cubic yards of fill material, 30,000 tons of crushed surfacing, and 32,000 tons of asphalt concrete pavement" and invalidating agency action.); *Ark. Nature Alliance, Inc. v. United States Army Corps of Engineers,* 266 F.Supp. 2d 876 (D. Ark. 2003) (more than doubling bridge side required EIS due to potential environmental impacts).

NEPA and the CEQ regulations unambiguously require the Coast Guard and other federal agencies to prepare an EIS or environmental assessment/finding of no significant impact ("FONSI") for all major federal actions that are not categorically excluded as in this case as discussed above. *Anacostia Watershed Society v. Bobbit,* 871 F.Supp. 475, 481 (D.D.C. 1994). If the Coast Guard believes that the project will have no significant impacts, it must provide that assertion in an environmental assessment/FONSI where no categorical exclusions apply. *Id.* at 482.

This project does not fit within categorical exclusion number 32(a) for a second reason. The exclusion does not include bridges with historic significance. The existing Ambassador Bridge is on the National Register of Historic Places. We do not believe that the construction of an entirely new bridge can reasonably be considered a "modification" of the existing bridge. In any event, categorical exclusion number 32(a) excludes on its face modifications to an existing bridge with historic significance. The Coast Guard has acknowledged that the Ambassador Bridge has historical significance. If the Coast Guard believes that the proposed project is a modification of the existing Ambassador Bridge, then it cannot rely on categorical exclusion number 32(a), because modifications to existing bridges with historical significance are excluded.[2]

3. Extraordinary Circumstances. Finally, even if this action fell under the definition of categorical exclusion number 32(a) (which it does not), the Coast Guard must conduct an EIS because the proposed action will significantly affect the quality of the human environment. *State of California v. Norton,* 311 F. 3d at 1168.

As mandated by NEPA, and explicitly required in the CEQ regulations and the Coast Guard's NEPA Implementing Instructions, a categorical exclusion does not apply under extraordinary circumstances in which a normally excluded action may have a significant environmental effect. When extraordinary circumstances are present, the Coast Guard must assess environmental impacts. *Id.* at 1170.

As noted above, the Coast Guard cannot ignore NEPA when reviewing a project under the CEQ regulations or its Implementing Instructions. Neither the CEQ regulations or the Implementing Instructions can trump the overriding duty of all federal agencies under NEPA to assess significant environmental impacts of their actions. The bottom line is that the Coast Guard must take a hard look at the potential impacts of this project. If there are any potential significant effects (and we believe there are many as set forth in Mr. Estrin's letter and letters from the U.S. EPA and other commenters), then the categorical exclusions cannot be used. *Sierra Club*, 352 F.Supp. 2d at 922 (to prove decision to not prepare EIS was contrary to law, plaintiffs need only show that there is a substantial possibility that action may have significant impact on environment, not that it will clearly have such an impact); *Nat'l Audubon Soc'y v. Hoffman,* 132 F.3d 7, 18 (2d Cir. 1997); *Sierra Club v. United States Forest Serv.,* 843 F.2d 1190, 1193 (9th Cir. 1988).

The "extraordinary circumstances" exception to the categorical exclusions in the CEQ regulations and the Coast Guard's Implementing Instructions merely state the obvious –

[2] Moreover, the new bridge will adversely affect, at a minimum, the aesthetic character of an existing historically significant bridge.

categorical exclusions cannot apply if the specific project may have significant environmental effects. Otherwise, the regulations and implementing guidelines would contravene NEPA's broad mandates and frustrate the fundamental purpose of NEPA, which is to ensure that federal agencies take a hard look at the environmental consequences of their actions. *State of California v. Norton*, 311 F. 3d at 1175.

The Coast Guard has identified in Enclosure 2 to the Implementing Instructions various considerations for determining when extraordinary circumstances are present. The City has provided substantial evidence wit[redacted]etter demonstrating that most of the potential effects identified in Enclosure 2 may result from the project. It defies logic to assume that the construction of a major new international bridge built into the center of two major cities would not have significant environmental impacts. The construction phase alone, with its noise impacts, stormwater run-off issues, and traffic impacts, among other things, would be sufficient to trigger NEPA review. *See Implementing Instructions*, Enclosure 1, Attachment 2, p. 12.

In its tentative determination, the Coast Guard relied exclusively on DIBC's assertions. Under NEPA, the Coast Guard must take a hard look at the potential effects of the action. *Sanluis Obispo Mothers for Peace,* 449 F.3d at 1035; *Highland Cooperative,* 492 F.Supp. at 1380. The Coast Guard may not base its determination on the conclusory statements of the applicant, particularly where other evidence in the record contradicts the applicant's assertions. *Highland Cooperative*, 492 F.Supp. at 1380.

Moreover, as pointed out by[redacted]any of the applicant's statements are erroneous, misleading, or inaccurate. Reliance on such statements without further inquiry to conclude that the categorical exclusion applies and that the exceptions to the categorical exclusion do not would be unreasonable, arbitrary and capricious. *See Highland Cooperative*, 492 F.Supp. at 1380; *Save the Courthouse Committee v. Lynn,* 408 F.Supp. 1323, 1341 (S.D.N.Y. 1975). In any event, there is substantial evidence in the record that extraordinary circumstances exist and, thus, the Coast Guard may not use the categorical exclusion. *State of California v. Norton*, 311 F.2d at 1177. As recognized in the Implementing Instructions, if a categorical exclusion is not appropriate, an environmental assessment or EIS must be prepared. *Implementing Instructions* at p. 2-5.

The Ambassador Bridge was built in 1929, well before NEPA was enacted. The Coast Guard cannot ignore the fact that the environmental effects of the original bridge were never assessed. Therefore, the Coast Guard has no basis to conclude that the construction of a much larger bridge in the same general area will have no significant effects. Even if this project was for the purpose of replacing the Ambassador Bridge (which it is not), it would be a violation of NEPA to assume that there are no effects. The Coast Guard cannot reasonably conclude that the construction of a six lane bridge that passes over parks, will increase traffic with related congestion, pollution and health concerns, and will generate substantial cumulative indirect impacts, among many other things, will have no significant effect on the environment.

The City requests the Coast Guard merely to follow its own procedures, which provide the specific circumstances where the categorical exclusion may and may not be used. The failure to follow its own requirements has been held by the courts to demonstrate that the agency's actions are unreasonable, arbitrary and capricious. *Simmons v. Block*, 782 F.2d 1545, 1550 (11th Cir. 1986); *Mine Reclamation Corp. v. Federal Energy Regulatory Comm'n*, 308 U.S. App. D.C. 152, 30 F.3d 1519, 1524 (D.C. Cir. 1994); *Bunyard v. Hodel*, 702 F.Supp. 820, 822 (D. Nev. 1988).

The Coast Guard's own policy requires that "responsible personnel should be alert for circumstances that dictate the need to prepare an EA or EIS" for actions that normally would be categorically excluded. *Implementing Instructions*, p. 2-4. The Implementing Instructions require that "the determination of a CE is inappropriate and more environmental analysis is needed, or that an EA or EIS is needed, must be based on the potential significance of the proposed actions affect on the environment. The proposed action must be evaluated in its context (whether local, state, regional, tribal, national or international) and in its intensity by considering the level of possible effects as listed in (1) – (10) above." *Implementing Instructions*, p. 2-5 (emphasis added).

Your policy also states that "a CE may not be used if the proposed action is likely to involve any of the circumstances set forth in Section 20.B(2) of DOT Order 5610.1 (enclosure 1). The 10 listed circumstances and those in the DOT Order are addressed in the Environmental Analysis Checklist (enclosure 1). If a CE is not appropriate, an EA or an EIS must be prepared." *Implementing Instructions*, p. 2-5 (emphasis added). Accordingly, your own commandant instruction requires that a categorical exclusion may not be used if the proposed action is likely to involve one of the circumstances set forth in the Environmental Analysis Checklis[redacted] ubmission includes a letter dated September 13, 2006 from Robert Hayes, Chief Planner, City of Windsor, in whic[redacted] as an experienced environmental assessment practitioner, provides a detailed discussion of the factors on the Checklist, showing that this project will in fact involve many of the listed circumstances. We ask the Coast Guard to follow its own guidance and procedures in this case and conduct a detailed environmental review of the project impacts.

[redacted] has described in detail the significant impacts from this project. He has described and provided supporting documentation that this project will greatly increase traffic into the City and over and through urban parks, residential neighborhoods, schools, and cause massive congestion of municipal roads. This will exacerbate air pollution, noise pollution and congestion within the City, as well as impairing health and safety of Windsor residents. *See*

SIGNATURE PAGE

Name of Organization: Go-Getters Prog.

Signed: [redacted]

Name: ____

Position: Director

Contact Person ____

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: ____

Our organization represents the following constituencies:

____

Optional

☑ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☑ Our organization is opposed to a river crossing which is not controlled by a public entity.

0110

Signed: [redacted]

SIGNATURE PAGE

Name of Organization: Apex Signal

Signed: [redacted]

Name: [redacted]

Position: Owner

Contact Person [redacted]

Address: [redacted]

Phone Numbe[redacted]

Fax Number: [redacted]

Email:

Our organization represents the following constituencies:

Optional

☑ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☑ Our organization is opposed to a river crossing which is not controlled by a public [redacted]

Sign[redacted]

0111

SIGNATURE PAGE

Name of Organization: ____________________

Signed: ____________________

Name: ____________________

Position: [redacted]

Contact Person [redacted]

Address: [redacted]

Phone Number: ____________________

Fax Number: ____________________

Email: ____________________

Our organization represents the following constituencies:

____

____

____

Optional

☑ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☑ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0112

SIGNATURE PAGE

Name of Organization: ______________________________

Signed: [redacted]

Name: [redacted]

Position: [redacted]

Contact Person ______________________________

Address: ______________________________

____

Phone Number: ______________________________

Fax Number: ______________________________

Email: ______________________________

Our organization represents the following constituencies:

____

____

____

Optional

☐ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0113

SIGNATURE PAGE

Name of Organization: ______________________________

Signed: [redacted] ______________________

Name: [redacted]

Position. [redacted]

Contact Person ______________________________

Address: ______________________________

____

Phone Number: ______________________________

Fax Number: ______________________________

Email: ______________________________

Our organization represents the following constituencies:

____

____

____

Optional

☐ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☐ Our organization is opposed to a river crossing which is not controlled by a public [redacted]

Sig [redacted] ______________

0114

SIGNATURE PAGE

Name of Organization: [redacted]

Signed: [redacted]

Name: ______________________

Position: ______________________

Contact Person ______________________

Address: ______________________

____

Phone Number: ______________________

Fax Number: ______________________

Email: ______________________

Our organization represents the following constituencies:

SOUTHWEST DETROIT BUSINESSES

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity [redacted]

Signed: [redacted]

0115

NEIGHBORHOOD CENTERS INC.

Building Blocks for Better Lives

8300 Longworth - Detroit, MI 48209 - Phone: [redacted]

[redacted]

September 13, 2006

[redacted]

U.S. [redacted] of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060
Fax: 216 902-6088

Regarding The DIBC Permit Application For A Second Span

Dear [redacted]

Here are my comments.

A. The application does not represent the full scale of the DIBC's proposed expansion plans (including a minimum of 34 additional primary inspection booths and the reconfiguration of Fort Street) and therefore is a segmentation of the project which is disallowable under the National Environmental Protection Act. A full environmental analysis is required.

B. The Federal Highway Administration has repeatedly stated that the Environmental Analysis completed for the Gateway Project did not evaluate the impacts of a second span of the Ambassador Bridge and, therefore, the Coast Guard's preliminary recommendation that the project be granted a categorical exclusion should be revised. Federal agencies have since weighed in and echoed the call for an environmental analysis.

C. Given the DRIC Study and a parallel permit application in Canada, the Coast Guard should further extend the comment peri[redacted] the permit application and hold a public hearing.

[redacted]

Executive Director

0116

FAX

[redacted]

PH: [redacted]
FAX: [redacted]

TO: [redacted]

U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, OH 44199-2060
FAX: 216-902-6088

SUBJ: **DIBC Second Span**

DATE: **9-14-06**

Please consider this an urgent request. Please stand firm in your position that this project which is disallowable under the National Environmental Protection Act as presented. Continue to pursue the full environmental analysis as required.

Hold fast to the impact study needs. And please hold a public hearing as early as possible.

[redacted]

0117

12th House District
Southwest Detroit

STATE CAPITOL
P.O. BOX 30014
LANSING, MI 48909-7514
(517) 373-0823
1-877-STEVE-12
FAX: (517) 373-5993

[redacted]
MICHIGAN STATE REPRESENTATIVE

Committee Member:
COMMERCE
GOVERNMENT OPERATIONS
(Min. Vice-Chair)
LOCAL GOVERNMENT AND
URBAN POLICY
(Min. Vice-Chair)

[redacted]

September 14, 2006

[redacted]
U.S Department of Homeland Security
United States Coast Guard
1240 East Ninth Street
Cleveland OH 44199-2060

Re: Public Notice 09-03-06

Dear [redacted]

I am writing with respect to the permit request from the Detroit International Bridge Company (DIBC) to build a second span adjacent to the Ambassador Bridge. I urge the US Coast Guard to (1) revise its preliminary determination of a categorical exclusion for this project under the National Environmental Policy Act (NEPA); (2) further extend the comment period; and (3) hold a public hearing with respect to this permit application. Construction of this facility represents a major increase in cross-border transportation capacity not only in Southwest Detroit, but for the region. **A project of this size, scale, and complexity cannot be undertaken without a full environmental review and until all of the environmental and community concerns are reviewed and addressed.**

There is no justification for a categorical exclusion of this project under NEPA. The DIBC is not proposing a mere enhancement of its existing bridge, but a *new second bridge*. Approval of this permit application will have far-reaching environmental and community consequences that must be reviewed and addressed. A private company should not be given an "environmental pass" when the Binational Partnership pursuing the Detroit River International Crossing Study (DRIC) must engage in a full environmental impact study. Given that the consequences of a new crossing are so significant, any new bridge must be held to the same standard.

- **No environmental assessment has *ever* been conducted regarding a new 6-lane bridge across the Detroit River at the location of the Ambassador Bridge.** DIBC has misrepresented the Gateway Project as having provided an environmental clearance for a second span of the Ambassador Bridge. The Gateway project is being undertaken by MDOT and DIBC to directly tie the Ambassador Bridge into the freeway system in order to improve transportation movements from the bridge to the freeway system and to take truck traffic off of local roads. The Gateway project was designed to *accommodate* a second span if one were built sometime in the future, not to *enable* a second span to be built. The Environmental

Assessment for the Gateway project, conducted in 1996 and updated in 1999, did not study the environmental impacts of the six-lane bridge currently being proposed by the DIBC. It studied the impacts related to the ramps and other infrastructure needed to connect the plaza to the freeway system. Recent correspondence from the Federal Highway Administration to the US Environmental Protection Agency clarifies this point, and is attached (Attachment A).

- **The DIBC permit application lacks critical information regarding public health and safety necessary to justify a categorical exclusion from NEPA requirements.** From the information available publicly, it appears that no air quality, noise, vibration, traffic or other environmental studies have been undertaken by the DIBC to bolster their claim for categorical exclusion. If such studies have been undertaken, the methodology, data and analysis of those studies have not been presented. The application for categorical exclusion draws conclusions that the project will have little to impact without providing the data to support those conclusions.

  In addition, the application overlooks critical components of a new bridge that would protect public health and safety. For example, the permit does not address the treatment of hazardous materials on the new bridge. Given the existing bridge's lack of capacity to safely handle any hazardous material spills and the federal prohibition on allowing hazardous materials to cross the existing Ambassador Bridge, the new bridge must have protections and safeguards to protect the Detroit River and the surrounding community from hazardous spills that might occur on the bridge. Recent media reports have suggested that DIBC engages in "lane-flushing," the practice of allowing trucks through without inspection, as well as "mis-placarding," the practice of allowing trucks known to be carrying hazardous materials to cross the Ambassador Bridge by ignoring their placarding (Attachment B). There must be a thorough understanding of the protections that will be put in place to ensure that hazardous materials are not a threat to the environment or community.

  As a project that may have national consequences for both our economy and homeland security, as well as serious local consequences, it is imperative that a complete description of the new facility and its design, construction, and operation, as well as a thorough assessment of its impacts are provided by the DIBC for consideration by the Coast Guard.

- **A second span of the Ambassador Bridge will have uncertain and unknown effects on the human environment which must be studied under NEPA.** Construction of a new six-lane bridge represents a 150% increase the number of lanes at the location of the Ambassador Bridge, an unprecedented expansion of border capacity at the Detroit-Windsor border—and one that was rejected in the DRIC because of its community impacts. Such a dramatic increase in border capacity must merit full environmental review, given the potential impacts of truck traffic, air pollution, sediment run-off into the Detroit River, and other consequences of such a serious future increase in traffic. Most significantly, the DIBC has not undertaken any air quality studies to support its claim that there would be no decline in air quality from the significant increase in traffic reasonably expected. With approximately 10,000 trucks crossing the Ambassador Bridge each day, Southwest Detroit has been documented to have high rates of asthma and other respiratory diseases. The health of humans is just as important as the health of wildlife and plant life. Increasing capacity via a second span will further threaten community health and air quality in Southwest Detroit and must be studied.

- **The DIBC permit application fails to mention the significant plaza expansion and reconfiguration currently being pursued that would ostensibly serve a second span.** DIBC has actively pursued a significant expansion of its plaza facility, called the International Center project. This plaza expansion is not mentioned in either the Coast Guard permit application or the previous application to the Michigan Department of Environmental Quality, which represents a segmentation of the project under NEPA and is not allowable. Given that no traffic information has been provided by the DIBC, it is unknown whether their current plaza or the one envisioned by the Gateway Project seven years ago can accommodate traffic from a second span.

  The issue of an expanded plaza at this location is extremely serious. An expanded plaza would severely impact the growing residential community and commercial area that has already seen encroachment by the bridge compound. DIBC has publicly touted its proposal for a new plaza facility going south of the existing plaza toward the river. This proposal has been made to Detroit City Council, the City of Detroit Mayor's office, various meetings at the DIBC offices, and to MDOT. DIBC-purchased advertisements depicting the proposed International Center have appeared in the *Detroit News, Detroit Free Press,* and *Crains Detroit Business* over the last year. DIBC has also requested MDOT relocate Fort Street to accommodate the International Center proposal. (See Attachments C and D). It is disingenuous to say that no additional plaza capacity would be needed for a second span while DIBC pursues actions to build such an expanded plaza—without environmental review. This plaza expansion may have significant impacts on the local community and should be fully studied as part of the permit application.

- **The DIBC permit application does not acknowledge the cumulative effects of the second span when considered with other transportation-related projects in Southwest Detroit.** Not only do the traffic increases associated with a second span of the Ambassador Bridge need to be studied, but the cumulative effects of traffic growth when one considers the Detroit Intermodal Freight Terminal Project, plans for expansion of the Port of Detroit, and other redevelopment plans in Southwest Detroit. Investments in key transportation infrastructure, such as increased border capacity, have an undisputed impact on other commercial, freight, and industrial investments whose cumulative impacts could have a serious impact on Southwest Detroit and the region. At minimum, an air quality conformity analysis is required.

- **A second span of the Ambassador Bridge, as proposed, may impact a historically significant structure.** The current bridge is a classic suspension bridge completed in 1929. The DIBC permit application proposes a cable-stayed bridge adjacent to the historic structure with no assessment of appropriateness from the State Historic Preservation Office. No information on the aesthetic elements of the new bridge is provided in the permit application. Given that twin spans of other historic bridges have been designed to minimize impacts to their historic predecessors (i.e. the Blue Water Bridge, the Peace Bridge), no less should be considered for the Ambassador Bridge. This is even more significant, given that in its permit application to the Michigan Department of Environmental Quality, the DIBC suggests that the existing bridge may be closed, temporarily or permanently, once the new bridge is built.

In addition, at least two historic districts are in proximity to the proposed new bridge—the Corktown Historic District and the Hubbard Farms Historic District. Impacts to these neighborhoods are given little consideration in the DIBC's application for categorical exclusion.

- **The DIBC permit application has significant potential for controversial effects.** A second span of the Ambassador Bridge has been an extremely controversial issue in both the United States and Canada. Canadian governmental agencies have outright rejected a second span as a viable alternative for additional border capacity between Detroit-Windsor, and continued efforts by the DIBC to pursue a second span only fuel controversy in Windsor.

  There has been significant debate about whether a new bridge should be publicly-owned and the consequences of a private monopoly controlling North America's busiest trade corridor. There has been a long history of community controversy related to projects related to the Ambassador Bridge plaza. In fact, the City of Detroit is currently engaged in a lawsuit before the Michigan Court of Appeals regarding the DIBC's claim that it is exempt from local zoning and building permits.

  Community members have had no forum to advocate for mitigation of environmental impacts of the existing bridge and will continue to lack such a forum due to the private nature of the second span. Unbridled expansion of private transportation infrastructure represents an environmental justice issue. Without a more thorough environmental review process, many of the affected residents, community organizations, businesses and other institutions will continue to be unaware of the current proposal. In addition, a second span directly impacts the Detroit Riverfront Conservancy's plans to bring public access to the west riverfront from Southwest Detroit.

- **Hasty approval of the DIBC permit application sets a precedent for the Detroit-Windsor border, without ensuring the best result.** The DRIC is currently studying alternatives for additional border crossing infrastructure along the Detroit River. DRIC is a comprehensive bi-national process to determine the best location for a new border crossing along the Detroit River. It considered the addition of a second span to the Ambassador Bridge crossing and rejected it because of the impacts on the Canadian side of the project. Sites located west of Ambassador Bridge were found to be more prudent and feasible and are currently being studied in a full Environmental Impact Study under NEPA. It does not make sense to circumvent the environmental review process by issuing permits for a location that

[redacted]

was found to have significant issues, particularly when other sites are being studied that balance the needs of both the U.S. and Canadian communities affected.

In addition, the General Services Administration (GSA) is currently undertaking a master plan study of the Ambassador Bridge commercial truck plaza and customs facilities. GSA may recommend long-term plaza improvements for the commercial freight inspection facility which could impact the second span. The outcome of this planning process may change the location, size and operation of the plaza facility and, therefore, the impacts of the second span. Consideration of the DIBC permit should be delayed until the GSA master plan is complete.

In light of Southwest Detroit's unique position as Southeast Michigan's transportation hub, as well as Detroit-Windsor's position as arguably North America's most important trade corridor, the DIBC permit application should be given even greater scrutiny. This community bears the burden of supporting not only the region's economy, but the national economy. It deserves to be afforded the greatest protections when it comes to quality of life, residents' health, and the environment. Community members deserve a forum for addressing their concerns related to any expansion of this burden. The DIBC permit application should be reviewed to the same standards as any border crossing currently being studied as part of the DRIC.

I am extremely concerned that the DIBC permit might be approved without appropriate consideration of the issues raised in my letter and other concerns expressed by the community. Construction of this second span raises serious questions about the community's ability to garner any benefits from the project to help mitigate the significant burden it will bear. Although the new crossing may be privately-owned, there should be as much public oversight as possible given the importance of this expanded infrastructure. Community members should be given the opportunity to negotiate some community benefits.

Given the grave deficiencies in the DIBC permit application, I urge you to reconsider your preliminary recommendation of a categorical exclusion under NEPA and require a full environmental impact study. I also urge you to further extend the comment period and solicit comments through a series of public hearings.

Thank you for the opportunity to comment on the DIBC permit application. I look forward to receiving additional information regarding this project, including any notices for public hearings should they be scheduled. I can be reached at (517) 373-0823 for any questions or additional information.

Sincerely,

[redacted]

0122

State Representative— 12th District, Southwest Detroit

ATTACHMENT A

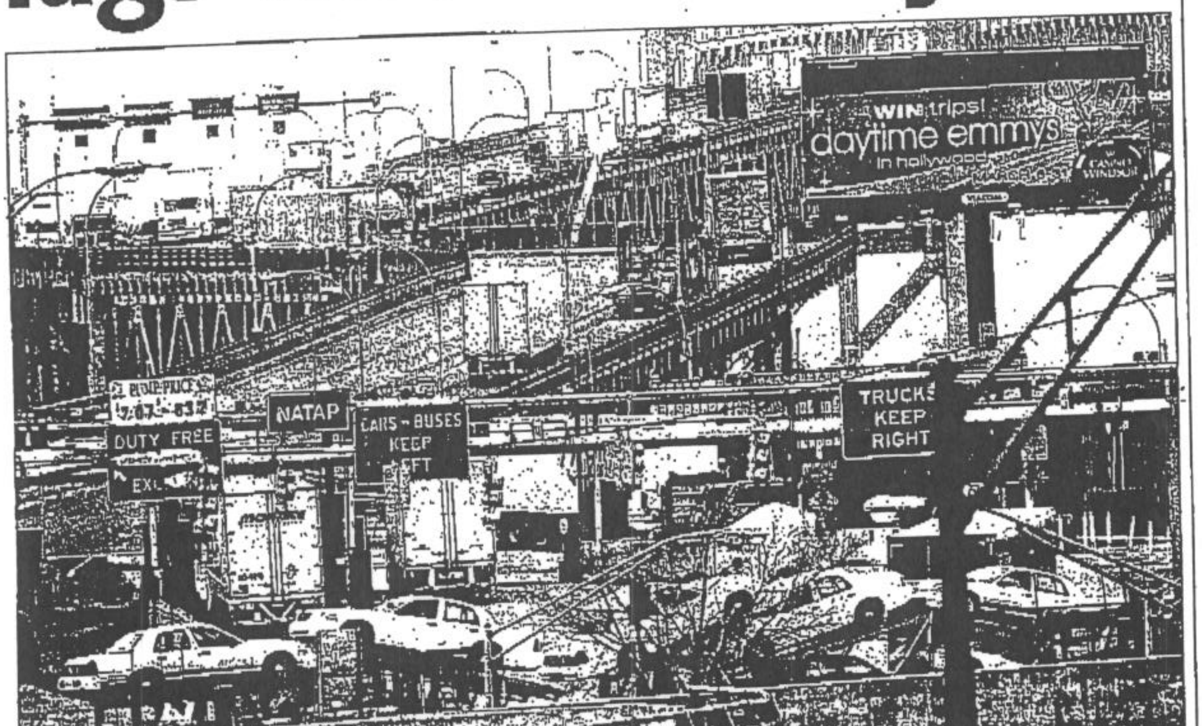
ATTACHMENT B

Detroit Free Press

50 CENTS WWW.FREEP.COM WEDNESDAY MARCH 29, 2006 METRO FINAL ••

SPECIAL REPORT: Bridge operator pushes to keep border travel moving. Government officials deny cutting corners.

Inspectors: Security lags when traffic jams



Photos by KATHLEEN GALLIGAN/Detroit Free Press

Traffic crosses the Ambassador Bridge earlier this month. Amid heightened terror concerns, about 9.4 million vehicles crossed the bridge in 2005, bridge officials said.

BY TAMARA AUDI
FREE PRESS STAFF WRITER

On a weekend night earlier this month, 12 big rigs from Detroit were lined up on the Canadian side of the Ambassador Bridge, waiting to be searched by inspectors who were on the lookout for a produce truck thought to be carrying drugs.

But before the Canadians could scan the trucks, their supervisor received a call from the U.S. company that owns the bridge. The trucks were snarling traffic. And the

Read part of a Canadian terror study at freep.com.

bridge's owner wanted traffic cleared quickly, an inspector working that night said.

What happened next, according to customs inspectors and security experts, is what routinely happens on the U.S.-Canadian border when security clashes with commerce: Commerce wins.

"We stopped the inspection," a Canadian inspector said, and let the trucks pass.

Despite fears of terrorism and other security concerns at U.S. ports and border crossings since Sept. 11, 2001, U.S. and Canadian inspectors on the Ambassador Bridge and elsewhere say they are routinely told by supervisors to wave vehicles through checkpoints without scrutiny to satisfy commercial interests.

Though government officials in the United States and Canada deny safety is compromised, inspectors say security lapses are a particular prob-

See BORDER, 7A

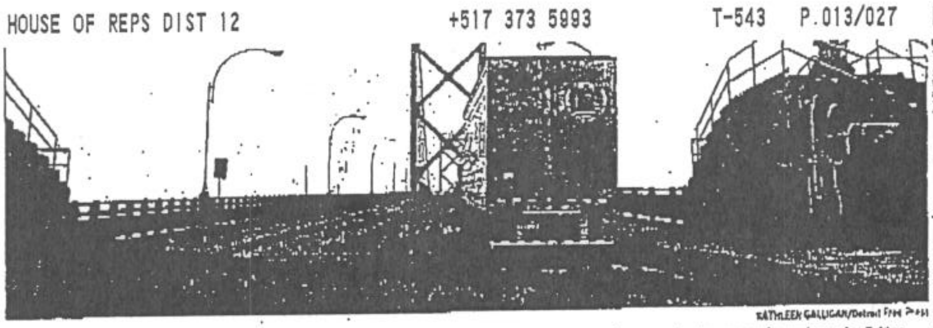
Marie-Claire Coupal, president of the Windsor district branch of the Customs Excise Union, says that despite the bridge owner's view, she doesn't feel very independent. "Matty Moroun calls the shots."

From Page 1A

lem at the Ambassador Bridge — the busiest northern border crossing, and one of only two along the U.S.-Canadian border that are privately owned.

In one practice known as lane flushing, inspectors at the bridge — owned by the Detroit International Bridge Co. — say supervisors force them to wave through long lines of cars and trucks to ease congestion, without asking even cursory questions of drivers or passengers.

01



KATHLEEN GALLIGAN/Detroit Free Press

The head of a union representing inspectors says the economic pressures mean inspectors are told to wave trucks across the Ambassador Bridge during backups. Government officials say security isn't being compromised at the crossings.

call is going to come [illegible] bridge company, one bridge inspector told the Free Press. "Then management jumps like lapdogs."

Robert Perez, port director of Detroit for U.S. Customs and Border Protection, an agency of the Department of Homeland Security, denied lane flushing takes place. Perez said his office tries to cooperate with bridge and tunnel operators, and that inspectors might view that cooperation as caving in to commercial interests.

"The people in the community, both in Detroit and Windsor, should feel good about the fact that their border crossings are safer than ever before," Perez said.

The Free Press interviewed more than a dozen inspectors, former inspectors, Homeland Security officials, customs supervisors, politicians and border security experts — including six inspectors assigned to the Detroit-Windsor border. All but one of the inspectors — a Canadian union leader — spoke on condition of anonymity, citing agency restrictions on media interviews and saying they feared job reprisals if named.

The allegations come as U.S. border security has faced its closest scrutiny since the 2001 terrorist attacks.

Congressional opposition recently scuttled a plan to have a Dubai-owned firm manage six U.S. ports. And Tuesday, as Congress debated tougher border security as part of an immigration package, a Senate subcommittee was investigating how undercover agents drove into the United States from Canada and Mexico with nuclear material.

Technology touted

U.S. and Canadian customs officials, and representatives from the bridge company — owned by trucking magnate Manuel (Matty) Moroun — insist security is never compromised for commerce and say, in fact, the reverse is true: Better technology, improved facilities and better cooperation between business and government make the border more secure and efficient.

Perez noted that the bridge and Detroit-Windsor Tunnel now feature high-tech surveillance — invisible to travelers — such as radiation detectors and electronic prescreening programs. And customs agents in Detroit seized more than 5,000 pounds of drugs last year, an eightfold increase over the previous year, he said.

Dan Stamper, president of the bridge company, said it has spent millions to expand facilities since 9/11 and would never ask inspectors to "give up any of their security initiatives to move traffic faster."

Bridge inspectors concede that, even under the best of circumstances, they could not fully inspect every vehicle entering the United States without crippling trade. Thus, they say, it is not unusual for drivers to pass inspection with only a few questions asked.

What they object to, they say, are orders from supervisors to wave through long lines of cars and trucks with no questioning at all. Sometimes, inspectors say, they have been told to stop inspecting a particular vehicle to open more booths when traffic backs up.

"They call and say, 'You're holding us up too much.' And they always win that argument," said Charles Showalter, national president of one of the two unions representing U.S. Customs and Border Protection officers. He said when inspectors or the union object, Homeland Security officials "call it 'acceptable risk.' It's 'Hurry up, hurry up, hurry up, hurry up.' Nobody wants to slow down commerce."

Bridge inspectors say this can happen once a week or more at the Ambassador Bridge — one of two privately owned crossings on the U.S.-Canadian border. The other is a bridge in International Falls, Minn. However, they also say that inspectors are also pressured to speed traffic at government-owned crossings that are run by private companies.

The Detroit-Windsor Tunnel, for example, is run by a private company but owned by the City of Detroit on one side and Windsor on the other. Toll profits are shared with the cities.

Tolls collected at the Ambassador Bridge go to the bridge company, owned by Moroun of Grosse Pointe Shores.

Keeping the wait down

Since 9/11, traffic has declined about 80% at Detroit's border crossings.

To counter memories of long delays in the months after Sept. 11, the Detroit-Windsor Tunnel tries to keep waits under 20 minutes. Both the tunnel and bridge post wait times on their Web sites. During rush hour on an evening this week, bridge travel to and from Canada was under 15 minutes. The tunnel wait was under 5 minutes.

Neal Belitsky, executive vice president of the Detroit & Canada Tunnel Corp., which operates the tunnel, said he considers a 20-minute wait as "the outer limits for acceptability" for the roughly 29,000 vehicles that pass through daily.

"When we see traffic getting to that threshold, we will start calling customs and saying we need more lanes," he said. "That's a standard part of the business and we all do it."

He added there are times when customs denies his request and he backs off.

Danny Yan, spokesman for the Canadian Border Services Agency in Windsor, said, "We've had our challenges" with the bridge company, but "we never compromise security for trade. It's a balance."

Haste makes risk, some say

But inspectors say the rush to speed traffic has spawned practices — such as lane flushing — that put security at risk.

"Lane flushing happens all over the place, at every crossing," Showalter said. "The traffic backs up. The supervisor gets a call" from private border businesses. "They run an officer with a canine through the line of cars, and the officers on the primary inspection lanes are told not to ask questions."

About 9.4 million vehicles crossed the Ambassador in 2005, according to bridge officials. Collectively, the bridge, tunnel and a commercial train tunnel account for nearly a quarter of all U.S. trade with Canada, the bulk of it by trucks crossing the bridge. When trade is delayed at the border, Michigan's automobile-reliant economy suffers most, a recent Ontario Chamber of Commerce study shows. Automakers use a "just-in-time" delivery system that depends on parts crossing promptly. A delay of even a few hours can cost millions.

A difficult balance

Perez, the Detroit port director, said changes intended to balance trade and security issues mean that some vehicles don't have to be checked as frequently. The government's so-called trusted traveler programs, for instance, allow prescreened businesses to cross faster and with fewer inspections, though critics say terrorists could exploit such efforts.

Colleen Kelley, president of the National Treasury Employees Union, a union representing 150,000 federal workers, including inspectors, said that pressure to speed trade means "something's got to give." What usually gives, she said, is thorough inspection work.

"The balance of trade and security became a battle that we really lost to trade years ago," said Joseph King, a professor and terrorism expert at John Jay College of Criminal Justice in New York who worked for U.S. Customs for 37 years. "Customs has become an honor system where the industry controls it, and periodically the government comes in and monitors."

And yet, ask Moroun — whose company gets a reported $60 million annually in bridge revenue and spent $645,000 on lobbying and consulting over the past nine years — about inspectors and he says, "They're very independent."

On the other side of the river, Marie-Claire Coupal, a Canadian customs inspector and local union leader, said she doesn't feel very independent lately. Of Moroun, she says, "He calls the shots around here."

The bridge company's Stamper responds that his firm has a duty to keep trade moving. And he notes that a recent study rated the Ambassador's travel times "clearly superior" to six other crossings.

Sept. 11, Stamper said, was a wake-up call for him, too. After the attacks, heightened security led to 14-hour bridge delays. Choking the economy was, after all, a major goal of the terrorists, he said.

So the main threat Stamper sees is not a dirty bomb, or suicide bombers. "Our biggest threat is our own government's reaction to the border."

Contact TAMARA AUDI *at 313-222-6582 or audi@freepress.com.*

Tracking international trade

$113.67 billion worth of trade passed between Detroit and Windsor in 2004, the last year for which figures are available:

Source: Canadian Senate Report on National Security and Defense

NOVIA KNIGHT/Detroit Free Press

0126

Today's Trucking

SPECIAL REPORT: Ambassador OKs banned hazmat cargo on bridge

WINDSOR, Ont. -- The Ambassador Bridge is telling its bridge workers to wave through trucks carrying hazardous cargo in violation of a U.S. ban, according to a document obtained by The Windsor Star.

A copy of a permission letter, signed Dec. 6 by Detroit International Bridge Company general manager Dave Jolly, advises bridge employees that trucks carrying a corrosive material for General Chemical Corp. were free to cross the international link seven days per week.

The letter informs the bridge's toll collectors that "the bearer of this letter ... has permission to transport the commodity 'Alum' across The Ambassador Bridge."

The letter advises bridge employees that "this is a 'mild' corrosive and the truck will be placarded as such." Jolly's letter states passage is permitted seven days per week until March 1, 2006, "when an updated letter must be obtained."

Bridge spokesman Skip McMahon claimed last week he was unaware of any such shipments.

But a representative of another firm, Harold Marcus Ltd., a Bothwell-based transportation company, said it uses the crossing almost daily to import alum. The representative said the company did so with the bridge's blessing and said other companies are also granted permission to haul hazardous cargo across the bridge.

Corrosives, explosives, flammables and radioactive goods are all banned from the Ambassador Bridge under the U.S. federal government's national hazardous materials route registry. Alum, or aluminum sulfate, is a corrosive which can form sulfuric acid when mixed with water.

Windsor West MP Brian Masse is calling on federal Public Safety Minister Stockwell Day to investigate the reports that restricted hazardous materials are being permitted to cross the privately owned span.

"Should an accident occur it will have grave consequences to people, the environment, and trade. It is without doubt the status quo is completely unacceptable," Masse wrote last week in a letter demanding Ottawa investigate "this urgent matter."

Messages left Monday and Tuesday with spokesmen for the bridge were not returned. Likewise, Day's office did not respond to requests for comment.

The driver of a Harold Marcus tanker truckload of alum delivered Tuesday to Windsor's Lou Romano Water

0127

Reclamation Plant wouldn't say how he crossed the border. As part of a $1-million 2006 city contract with the Cambridge-based Kissner Group, such loads are sourced in the U.S.

The approved area border crossings for hazmat loads are the Windsor-Detroit truck ferry or Sarnia's Blue Water Bridge, but not the Ambassador, which is privately owned by Grosse Point, Mich. trucking mogul and powerbroker Matty Moroun.

Masse said he's heard from truckers who claim they simply remove their hazardous materials placards in order to cross the Ambassador, which is quicker and cheaper than the truck barge or Blue Water Bridge. In the past, the owners of the bridge have argued they can determine what should or shouldn't cross over their private property.

In fact, anyone, including law enforcement and bridge engineers are allowed on the bridge only at the owners' discretion. State police are generally banned from bridge property but enforce hazmat rules on access streets.

"Inconsistent policies and enforcement of hazmat regulations endangers us all by emboldening and encouraging those that wish to operate outside law. It will only lead to a bad result," says Gregg Ward, owner of the ferry service that takes hazmat trucks across the Detroit River.

A spokesperson for Canada Customs' workers union says there's little his members can do either. "It's pretty scary stuff. Some trucks can sneak by, and there's nothing Customs can do -- we can't enforce that law," said Marie-Claire Coupal, Windsor branch president for the Customs Excise Union.

Hazardous goods shipments on local roads are the responsibility of the Ontario Ministry of Transportation (MTO), but deciding what's allowed onto the bridge from the Canadian side is left to the bridge's owners.

"Although it is not an offence to transport dangerous goods across the bridge, the bridge authority prohibits access to trucks carrying hazardous material," MTO spokeswoman Emna Dhahak stated in an e-mailed response to questions by The Star.

Masse said it's "complete hypocrisy" for Canada not to have the same safety regulations in place as the American authorities have on their side of the Ambassador. Allowing the bridge company to issue special permission to some carriers of hazardous materials "shows how lax we are ... it's why I'm asking for a full investigation."

An interim report issued last summer in Ottawa by the Senate Security and Defence Committee sounded an ominous warning of how fragile the most important commercial border link is between Canada and the U.S.

"If somebody really wanted to tear into Canada's political and economic future and wound the Americans at the same time, an optimal target might well be the Ambassador Bridge in Windsor," stated the report, entitled Borderline Insecure.

The report also make several blunt recommendations to the federal government -- addressing everything from a new Windsor-Detroit bridge crossing; reverse customs clearance, armed Canada Customs inspectors.

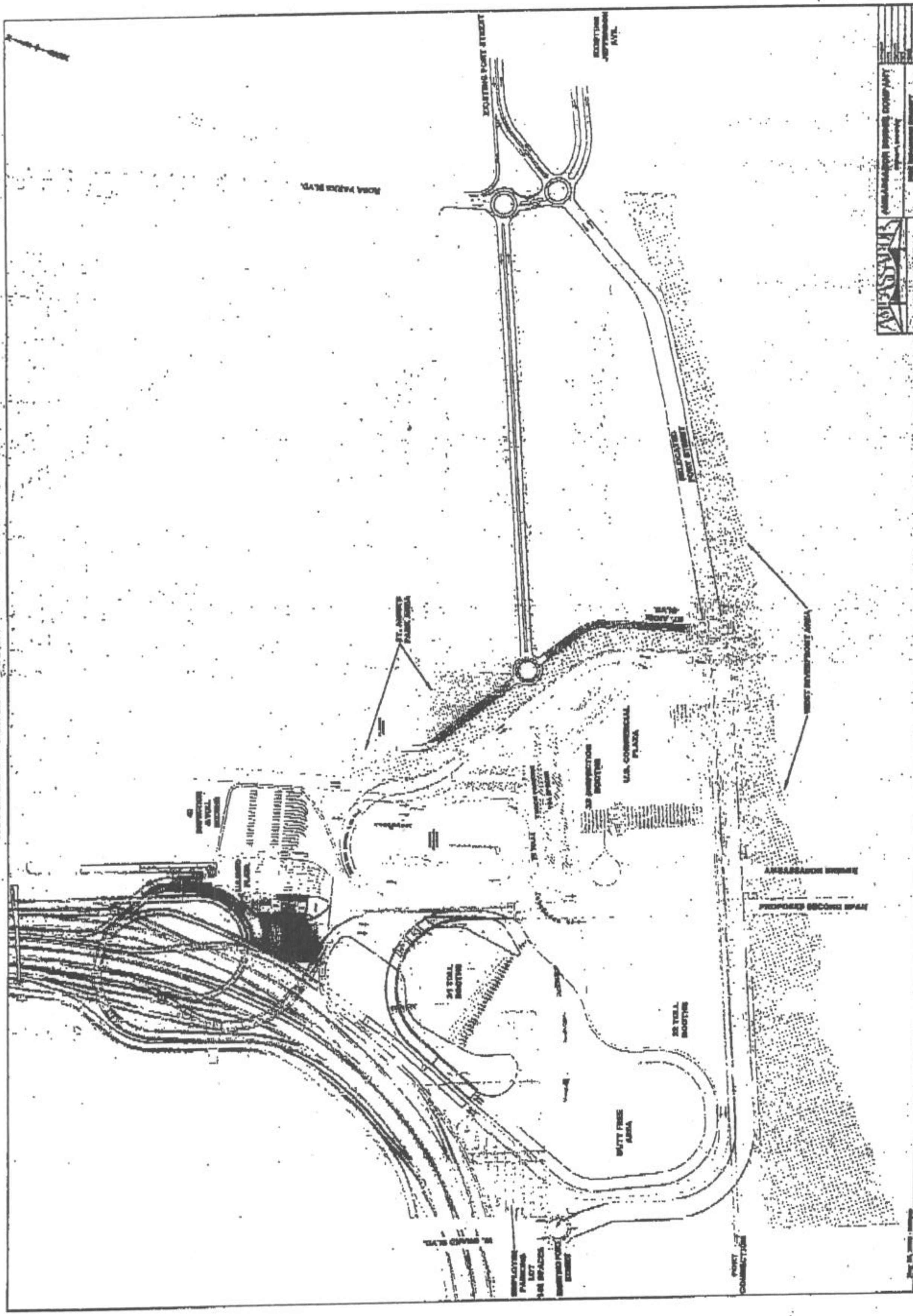
It also dedicates an entire chapter to Windsor-Detroit -- frequently referred to as the world's busiest trade gateway. The committee urged governments on both sides of the border to expedite another bridge crossing in order to create much-needed redundancy at the border location.

-- Files reprinted with permission from the Windsor Star

0129

ATTACHMENT C

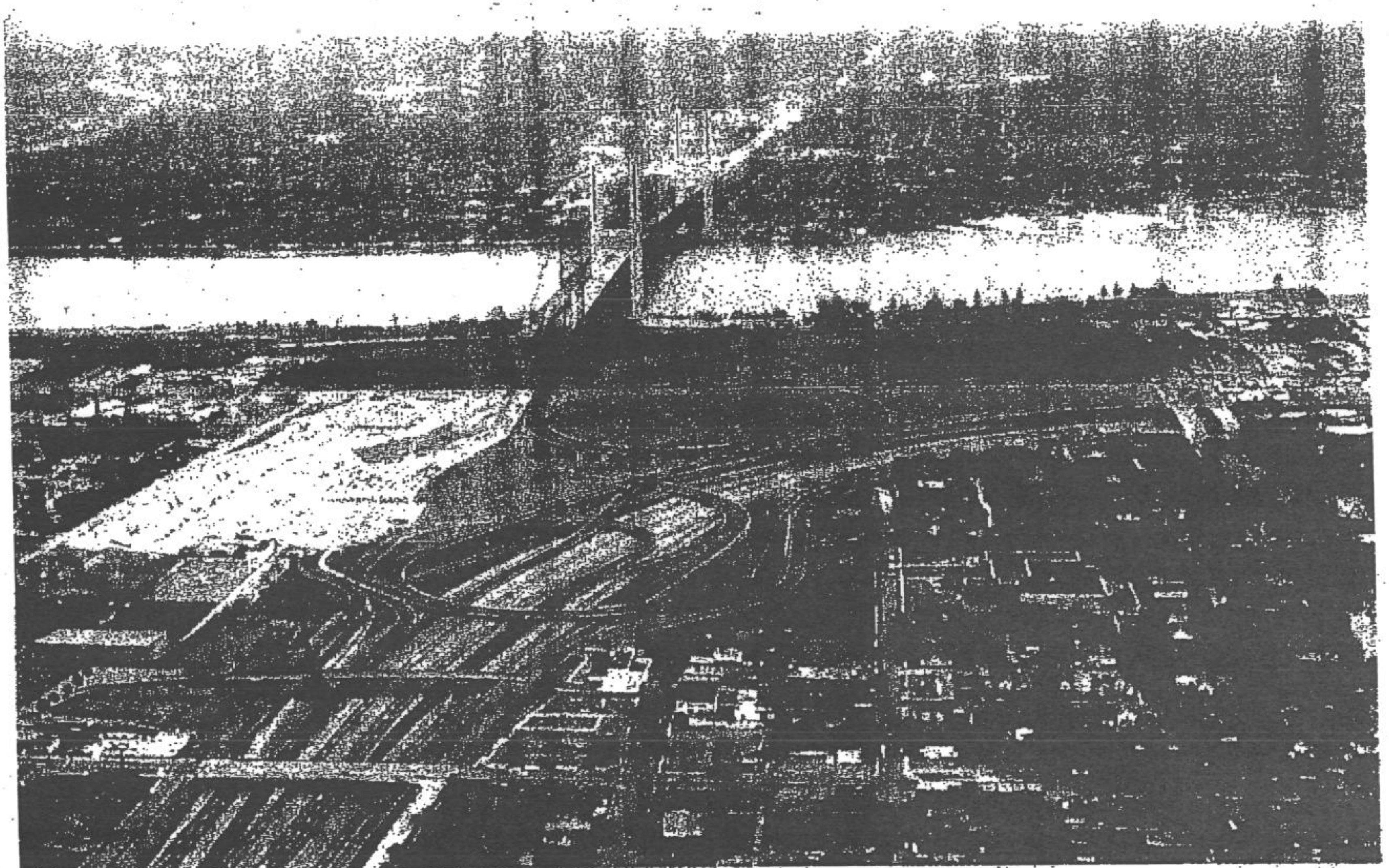
INTERNATIONAL CENTER SCHEDULED OPENING 2009



AMBASSADOR

AMBASSADOR BRIDGE

Master Plan 2011



2810 West Vernor Highway
Detroit, MI 48216
ph 313.967.9898
f 313.967.9903

Mexicantown Community Development Corporation

Fax

To: [redacted]		**From:** [redacted]	
Fax: 216 902-6088		**Pages:** 23 (including cover)	
Phone:		**Date:** 9/13/2006	
Re:		**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

• **Comments:**

0133

Community Development Corporation

September 13, 2006

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East North Street
Cleveland, Ohio 44199-2060

Re: DIBC Bridge Permit Application, Detroit, Michigan
Public Notice 09-03-06

Dear Mr[redacted]

I am pleased to submit these comments on behalf of Mexicantown Community Development Corporation with regard to the pending international bridge permit application filed by the Detroit International Bridge Company as described in USCG, Public Notice 09-03-06 (July 28, 2006).

Mexicantown Community Development Corporation is a community-based, economic development corporation that develops neighborhood serving retail facilities in the restaurant district, known as Mexicantown, located adjacent to the U.S. Customs Plaza at the Ambassador Bridge. Our mission is to advocate for and build a stronger, more prosperous future for the historic, vibrant and diverse Mexicantown community of Southwest Detroit through economic, business and cultural development. We are a member of Gateway Communities Development Collaborative and would like to not only take this opportunity to reiterate the comments submitted by Gateway Communities Development Collaborative on our behalf but would like to add to those comments.

Generally, speaking we have two major concerns with this permit request. First, the Detroit International Bridge Company has applied to the USCG for a permit to construct a new 6-lane international bridge to Canada. A new 6-lane international bridge will have significant impacts on the human environment here in Mexicantown. Therefore, a full environmental impact statement is required as part of the U.S. Coast Guard's consideration of the permit request. Secondly, the Detroit River International Crossing project is currently conducting a comprehensive, transparent and inclusive analysis regarding the optimal location in Southwest Detroit for additional border crossing capacity. **The DRIC analysis includes a full environmental impact statement and it has determined that the current site of the Ambassador Bridge is not an appropriate location for future investment in border**

2810 W. Vernor Hwy. Detroit, MI 48216 Phone: (313) 967-9898 Fax: (313) 967-9903

crossing infrastructure. Based on this conclusion, the DIBC permit request should be denied.

The proposal in question will have significant short and long term direct and indirect impacts on the human environment. Presently the demand for international vehicular crossings between the United States and Canada in the Detroit area is met by the Ambassador Bridge and the Detroit Windsor Tunnel. For trucks (and thus international trade) the Ambassador Bridge is the principal crossing because few trucks can or are permitted to use the tunnel. Assuming border crossing capacity is increased, border crossings will increase 180% over the next 30 years from 9.5 million crossings per year to 17.2 million crossings, with truck traffic increasing by an even greater rate, 230%. IBI Group for URS Canada, Detroit River International Crossing Study: Travel Demand Forecasts, Working Paper (Sept. 2005), Ex. 5-23.[1] (The DIBC's permit application at p. 15 grossly understates the current traffic growth estimates.)

Under the present base travel forecast prepared for the Detroit River International Crossing Study ("DRIC), the effective capacity (the point at which congestion is so significant that traffic conditions are "unstable") of the Ambassador Bridge is about 3,000 vehicles per hour in one direction and the absolute maximum capacity is about 3,500 vehicles per hour. DRIC, Travel Demand Forecasts. The base forecast travel demand indicates that demand will exceed the effective capacity by about 2011 and reach the absolute maximum capacity by 2020. Thereafter, unless there is a new bridge crossing, traffic will not be able to increase further. However, if additional capacity were available, the base travel forecast for 2035 is 4,500 vehicles per hour, which is 1,000 vehicles per hour above the Ambassador Bridge's maximum capacity.

When expressed on an annual basis, construction of additional river crossing capacity to cater to travel demand after 2020 will permit additional border crossings on the order of 1,780,000 annual auto trips and 2,220,000 annual semi truck trips (a total increase of 3,000,000 trips per year) that could not otherwise occur because of crossing capacity limitations. DRIC, Travel Demand Forecast, Ex. 5-23.

If the Ambassador Bridge is kept in service (and the permit application indicates it will), then a new six-lane bridge crossing will represent an approximate 150% increase in crossing capacity. Even if the Ambassador Bridge were taken out of service, a new bridge will represent a 50% increase in border crossing capacity.

In addition to the absolute increase in travel which an increase in crossing capacity will permit, adequate crossing capacity will reduce the time and cost associated with delays and congestion associated with crossing facilities otherwise operating at or near capacity. Given the forecast that Detroit/Windsor economic activity related to international trade will grow to the extent that international travel across the Detroit River is able to grow, increased

---

1 This DRIC report was included as Attachment A, "A collection of relevant DRIC reports" to the comments submitted on our behalf from Gateway Communities Development Collaborative.

0135

border crossing capacity beyond the capacity of the present bridge and tunnel portends major economic and community growth in Detroit and Windsor.

In this context, clearly the proposed action before the Coast Guard is not just the construction of a new six-lane bridge. Rather, the proposed action is more accurately described as "Undertake a new border crossing in order to increase border crossing capacity by 50% to 150% in the vicinity of Detroit in order to permit the additional growth of 3,000,000 trips per year by 2035 beyond current crossing capacity and to permit the expanded growth of Metropolitan Detroit/Windsor as an international trade center."

It is worthwhile considering the alternatives to issuing this specific bridge permit. The "no-action" alternative would be no new border crossing capacity in the Detroit area with the border crossing capacity being reached in the next 15 or so years. Clearly, if an action were proposed to cap crossing capacity so that no border crossing growth would occur after 2020, everyone would agree that would be a public policy decision with very significant impacts (largely adverse) on the southeast Michigan region. The decision to permit a new bridge to expand crossing capacity to permit border crossing growth after 2020 will have analogous impacts, mostly positive. In either case, the impacts are so significant that an EIS is required.

The fact that the proposed action is almost universally desired in order to encourage regional economic growth does not obviate NEPA's requirement that the significant effects of such an action on the human environment be fully considered before a bridge permit is granted. In fact, Mexicantown Community Development Corporation has continually advocated it's position that the best location for a new border crossing is somewhere other than the in the vicinity of the Ambassador Bridge.

USCG Needs To Incorporate DRIC Study Into Its Review

The "go-it-alone" DIBC permit application is in marked contrast to the Detroit River International Crossing Study being conducted by a bi-national partnership of transportation agencies (MDOT, FHWA, Transport Canada and the Ontario Minority of Transportation). As part of the DRIC study, the alternatives analyses have identified numerous significant impacts associated with alternative crossing locations including a bridge adjacent to the Ambassador Bridge. The DRIC Study is preparing a draft EIS to insure that such impacts are fully considered. Nearly everything being done in the DRIC Study is relevant to considering the impacts of the DIBC permit application. The DRIC study has also demonstrated that a new river crossing, wherever located, will have significant environmental impacts. **Furthermore, we urge the USCG to deny this permit application because is it inconsistent with conclusions of the DRIC study.**

Analysis of the Bridge Application on a Stand-Alone Basis will Violate the Prohibitions on Project Segmentations Under NEPA.

CEQ requires that proposed actions be considered in their entirety and that actions not be analyzed as discrete segments that could tend to minimize impacts and avoid preparation of an EIS.

0136

> "The range of actions that must be considered includes not only the project proposal but all connected and similar actions that could contribute to cumulative effects. Specifically, NEPA requires that all related actions be addressed in the same analysis. For example, the expansion of an airport runway that will increase the number of passengers traveling must address not only the effects of the runway itself, but also the expansion of the terminal and the extension of roadways to provide access to the expanded terminal. If there are similar actions planned in the area that will also add traffic or require roadway extensions (even though they are nonfederal), they must be addressed in the same analysis." CEQ, Considering Cumulative Effects Under the National Environmental Policy Act (January, 1997), pp. 1,2.

This permit application, as presented to USCG, clearly segments the overall action being proposed by the DIBC. The overall project is the expansion of the Ambassador Bridge crossing through i) expansion and improvements to the bridge plaza, ii) access improvements to state trunkline highways and the Canadian roadway system, and iii) construction of additional bridge capacity. Now, in addition to the new bridge capacity reflected in the DIBC's permit application, a number of other bridge-related projects are in the offing. For example, DIBC has begun to consider improvements to the plaza and access roads beyond what is included in the Gateway Project. (See Attachment C of Gateway Communities Development Collaborative letter.) We are informed that the General Services Administration has a master plan study underway to identify federal facility needs. That study may prompt expansion of the bridge plaza. The DRIC Study has identified the need to greatly expand the U.S. and Canadian bridge plazas to meet long-term traffic needs. None of these activities are reflected in the DIBC's permit application but USCG must take them into consideration in assessing whether the proposed action will have significant impacts.

We are also aware that FHWA has already expressed its concern that incremental consideration by federal agencies of DIBC's developing plans will lead to inappropriate segmentation of project impacts from the point of view of NEPA.

An Action Qualifies For A Categorical Exclusion Only If It Is So Identified in Adopted Agency Procedures And Major New Bridges Are Not So Identified.

In its notice of July 28, 2006 the Coast Guard has stated that it has made a tentative determination that the construction of a new 6-lane, mile-long international bridge should be granted a Categorical Exclusion from an analysis of its environmental impacts. USCG, Public Notice 09-03-06 (July 28, 2006). This initial determination is in error because i) the USCG's adopted list of actions which qualify as Categorical Exclusions does not include projects like a new 6-lane international bridge, and ii) the proposed action meets all of the criteria for the conduct of an environmental impact statement. Accordingly the correct determination should be that an environmental impact statement must be prepared before the Coast Guard grants or denies the pending permit request.

0137

American
Consulting Professionals of New York, PLLC
70 Niagara Square, Suite 410, Buffalo, NY 14202
Tel 716.362.1116 • Fax 716.362.1166
american@acp-ny.com • www.acp-ny.com

TELEPHONE CALL RECORD

Date: February 27, 2007 **Date Issued:** February 27, 2007
Time: 0945 hrs **Issued by:** [redacted]

Contact: [redacted] **Phone #:** 517-351-6326
Company: U.S. Fish and Wildlife Service, East Lansing, MI 48823-6316

Project: Ambassador Bridge Enhancement Project (ABEP)
Subject: Federally endangered species.

The following notes reflect our understanding of the discussions and decisions made during this telephone conversation. If you have any questions, additions or comments, please contact us at the above address. We will consider the record to be accurate unless written notice is received within 10 working days of the date issued.

1. This telephone call was made [redacted] and [redacted] to discuss federally endangered species impacts.
2. [redacted] is the threatened and endangered species point of contact for the East Lansing Field Office of the U.S. Fish and Wildlife Service (USFWS). We called to follow-up on the August 29, 2006 letter from USFWS to [redacted] Chief, Bridge Program Manager, U.S. Coast Guard, Cleveland, OH.
3. We advised that in our opinion the project will have no impact on the federally endangered northern riffleshell mussel because there will be no work or structures within the Detroit River, barges will only be used to deliver materials, and the closest structure (support tower) will be constructed upland over 100 feet from the river bank. We explained that erosion and sediment control systems will be used for the tower construction and no impacts from siltation are anticipated. Delivery barges must meet USCG marine safety standards.
4. [redacted] stated th[redacted] received a letter last week from the U.S. Coast Guard (USCG) that was sent pursuant to Section of the Endangered Species Act of 1973, as amended. The letter from the USCG stated that the ABEP would have no effect. We inquired about the USFWS response and [redacted] said there is no requirement for USFWS to respond or concur unless they disagree. [redacted] advised that they do not disagree with the USCG assessment.
5. In regard to the Michigan threatened and endangered species program [redacted] stated this is a program under state law and we should call [redacted] of MDNR to discuss their concerns.

0056

American Project #: 5049964_Detroit
Copies To: [redacted] File

F:\Marketing\Stationary Masters\LLC\Phone Record_LOL.doc

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpb)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
Ser. B-008/sms
January 30, 2007

[redacted]
Director – Water Division
U. S. Environmental Protection Agency – Region V
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Re: Detroit Ambassador Bridge Enhancement Project,
Detroit River, Detroit, Wayne County, Michigan

Dea[redacted]

This is in regard to the issuance of Section 401 Water Quality Certification (WQC) issued by Michigan Department of Environmental Quality for the construction of six additional lanes over the Detroit River adjacent to the existing Ambassador Bridge.

WQC certification was provided by permit dated January 17, 2007. Your office was included in our Public Notice mailing list for this project. The Public Notice was dated July 28, 2006 with an original comment expiration date of August 30, 2006, which was subsequently extended to September 5, 2006.

Please contact me at (216) 902-6085 with any questions. Thank you.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

[redacted]

From:	[redacted]
Sent:	Wednesday, June 07, 2006 10:54 AM
To:	[redacted]
Cc:	[redacted]
Subject:	Ambassador Bridge -- June 19 Meeting in DC

[redacted]-- As I informed your assistant, a meeting has been scheduled for the Ronald Reagan Building at 10 am on June 19 between my client, the Detroit International Bridge Company, and representatives of the CBP [redacted] and others who work with her), DHS Private Sector Offic[redacted] and likely a GSA representative. The discussion will focus on an update on developments concerning the planned new bridge span, as well as facilities issues.

We thought it appropriate to let you know about the meeting should you wish to attend. Please let me know if you or any of your colleagues might attend and I will pass along the room number as soon as I receive it.

Regards.[redacted]

[redacted] Direct Facsimile
[redacted] Central Facsimile
[redacted]

0033

U.S. Department of
Homeland Security

United States
Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-037/sms
April 5, 2006

[redacted]
Division Administrator
Federal Highway Administration – Michigan Division
315 West Allegan Street – Room 201
Lansing, Michigan 48933

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted] Thank you in advance for your attention to this matter.

Sincer[redacted]
Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Fish and Wildlife Service, East Lansing, Michigan
U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
Michigan Department of Environmental Quality – LWMD, Lansing, Michigan

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-040/sms
April 5, 2006

[redacted]
Michigan Department of Transportation
Bureau of Transportation Planning
P.O. Box 30050
Lansing, Michigan 48909

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contac[redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902[redacted]. Thank you in advance for your attention to this matter.

Sincerely,

[redacted]
Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Fish and Wildlife Service, East Lansing, Michigan
U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
U.S. Federal Highway Administration, Lansing, Michigan

COPY

U.S. Department of Homeland Security

United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-036/sms
April 5, 2006

International Joint Commission
Acting Secretary
U.S. Section
1250 23rd Street, NW – Suite 100
Washington, D.C. 20037

Dear Acting Secretary,

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted]. Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Fish and Wildlife Service, East Lansing, Michigan
U.S. Environmental Protection Agency, Chicago, Illinois
Federal Highway Administration, Lansing, Michigan
Michigan Department of Environmental Quality – LWMD, Lansing, Michigan

U.S. Department of Homeland Security

United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-035/sms
April 5, 2006

[redacted] Chief
NEPA Implementation Section
U.S. Environmental Protection Agency – Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted] Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Fish and Wildlife Service, East Lansing, Michigan
International Joint Commission, Washington, D.C.
Federal Highway Administration, Lansing, Michigan
Michigan Department of Environmental Quality – LWMD, Lansing, Michigan

U.S. Department of Homeland Security

United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-032/sms
April 5, 2006

[redacted]
Michigan Department of Environmental Quality - LWMD
P.O. Box 30458
Lansing, Michigan 48909-7958

Dea[redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902[redacted] Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Environmental Protection Agency, Chicago, Illinois
U.S. Fish and Wildlife Service, East Lansing, Michigan
International Joint Commission, Washington, D.C.
Federal Highway Administration, Lansing, Michigan

COPY

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-039/sms
April 5, 2006

[redacted]
Michigan Department of Natural Resources
Wildlife Division
P.O. Box 30180
Lansing, Michigan 48909

De[redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted] Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
U.S. Federal Highway Administration, Lansing, Michigan
U.S. Fish and Wildlife Service, East Lansing, Michigan

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-038/sms
April 5, 2006

[redacted]
State Historical Preservation Officer
Michigan Historical Center
P.O. Box 30740
702 West Kalamazoo Street
Lansing, Michigan 48909-8240

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted]. Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
U.S. Federal Highway Administration, Lansing, Michigan
U.S. Fish and Wildlife Service, East Lansing, Michigan

U.S. Department of
Homeland Security

United States
Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-042/sms
April 5, 2006

[redacted]
City of Detroit – Historic District Commission
65 Cadillac Square – Suite 1300
Detroit, Michigan 48226

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted]. Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Fish and Wildlife Service, East Lansing, Michigan
U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
U.S. Federal Highway Administration, Lansing, Michigan

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-033/sms
April 5, 2006

[redacted]
United States Fish and Wildlife Service
East Lansing Field Office
2651Coolidge Road – Suite 101
East Lansing, Michigan 48823

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted] Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
U.S. Federal Highway Administration, Lansing, Michigan
Southeast Michigan Council of Governments, Detroit, Michigan

0067

COPY

U.S. Department of Homeland Security
United States Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street, Room 2019
Cleveland, OH 44199-2060

Phone: (216) 902-6084
FAX: (216) 902-6088

16590
B-041/sms
April 5, 2006

[redacted]
Director, Transportation Programs
Southeast Michigan Council of Governments
535 Griswold – Suite 300
Detroit, Michigan 48226

Dear [redacted]

I am writing to extend an invitation to you or your representative to attend a meeting to discuss and evaluate a proposal to construct a companion structure to the Ambassador Bridge over Detroit River. A proposal has been submitted to the Coast Guard from the Detroit International Bridge Company in Detroit and your agency may have review or permitting requirements associated with this proposed project. Your attendance will help the Coast Guard, a federal permitting agency, to determine potential environmental impacts related to the proposed project.

The meeting will take place at 10:00 a.m. on Thursday, May 4, 2006, at the CENTRA Headquarters in Warren, Michigan. The address is: 12225 Stephens Road, Warren, Michigan, 48089. A location map is attached.

Please contact [redacted] of this staff to advise whether you or your representative can attend this meeting. He may be reached by calling (216) 902-[redacted] Thank you in advance for your attention to this matter.

Sincerely,

[redacted]

Chief, Bridge Branch
By direction of Commander,
Ninth Coast Guard District

Copy: U.S. Fish and Wildlife Service, East Lansing, Michigan
U.S. Environmental Protection Agency, Chicago, Illinois
International Joint Commission, Washington, D.C.
U.S. Federal Highway Administration, Lansing, Michigan

Public Comment Letters to Coast Guard Public Notice 09-03-06

CG response letters

MICHIGAN Environmental Council

FAX COVER SHEET

DATE: 9/14/06 [redacted]

FROM: [redacted]

TO: [redacted]

PHONE: 517/487-9539

FAX: 216-902-6088

FAX: 517/487-9541

RE: DIBC permit

Pages (including cover sheet): 3

Message:

0090

Michigan Environmental Council, A Coali[...]an's People and the Environment
119 Pere Marquette Dr. • Suite 2A • Lansing, MI 48912 • (517) 487-9539 • Fax (517) 487-9541 • mec@voyager.net
http://www.mecprotects.org

MICHIGAN Environmental Council

Sept 14, 2006

[redacted]
Chief Bridge Branch
US Coast Guard, Ninth District
1240 E. Ninth Street
Cleveland, OH 44199-2060

Dear [redacted]

First we would like to thank the Coast Guard for fulfilling the public's request for an extension on the comment period of this particular permit. Michigan Environmental Council represents a coalition of 72 environmental and public health organizations from across the state of Michigan with over 200,000 members. For over 26 years, we have provided a voice for the environment in the state's capitol. Our organization develops public policy, educates elected officials and the public on statewide environmental issues. The Michigan Environmental Council is concerned that the proposed second span of the Ambassador Bridge will pose serious environmental and public threats that were not evaluated in the previous EA of the Gateway project. Therefore in order to adequately assess these impacts, a full EIS must be conducted and the project should not be eligible for a Categorical Exclusion under the National Environmental Protection Act.

There are many problems that the Michigan Environmental Council encounters upon review of the DIBC permit request for Categorical Exclusion. First, there seems to be a contradiction on the segmentation of this project from the old Gateway project. One part of document refers to it as separate from Gateway and other refers to it as part of Gateway. It seems as though DIBC acknowledges plans with Gateway project where convenient however letters and documentation from organizations in the Gateway project contend this particular second span project was not discussed with them.
Therefore the existing and ongoing enhancements were planned in relation to capacity issues of the existing bridge and are not being constructed with the intentions of the second span. Since these plans were not disclosed in the original Gateway project, the EA did not adequately address a scenario of a second span.
DIBC claims there will be not cumulative impacts. Michigan Environmental Council finds that since there are already ongoing plaza expansions and industries in addition to the construction of this second span that may have cumulative impacts over time. For example, DIBC has no definite plans outlined on storm water management which is a foreseeable cumulative impact of simultaneous construction of plazas and the bridge. In addition the existing industries and increased truck traffic that are predicted in this document and others may also cause foreseeable cumulative impacts on air quality in this area. 007

The DIBC states that this proposed project would not "decrease air quality". Michigan Environmental Council finds that there are air quality concerns with this project. The area in which the project is proposed is in non-attainment and although DIBC uses information for seven county regions it does not address the concern of the area already

Michigan Environmental Council. A Coalition of Organizations Protecting Michigan's People and the Environment
119 Pere Marquette Dr. • Suite 2A • Lansing, MI 48912 • (517) 487-9539 • Fax (517) 487-9541 • mec@voyager.net
http://www.mecprotects.org

MICHIGAN
Environmental
Council

as a hotspot PM2.5. In addition the i[illegible] they use from the SEMCOG analysis does not include projections of their proposed second span. This conformity analysis is required for all major proje[illegible]d air quality concerns of a proposed span could increase the non-attainment status of this region and in particular cause health problems from of the local community from poor air quality. There is already air quality monitors placed on schools in the vicinity of the existing bridge showing increased levels of PM 2.5, a pollutant responsible for severe asthma attacks. DIBC shows know plan or acknowledgement of addressing these issues in its discussion of air quality.

Although DIBC contends air quality will not change because they are only proposing increased number of lanes, it is not clear whether the enhancement of the plazas is considering the proposed second span in its construction of the plazas. This can create a potential problem since DIBC states that this project is not part of the ongoing enhancement thus creating truck backup with increased number of traffic at either end and therefore increased idling from un-coordinated efforts of these simultaneous projects.

In addition, the Coast Guard is required federally to conduct an environmental justice review of this project under the Federal Environmental Justice Executive Order. The communities surrounding the Detroit side plaza are predominantly low-income African-American and Hispanic communities. These communities have already been disenfranchised by the existing DIBC projects and existing industries in the area therefore an Environmental Justice Analysis under NEPA must be conducted.

There have been a number of public outcries to the overall DIBC activities of the existing Ambassador Bridge. This new proposal of a second span has generated outrage in many of the local communities. Local newspapers including Metro Times, Detroit News and other local media have highlighted in general the public contention around the existing and all proposed border crossings; in particular articles featured the distrust of the local community for over 10 years with the DIBC.

The conclusion of the Michigan Environmental Council based on documents provided is that this project is a separate project not evaluated under the original Gateway EA and therefore creates segmentation issues, there are significant air quality and environmental justice impacts that need to be evaluated in this proposed project and that this project is a public controversy that warrants additional public participation. The Michigan Environmental Council urges the US Coast Guard to not consider the DIBC proposal for Categorical Exclusion and conduct a full EIS.

Thank you for your time and cooperation.

Sincerely,

0072

[redacted]

Environmental Campaign Coordinator
Michigan Environmental Council

Michigan Environmental Council, A Coalition of Organizations Protecting Michigan's People and the Environment
119 Pere Marquette Dr. • Suite 2A • Lansing, MI 48912 • (517) 487-9539 • Fax (517) 487-9541 • mec@voyager.net
http://www.mecprotects.org

Clark Park Coalition

1130 Clark Street, Detroit, Michigan 48209

Rec'd
5 Sep 06

August 28, 2006

Office of Commander (dpw-3)
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060

RE: Public Notice 09-03-06 Dated July 28, 2006 Construction of a second (twin) fixed Highway bridge adjacent to, and immediately south of, the existing Ambassador Bridge

Dear Commander (dpw-3),

I am writing on behalf of the Clark Park Coalition regarding the referenced Public Notice above pertaining to an application for approval of location and plans for construction of a second (twin) fixed highway bridge over a navigable waterway of the United States adjacent to the existing Ambassador Bridge and submitted by the agent of the Detroit International Bridge Company (DIBC).

The Clark Park Coalition requests that the Coast Guard fully evaluate the environmental impacts, short and long term of the local host communities and regional areas regarding the complexities and impacts of this application for approval.

For myriad of serious reasons that exist within our Southwest Detroit community, the Coalition believes that the National Environmental Policy Act (NEPA), the Federal Highway Administration (FHWA) and the Michigan Department of Transportation (MDOT) needs to have a comprehensive environmental review regarding the DIBC Application for Approval. It would seem imperative that DIBC would be required to conduct a full Environmental Impact Statement (EIS) and has provided the Coast Guard with no justification for the preliminary finding that the project will qualify for a categorical exclusion for the NEPA's requirement that an environmental analysis be performed. As you are aware, the Detroit River International Crossing (DRIC) Study has been well underway to study the most appropriate location for another border crossing including all of the international governmental agencies involvement including the Southwest Detroit community. The DRIC study and it's process has been conducted quite thoroughly thus far and allowing the community to be fully engaged.

Unfortunately, the DIBC does not operate in this type of open public process and now all of a sudden since the DRIC study did not prefer the DIBC's "twinning" of their bridge proposal, DIBC has now decided to make the case that their existing bridge is obsolete and a "replacement" bridge must built. DIBC has repeatedly published full page color advertising in our city newspapers regarding their plans to build new expanded toll booth plaza and yet within their application permit to MDEQ regarding their "bridge enhancement / bridge replacement" they state something quite to the contrary "no plaza expansion needed". Such conflicting messages to the public, to the State of Michigan, to the City, to our border country, to our federal government agencies and to the surrounding community.

The Clark Park Coalition believes the bullet points below are additional concerns that the Coast Guard must take into serious consideration:

Comprehensive environmental review

- The proposed DICB Project would in fact impact minority and low income populations that happen to be located in the geographical area of Southwest Detroit where this

- There is an on-going bi-national process that has been studying the need for additional border infrastructure capacity. That study, called the Detroit River International Crossing Study, considered the addition of a second span to the Ambassador Bridge crossing and rejected it because of the impacts on the Canadian side of the project. Nevertheless, DIBC is free to pursue construction of a second span outside of this process. However, all state and federal agencies responsible for issuing permits should agree to a moratorium on issuing all new permits related to new or expanded border crossings along the Detroit River until the DRIC study is complete. The impacts of new border crossings should not be studied independently of each other, given their close proximity.

- Given the concentration of transportation uses and proposed transportation projects in Southwest Detroit, a comprehensive transportation study is needed to truly understand the impacts of any transportation project in Southwest Detroit. No permits should be approved until that study is undertaken and completed.

- Six-lane bridge is an expansion of capacity which should have full environmental impact review, even if the existing bridge is never put back into service.

- Should the original bridge be repaired after the new bridge constructed, this project represents an *unprecedented* expansion of border capacity at the Detroit-Windsor border—and one that was rejected in the bi-national study conducted to address border capacity at the Detroit-Windsor border.

- The public deserves to be afforded the greatest protections when it comes to the quality of their community, their health and the environment. Unbridled expansion of private transportation infrastructure represents an environmental justice issue. How will community concerns like economic development, air quality, etc be addressed by this project?

- There should be an air quality analysis conducted, particularly since the expansion of the bridge will likely lead to increased truck traffic.

- Some analysis of health impacts must be undertaken. This is particularly true given the importance being placed on protecting the natural environmental. The health of humans is just as important as the health of wildlife and plant life.

Project specifications

Must independently confirm that a new bridge is needed

- Before approving this permit, the Coast Guard should require an independent analysis of the condition of the original bridge. The permit application is premised on the notion that the existing bridge is unsafe and must be repaired or shut down. Before the environment is disturbed by construction of a new crossing, we should have an independent analysis of the condition of the existing bridge.

- In addition, the claim that the existing bridge would not be put into service without "all necessary approvals" should be substantiated with a listing of the required approvals.

- While the DIBC portrays the purpose of the Gateway project as being to build a second span for the Ambassador Bridge, the actual purpose of the Gateway project is to directly tie the bridge into the freeway system in order to improve transportation movements from the bridge to the freeway system and to take truck traffic off of local roads. The Gateway project was *designed* to accommodate a second span if one were built sometime in the future, not to enable a second span to be built. The Environmental Assessment for the Gateway project did not study the impacts to the Detroit River, the environment, or the community of a second span. It studied the impacts related to the ramps and other infrastructure needed to connect the plaza to the freeway system, with or without expanded border capacity at that location.

Must evaluate whether an expanded plaza will be required

- While DIBC says that no increase in plaza size is necessary, they have provided no evidence that their current facility or even the slightly expanded facility created through the Gateway project will be able to accommodate future truck traffic should a new 6-lane bridge be built or the existing bridge rehabilitated and both bridges functioning. An expanded plaza would severely impact the growing residential community and commercial area that has already seen encroachment by the bridge compound.

- DIBC has publicly touted its proposal for a new plaza facility going south of the existing plaza toward the river. This proposal has been made to Detroit City Council, the City of Detroit Mayor's office, various meetings at the DIBC offices, and to MDOT. MDOT is currently beginning the process of studying the relocation of Fort Street as it relates to this proposal. The permit to build a second span cannot be issued without an environmental review of this proposal. The environmental consequences of having a truck facility so close to the Detroit River must be studied to ensure that run-off and other contaminants does not pollute the environment.

Must protect the river and community from hazardous materials spills

- In addition, the permit does not speak to the treatment of hazardous materials on the new bridge. Given the existing bridge lacks the capacity to safely handle any hazardous material spills, the new bridge must have protections and safeguards to protect the Detroit River and the surrounding community from hazardous spills that might occur on the bridge. Recent media reports have revealed that DIBC engages in "lane-flushing," the practice of allowing trucks through without inspection, and have even allowed trucks known to be carrying hazardous materials, which are prohibited by federal statute from crossing the bridge, to cross. There must be a thorough understanding of the protections that will be put in place to ensure that hazardous materials re not a threat to the environment or community.

More information needed

- In fact the information provided in the permit application is minimal in tèrms of design, construction, and operation. More detailed information regarding site plans, construction phasing, construction methods, homeland security safeguards and other safety features must be provided before a permit can be issued.

Should be designed with true community input

- There has been limited community involvement in the design of this new bridge.

- The bridge should be designed to be a signature structure for the city, a symbol for the area.

- There should be consideration of the West Riverfront Conservancy plans to bring public access to the riverfront.

Bridge oversight and long-term community impact

- There should be open discussion and debate regarding the most appropriate governance structure for the next border crossing. While the DIBC proposes to build a new span, there should be public oversight over the crossing given the long-term implications of this expanded infrastructure. The community has no venue for having their complaints heard and a new bridge will only exacerbate this problem.

- Should an additional border crossing be pursued for construction anywhere along the Detroit River, there must be a Community Benefits Agreement between members of the host community and the project sponsors.

Thank you your completely thorough and comprehensive review the this complex issue and the request of approval of the application before you from DIBC. The Coalition has request that the Coast Guard "deny" approval of constructing a twin structure in our international waterway. The DIBC twin border crossing at their proposed location in our Detroit River way is redundant, a homeland security issue, an environmental justice issue for the residential, small business and tourist host community including an extreme burden on our low income, minority community.

Sincerely,

[redacted]

President [redacted]

8-02-06

Mr [redacted]
Bridge Program Manager,
About Second (twin) bridge
Yes it would be very bad
for us, who live just across
the alley way from present bridge.
The fumes from trucks is
damaging to our health now, So
a second one would be double
trouble.
Thanks,
Home Owner
[redacted]

0078

GRAND LODGE

Executive Chairman

Grand Lodge
International Ship Masters' Association

Navigation, Engineering and Legislative Committee
4767 Elizabeth Lane, Brooklyn, Ohio 44144
Tel: (216) 661-4378; Fax: (216) 551-4770
Email: rgasior@ameritech.net

6 August 2006

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 E. Ninth Street
Cleveland. Ohio 44199

RE: Public Notice 09-03-06, Ambassador Bridge (twin) permit application

Dear [redacted]

The International Ship Masters' Association has no objection to the issuance of a Coast Guard permit approving the location and plans of the proposed bridge as depicted in the Public Notice.

We note that on Sheet 3 of 4 the vertical clearance is measured from MLW El, 572.3' which is Low Water Datum for Lake St. Clair. It is suggested that, if constructed, the owner provide the actual vertical clearance at the bridge site referring to the sloping surface of the river in accordance with the notes published on Detroit River Chart #14848 and in Coast Pilot No.6.

The opportunity review and comment on this project is appreciated.

Sincerely,

[redacted]

[redacted] Chairman
Navigation, Engineering and Legislative Committee

SIERRA CLUB
FOUNDED 1892

August 25, 2006

-- via fax --

[redacted]
Bridge Program Manager
U.S. Department of Homeland Security
United States Coast Guard
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, OH 44199-2060

Dear [redacted]

I am writing on behalf of the Sierra Club to request an extension of the public comment period and a local public hearing for the permit application by the Detroit International Bridge Company for a second (twin) bridge adjacent to the Ambassador Bridge in Detroit.

This permit request only just came to our attention and to the attention of a number of local residents and groups who will be directly affected by expanded bridge development in the vicinity of the existing Ambassador Bridge. So that we have adequate time to provide comments regarding such issues as the impact of the proposed bridge project on minority and low-income communities and the environmental impacts of the proposed bridge project and the resulting increase in vehicular traffic, we are requesting an extension of the comment period.

We are also requesting a local public hearing to provide opportunity for affected residents, including Sierra Club members, to provide their comments directly to the Coast Guard.

I realize that this request is coming to you late in the comment period, but I would request that you notify me of a decision regarding this request by Monday, August 28, 2006.

I would also ask you to identify for me the categories the USCG is citing as a basis for the tentative determination of categorical exclusion for the purposes of the National Environmental Protection Act (NEPA).

Thank you for your attention to this request.

Sincerely,

0080

[redacted]
Midwest Region Staff Director

Midwest Office – 400 West Front Street, Suite 204 – Traverse City, MI 49684
231.922.2201 (p) – 231.922.2909 (f) – [redacted]

Southwest Detroit Environmental Vision
P.O. Box 9400
Detroit, MI 48209
Phone: (313) 842-1961
FAX: (313) 842-2158
Email: [redacted]

August 22, 2006

[redacted]
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

Dear [redacted]

On behalf of Southwest Detroit Environmental Vision (SDEV), a non-profit environmental organization representing residents, business and industry in Southwest Detroit, I am writing to express community concerns about the permit application filed by the Detroit International Bridge Company (DIBC) to expand/enhance its operations here in Detroit.

I feel strongly that the proposal to add six lanes to the existing international crossing exceeds the scope of whatever environmental work was done for the Gateway transit study and clearly necessitates a full environmental review with attention directed to all aspects of DIBC's expansion plans. This size and complexity of the project and the many jurisdictions involved indicate the need to proceed under the NEPA process.

In view of the MDOT Detroit River International Crossing study and ongoing environmental issues at the Ambassador Bridge, I feel that a thorough and open public review of this permit request must be conducted. This particular permit cannot be evaluated outside the context of the numerous other initiatives taking place in the border area at this time. Public safety, national security, navigation, and air and water quality impacts are just some of the areas that require thoughtful review and discussion.

Transportation infrastructure improvements undertaken by units of government receive intense public scrutiny before they can proceed. A permit request for a new international border crossing coming from a private entity must be scrutinized at the same level. I request that the comment period for the permit be extended and that a public hearing for all affected stakeholders be scheduled.

Yours truly,

[redacted]

Executive Director

Southwest Detroit Environmental Vision

[redacted] [redacted]

Fax Transmittal Form

U S Coast Guard

To: [redacted]

Phone number:

Fax number:

[redacted]

From: Southwest Det. Envir. Vision

Date sent: 8/24/2006

Number of pages including cover page: 2

0032

SOUTHWEST DETROIT
BUSINESS ASSOCIATION

September 14, 2006

[redacted]
U.S. Coast Guard
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199

RE: Second Fixed Highway Bridge Adjacent to Ambassador Bridge

Dear [redacted]

I am writing on behalf of the Southwest Detroit Business Association regarding the permit application Due to the complexities, controversy, and potential impacts of this permit application, we respectfully request that the U.S. Coast Guard conduct a public hearing within the host communities.

We are requesting that the U.S. Coast Guard provide a detailed explanation of the basis for the preliminary determination that the proposed project is categorically exempted under the National Environmental Policy Act (NEPA). The Federal Highway Administration, the lead agency, has clearly stated to the Environmental Protection Agency that the environmental assessment completed for the Ambassador Bridge Gateway Project did not review and report on the impacts of a second, twin, or companion bridge structure, including plaza and connections, of the Ambassador Bridge. The Gateway Project environmental assessment was completed over ten years ago in the mid- 1990s and is not entirely applicable to the context at the Ambassador Bridge crossing today. The proposed "Enhancement Project" is not accurately named in that the project will result in a second bridge located adjacent to the existing Ambassador Bridge adding significant border crossing and transportation infrastructure. The construction of a second bridge would increase international border traffic capacity by 50 -150 percent. The impacts are vast and significant and require a full Environmental Impact Statement.

The optimal location for expanded international border crossing capacity within the Detroit and Windsor area is currently being evaluated through the Detroit River International Crossing (DRIC) Study. The GCDC has been actively engaged in discussions and plans regarding the international border and several member organizations serve on the DRIC Local Advisory Council. At the inception of the DRIC Study, the GCDC advocated for a moratorium on governmental actions that would promote any border crossing option until the study is completed. While the DIBC may pursue its plans independent of the DRIC Study, the proper evaluation of the permit application requires review within the context of a bi-national, multi-agency analysis of expanded border crossing capacity in the Detroit and Windsor area. *The DRIC Study evaluated the feasibility and impacts of expanded capacity at the Ambassador Bridge and concluded that it is not feasible and that there are viable alternatives.* The U.S. Guard should consult the data and information gleaned through the DRIC Study process.

0083

GCDC understands that there are outstanding questions regarding the process, requirements, and timeline for processing local, state, and federal governmental permits for expanded and new

7752 West Vernor Highway, Detroit, MI 48209-1516
T313 842 0986 F313 842 6350 WWW.SOUTHWESTDETROIT.COM

international border crossing capacity external to the DRIC Study. The U.S. Coast Guard should conclusively ascertain that the permit application must be processed prior to completion of the DRIC Study. The GCDC would appreciate reviewing any correspondence on this matter.

The GCDC is particularly concerned that the ABEP permit application improperly and inadequately describes the full scope of the expansion that could occur at the Ambassador Bridge location and thereby segments the proposed project disallowable under NEPA. As already indicated, the project consists of the construction of a second bridge – it is not a modification or an enhancement of the existing bridge or plazas. In fact, there are no modifications, enhancements, or other changes to the existing bridge and the application states that there are no modifications to the plazas :

> "This project consists of additional lanes over the Detroit River to the west of the existing span and connecting directly into the existing plazas in both Windsor and Detroit without the need for modification."

However, during the DIBC's presentation to the Detroit City Council on September 14, 2006, they clearly stated their intention to initiate plaza expansions and a relocation of Fort Street to accommodate existing and future traffic processing demands. The DIBC contends that these endeavors are separate and distinct from the construction on a second bridge and therefore are not including these activities in their proposed Enhancement Project. NEPA is clear that cumulative and future contemplated actions are collectively assessed and reported.

Additionally, the DIBC has repeatedly and publicly announced their intention to construct an "international plaza" that would accommodate joint United States and Canadian customs inspections requiring a substantial expansion of the existing U.S. plaza. This international plaza is described as consisting of between 100 to 200 toll booths. The DIBC has presented these plans to local, state, and federal public officials and has had these plans depicted in advertisements published in the *Detroit News, Detroit Free Press,* and *Crain's Detroit Business*. In October, 2005 a proposal to sell the Detroit interest in the Detroit-Windsor Tunnel to a DIBC-affiliated company including construction of a joint customs facility and connector road between the Ambassador Bridge and the Detroit-Windsor tunnel, was presented to the Detroit City Council and represented in a document entitled "Binding Agreement." Finally, the DIBC has submitted a request to the Michigan Department of Transportation requesting that Fort Street be reconfigured and relocated to the south to accommodate their expansion plans. Collectively, these actions create a compelling case that the DIBC is misrepresenting the full scope of their intended project and that the permit application segments the project in violation of the National Environmental Protection Act.

In March and May 2006, the joint Michigan Senate and House of Representatives Transportation Committee held four hearings on the DRIC Study. The DIBC testified at each of these hearings directly and through their consultants. The transcripts of these hearings should be considered in the evaluation of the permit application as there were various, and conflicting, representations made by or on behalf of the DIBC with respect to the need and timing of expanded international border crossing capacity, whether state and federal funding would be requested for their border crossing projects, and the capacity of existing plaza facilities to accommodate increased traffic. Today, the DIBC testified that their Enhancement Project will not increase capacity. Traffic infrastructure is one variable that strongly predicts traffic levels. The second proposed bridge will be six lanes with the capacity to go to eight lanes. The existing Ambassador Bridge is four lanes. There is no firm plan for the future of the existing Ambassador Bridge. Today, the DIBC testified that the

Ambassador Bridge would eventually be taken out of service. In their permit application the future of the Ambassador Bridge is predicated on the economic outcomes of leaving it in service or taking it out. They further state that once the second bridge is constructed, the Ambassador Bridge would provide desired redundancy in crossing capacity. The future of the existing Ambassador Bridge under the DIBC's Enhancement Project is anything but clear and therefore should be clarified before a processing the permit application.

The General Services Administration (GSA) is currently undertaking a Master Planning analysis for the Ambassador Bridge inspection facility, expected to be complete in September. The outcome of this planning process may change the location, size, and operation of the plaza facility and therefore the impacts of the project. It would be prudent to delay evaluation of the permit application until the GSA completes its Master Plan.

Under Item 2 – Project Description, the following is stated:

> "The proposed bridge will run roughly parallel to the existing Ambassador Bridge and will tie directly into the existing plaza areas without need for plaza configuration modifications beyond those already approved under the Gateway project approved by FHWA and undertaken by MDOT and DIBC. Once the new structure is completed, the exiting Ambassador Bridge will be taken out of service in order to evaluate and make repairs deemed necessary and economically feasible. Upon completion of the anticipated repairs, the existing bridge will be used to provide redundancy and backup support when necessary to ensure the free flow of traffic at all times. The existing bridge would not be placed back into service before all necessary approvals are obtained."

The Environmental Assessment (EA) conducted for the Gateway Project resulted in a Finding of No Significant Impact (FONSI). Although the Gateway Project was designed to accommodate a second span of the Ambassador Bridge – should that action be studied, mitigated, and undertaken in the future – the impacts of a new six lane bridge or two parallel bridges, representing a doubling of capacity, were not included in the Gateway Project EA. Therefore, a full Environmental Impact Statement should be conducted on the impacts of a new six-lane bridge as well as the operations of two parallel bridges. In addition, the capacity of the plaza, following completion of the Gateway Project, to accommodate the traffic estimates for two bridges, with an appropriate time horizon, must be evaluated and its impacts determined.

One of the objectives of the DRIC Study is to recommend an alternative that will provide redundancy, or other options, for crossing the Detroit and Windsor border. Given that the permit application explicitly discusses the possibility of the project providing redundancy, the U.S. Coast Guard should inquire and secure a clear definition of redundancy from the various agencies and departments participating in the DRIC Study; specifically such a definition should be requested of the Department of Homeland Security. Based on previous commentary and testimony, redundancy is not achieved by the close proximity of two parallel bridges.

The U.S. Coast Guard should ascertain the positions of the Canadian parties as it relates to the permit application. The DRIC Study partners developed several principles that govern the study process and the final recommendations. One principle is that decisions would not be made that disproportionately burden one side of the border. The U.S. Coast Guard evaluation of the permit application should acknowledge that the DRIC Study has already determined that increased capacity

0085

at the Ambassador Bridge location is not feasible due to its impacts on the Canadian border and therefore be denied.

The permit application states that the existing Ambassador Bridge structure will be evaluated to determine the extent of repairs required and its future use. Whether the existing structure will continue to be used is predicated on the economic feasibility of the repair costs. The economic feasibility of repairs is a subjective matter and can be significantly different for a private corporation than for a public entity. Given the importance of the international crossing to the commerce, trade, and security of the United States and Canada, what is the government's role in the evaluation of the conditions of the Ambassador Bridge and the determination of economic feasibility? Since the future use of the existing structure is described in the permit application, the U.S. Coast Guard should require that an independent third party inspection of the Ambassador Bridge is completed and reviewed in evaluating the permit application.

Southwest Detroit hosts extensive transportation infrastructure that primarily benefits the regional and state economies while the host communities shoulder the negative impacts. Expanded transportation infrastructure has not been coordinated within a comprehensive and cumulative framework. In particular, the environmental impacts have not been comprehensively evaluated. The permit application is another example of the piecemeal approach to transportation infrastructure expansion in southwest Detroit. The U.S. Coast Guard should require and participate in a comprehensive analysis of the environmental impacts – including air quality impacts which are not reported in the permit application.

Thank you for the opportunity to comment on the permit application. As the process continues and additional information is disclosed, we are likely to have additional comments. The SDBA is available for additional discussion of this important matter.

Sincerely,

[redacted] President
Southwest Detroit Business Association

cc: Senator Carl Levin
Senator Debbie Stabenow
Representative Carolyn Cheeks-Kilpatrick
Governor Jennifer Granholm
Representative Steve Tobocman
Senator Buzz Thomas
Senator Hansen Clarke
Mayor Kwame Kilpatrick
Detroit City Council

0036

SOUTHWEST DETROIT
BUSINESS ASSOCIATION

7752 W. Vernor Highway• Detroit, Michigan 48209

Phone: 313/842-0986 Fax: 313/ 842-6350

FAX

Date: 9-14-06 Pages (Including Cover) 5

To: [redacted]

Company: USCG

Fax Number:

From:

[redacted] X [redacted]

Message: Re: DIBC permit application

September 4, 2006

[redacted]
U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

Re: Public Notice 09-03-06

Dear [redacted]

As a resident in the neighborhood adjacent to the Ambassador Bridge, I am writing to express my concerns about the permit application of the Ambassador Bridge to build a second span. I respectfully request a public hearing on the permit application.

I am extremely concerned about the environmental consequences of building a second span of the Ambassador Bridge. The southwestern portion of the City of Detroit is an area that has seen significant residential and commercial revitalization and is the only part of the city experiencing population growth. This community has born the burden of the region's transportation and industrial infrastructure without any community benefits. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will surely only grow once the bridge's capacity is expanded.

I am extremely concerned that a second span of the Ambassador Bridge will be built without any environmental review. The Gateway Project, while designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the Ambassador Bridge has well-documented plans to significantly expand its plaza beyond what was anticipated in the Gateway study and beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications. There has been no environmental analysis of those impacts. Therefore, the Coa ... preliminary recommendation that the project be granted a categorical exclusion shoul

Before any new or enhanc
and participatory bi-natior
parallel permit applicatior
on the permit application
should systematically be
and nation reap the bene
kinds of major border in

Sincerely, [redacted]

One complete Set of PN Responses - Ambassador (Please keep together)

0088

September 12, 2006

[redacted]
U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

Re: Public Notice 09-03-06

Dear [redacted]

As a resident in the neighborhood adjacent to the Ambassador Bridge, I am writing to express my concerns about the permit application of the Ambassador Bridge to build a second span. I respectfully request a public hearing on the permit application.

I am extremely concerned about the environmental consequences of building a second span of the Ambassador Bridge. The southwestern portion of the City of Detroit is an area that has seen significant residential and commercial revitalization and is the only part of the city experiencing population growth. This community has born the burden of the region's transportation and industrial infrastructure without any community benefits. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will surely only grow once the bridge's capacity is expanded.

I am extremely concerned that a second span of the Ambassador Bridge will be built without any environmental review. The Gateway Project, while designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the Ambassador Bridge has well-documented plans to significantly expand its plaza beyond what was anticipated in the Gateway study and beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications. There has been no environmental analysis of those impacts. Therefore, the Coast Guard's preliminary recommendation that the project be granted a categorical exclusion should be revised.

Before any new or enhanced border infrastructure is to be built, it must be determined in an open and participatory bi-national process. Given the Detroit River International Crossing Study and a parallel permit application in Canada, I encourage the Coast Guard to extend the comment period on the permit application and hold a public hearing. I strongly believe that no one community should systematically bear the burden of the state's transportation infrastructure while the region and nation reap the benefits of international trade. There must be public accountability for these kinds of major border infrastructure and significant protections for impacted communities.

Sincerely, [redacted]

0089

September 4, 2006

[redacted]
U.S. Department of Homeland Security
U.S. Coast Guard
9th Coast Guard District
Cleveland, Ohio 44199-2060

Re: Public Notice 09-03-06

Dear [redacted]

As a resident in the neighborhood adjacent to the Ambassador Bridge, I am writing to express my concerns about the permit application of the Ambassador Bridge to build a second span. I respectfully request a public hearing on the permit application.

I am extremely concerned about the environmental consequences of building a second span of the Ambassador Bridge. The southwestern portion of the City of Detroit is an area that has seen significant residential and commercial revitalization and is the only part of the city experiencing population growth. This community has born the burden of the region's transportation and industrial infrastructure without any community benefits. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will surely only grow once the bridge's capacity is expanded.

I am extremely concerned that a second span of the Ambassador Bridge will be built without any environmental review. The Gateway Project, while designed to accommodate a second span, did not analyze the environmental consequences of a second span, simply the connections between the Ambassador Bridge and the interstate freeway system. In addition, the Ambassador Bridge has well-documented plans to significantly expand its plaza beyond what was anticipated in the Gateway study and beyond what has been revealed in its Coast Guard or Michigan Department of Environmental Quality permit applications. There has been no environmental analysis of those impacts. Therefore, the Coast Guard's preliminary recommendation that the project be granted a categorical exclusion should be revised.

Before any new or enhanced border infrastructure is to be built, it must be determined in an open and participatory bi-national process. Given the Detroit River International Crossing Study and a parallel permit application in Canada, I encourage the Coast Guard to extend the comment period on the permit application and hold a public hearing. I strongly believe that no one community should systematically bear the burden of the state's transportation infrastructure while the region and nation reap the benefits of international trade. There must be public accountability for these kinds of major border infrastructure and significant protections for impacted communities.

Sincerely, [redacted]

0090

jubilee 1701–2001

STE. ANNE DE DETROIT

tricentennial

1000 Ste. Anne Street
Detroit, Michigan 48216
Phone: (313) 496-1701
Fax: (313) 496-0429
Web: www.ste-anne.org

[redacted]
Bridge Program Manager
Ninth Coast Guard Division
1240 East North Street
Cleveland OH 44199-2060

September 9, 2006

Dear [redacted]

As members of Ste. Anne de Detroit Catholic Church, which is immediately adjacent to the Ambassador Bridge, we are writing to request a public hearing concerning the permit application of the Ambassador Bridge Enhancement Project (ABEP).

Building a second span raises many questions concerning its environmental consequences. Southwest Detroit, especially the Hubbard-Richard neighborhood where the church is located, is an area that has seen residential and commercial revitalization. It is the only part of the City of Detroit experiencing significant population growth. This community has born the burden of the region's transportation and industrial infrastructure without any benefits for the community. Over 10,000 trucks currently cross the Ambassador Bridge each day and that number will eventually grow once the bridge's capacity is expanded.

The ABEP permit application should be examined carefully and a full environmental review completed. This review should include:

- an analysis of whether a "replacement" span is presently necessary, since on any number of occasions members of the DIBC have stated that no relevant need for expansion will exist for the next twenty years,
- a traffic analysis and corresponding air quality impact analysis for both the replacement bridge and both bridges operating in tandem, and
- an analysis of all other environmental and community impacts.

It seems incredible that such a large task as this could be undertaken without "input" from the populace living in the affected area. Both accountability and protection for impacted communities should be an essential part of this project.

Sincerely,

The Pastor and Parishioners of
Ste. Anne Catholic Church
1000 St. Anne Street
Detroit, Michigan 48216

0091

(See accompanying list of signatories)

N 691 Anderson House Office Building, P.O. Box 30014, Lansing MI 48909 • Ph: (517) 373-0823 • Fx: (517) 373-5993

Michigan House of Representatives
Rep. Steve Tobocman- 12th District

Fax

To:	[redacted]	**From:**	Rep. Steve Tobocman
Fax:	216 902-[redacted]	**Pages:**	26
Phone:	216 902-[redacted]	**Date:**	9/14/2006
Re:	Comments re Public Notice 09-03-06	**CC:**	

☐ **Urgent** **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Original follows by mail.

September 13, 2006

[redacted]
Bridge Program Manager
Ninth Coast Guard District
1240 East North Street
Cleveland, Ohio 44199-2060

Re: Proposal For New Detroit/Windsor Bridge
Public Notice 09-03-06

Dear [redacted]

The United States Coast Guard has received an application for a bridge permit from the Detroit International Bridge Company. The proposed bridge would be six-lane one-mile long bridge creating a new international crossing to Canada. Demand for river crossings south of Detroit are estimated to increase by 52% for autos and 132% for heavy trucks over the next 30 years. This travel demand will exceed the capacity of the Ambassador Bridge at some time between 2011 and 2020. Thereafter, travel growth will increase *only* if a new river crossing is constructed. The largest direct environmental impact of the new bridge will be the impacts flowing from the millions and millions of truck and auto trips that will occur in southwest Detroit *only* if a new bridge is built in southwest Detroit. The Bi-National Partnership's Detroit River International Crossing ("DRIC") Study is considering the best location for a new river crossing to accommodate this travel demand and its social and environmental impacts.

We, the undersigned individuals, residents and organizations, are stakeholders in any new river crossing project. Our community, constituents and organizations will be affected by the short and long term impacts which will flow from a new international bridge crossing in southwest Detroit. We have been involved in the Detroit River International Crossing study for two years for that reason. NEPA requires the Coast Guard to recognize that the permit application before it is not for a mere bridge; it is an application for a new international border crossing and, if you accept DIBC's position that regional economic growth is tied to adequate river crossing capacity (which we do), then it is an application to construct one of the most important trade and redevelopment projects to be considered in the Detroit region for decades to come, rivaling the new terminals at Metro airport in significance for the region's trade and economic development. To limit an environmental assessment to just the mile-long bridge span would effectively segment the analysis of the impacts of this regional trade and development project in violation of NEPA.

Even though the permit application proposes that the bridge itself will be privately funded, the history of the both the Detroit & Windsor Tunnel and the Ambassador Bridge demonstrates that even privately owned and financed border crossings require hundreds of millions in public funding for access roadways and appurtenant facilities.

NEPA requires the Coast Guard to fully evaluate the environmental impacts, short and long term, local and regional, which will flow immediately from a new crossing (wherever located) as well as its cumulative impact considering other major transportation projects in southwest Detroit and Wayne County. NEPA requires a full environmental impact statement be prepared before making a decision on the pending permit application. FHWA's NEPA guidance gives major transportation projects and freight terminals as examples of projects for which an EIS will be routinely required. A new bridge with attendant toll facilities and customs inspections will be both a major transportation project and a freight terminal serving over 10,000 trucks per day. MDOT and FHWA have required the preparation of an EIS for the 2nd span of the Blue Water Bridge and as part of the evaluation of alternative river crossings being evaluated by the DRIC Study. In contrast, the DIBC application has provided the USCG with no justification for USCG's finding that the project will qualify for a categorical exclusion for NEPA's requirement that an environmental analysis be performed, other than a one-page cursory checklist which is completely lacking in supporting materials and is completely at odds with actual circumstances.

Some of the factors requiring a full EIS for this project include:

- **Significant Effects On Pubic Health And Safety**
    - Immigration and border control considerations have not been addressed.
    - Issues related to the prevention of terrorism need to be addressed.
    - Redundancy of a crossing if there is catastrophic damage to one bridge or a plaza serving a bridge.

0094

- Traffic safety arising out of an 80% increase of border traffic
- No recent microscale modeling of pollutants of concern has been performed to evaluate air quality impacts.
- Hazardous air pollutants from many thousands of diesel trucks each day have not been addressed.
- Air quality, noise and traffic safety impacts on numerous nearby schools, churches and other institutions have not been considered.
- Substantial traffic and truck congestion of access roads in Windsor.

- **Potential for Controversial Effects**
    - The application conflicts with recommendations of DRIC Study which has dropped a 2nd Ambassador Bridge crossing for environmental and community impact reasons.
    - Publicly stated Canadian opposition to new crossing at the Ambassador Bridge.
    - Issues over public or private ownership of the river crossing.
    - Issues related to private monopoly control of river crossings.
    - FHWA guidance recognizes that toll facilities raise issues which must be addressed in an EIS.
    - Long standing community controversy and opposition to an expanded river crossing in vicinity of the existing Ambassador Bridge.
    - No effort has been made to work with a broad base of the affected community or its citizens or businesses.

- **Uncertain and Unknown Effects on the Human Environment**
    - Difficulty in evaluating mobile source air quality impacts from diesel trucks, where diesel emissions are believed to be the predominant contributor to adverse health effects from mobile source emissions.

- **Precedent For Future Actions With Significant Effects Or A Decision In Principle About A Future Consideration**
    - Action would preempt the ongoing DRIC Study.
    - Need to consider results of General Services Administration's ongoing master plan study of future customs, immigration and DHS facility needs associated with future border crossings.
    - The Gateway Project Environmental Assessment did not consider any other crossings as alternative locations to accommodate the 80% future growth in border crossings.

0095

- **Significant Cumulative Impacts When Considered With Other Foreseeable Future Actions**
    - Need to consider the interrelationship between a new river crossing and the proposed Detroit Intermodal Freight Terminal.
    - Interrelationship between a new river crossing and redevelopment plans for southwest Detroit.
- **Impacts on Historic Resources**
    - During the Blue Water Bridge EIS, the original structure of that bridge was considered an historical structure. The Ambassador Bridge which has dominated the downriver skyline for many years requires the same consideration because it is on the National Register of Historic Places.
- **Other Significant Impacts**
    - Any bridge crossing in southwest Detroit will affect various low income and minority neighborhoods, requiring consideration of environmental justice and other considerations which may vary substantially depending on where a new crossing is located.
    - DIBC has made proposals for plaza configuration and construction different from that which is part of the Gateway Project plans. No environmental impacts or considerations arising out of those plans has been considered.

Finally, we request that each of the entities signing this letter be made participants in the citizen participation process which must be part of the preparation of an EIS.

Thank you for your consideration.

[SIGNATURE PAGES ATTACHED]

0096

SIGNATURE PAGE

Name of Organization: GATEWAY COMMUNITIES DEVELOPMENT COLLABORATIVE

Signed: [redacted]

Name: [redacted]

Position: TRANSPORTATION CO-CHAIR

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

residents, businesses, community development corporations in Southwest Detroit.

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0097

[redacted]

SIGNATURE PAGE

Name of Organization: Michigan Avenue Business Association

Signed: [redacted]

Name: [redacted]

Position: Executive Director

Contact Person Same

Address: [redacted]

Phone Number: [redacted]

Fax Number:

Email: [redacted]

Our organization represents the following constituencies:

Optional

☐ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☐ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0008

SIGNATURE PAGE

Name of Organization: Bagley Housing Association

Signed: [redacted]

Name: [redacted]

Position: Executive Director

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

Residents of Hubbard-Richard, Hubbard Farms, and from Junction to Livernois

Optional

☐ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☐ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed:______________________________

0009

SIGNATURE PAGE

Name of Organization: __Southwest Housing Solutions______________

Signed: [redacted]

Nam[redacted]

Position:__Executive Director_______________

Contact Person [redacted]

Address:[redacted]

Phone Number:[redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies: The population of the area roughly bounded by Tireman on the north, the Detroit River on the south, the Lodge Freeway/Grand River Avenue on the east, and the City limits on the west with a special emphasis on low and moderate income and/or disabled individuals and families residing in that area.

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signe[redacted]

0100

SIGNATURE PAGE

Name of Organiz[redacted] Mexicantown Community Development Corp.

[redacted]

Nam[redacted]

Position: [redacted]

Contact Person [redacted]

Addr[redacted]

Phone Num[redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

Mexicantown Hubbard Communities commercial district

we are close to the Bridge

(in distance)

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public

Sig[redacted]

0101

SIGNATURE PAGE

Name of Organization: GREATER CORKTOWN DEVELOPMENT CORPORATION

Signed: [redacted]

Name: [redacted]

Position: Chief Operating Officer

Contact Person SAME

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

Business and Residence within the corktown boundries -

Optional

☑ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity

Sign[redacted]

0102

SIGNATURE PAGE

Name of Organization: Southwest Detroit Environmental Vision [redacted]

Signed: [redacted]

Name: [redacted]

Position: Executive Director

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed [redacted]

0103

SIGNATURE PAGE

Name of Organization: DELRAY COMMUNITY COUNCIL

Signed: [redacted]

Name: [redacted]

Position: chairperson

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0104

SIGNATURE PAGE

Name of Organization: Bridging Communities, Inc. [redacted]

Signed: [redacted]

Name: [redacted]

Position: Special Projects Coordinator

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

Zip Codes 48208, 48209, 48210, 48216, 48217

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0105

SIGNATURE PAGE

Name of Organization: People's Community Services

Signed: [redacted]

Name: [redacted]

Position: Executive Director

Contact Person [redacted]

Address [redacted]

Phone Number: [redacted]

Fax Number:

Email: [redacted]

Our organization represents the following constituencies:

Residents of Delray

Optional

☒ **Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.**

☒ **Our organization is opposed to a river crossing which is not controlled by a public entity** [redacted]

Signed: [redacted]

0106

SIGNATURE PAGE

Name of Organization: __SER Metro-Detroit__[redacted]

Signed: [redacted]

Name: [redacted]

Position:______President______________________

Contact Person ______________________________

Address:[redacted]

[redacted]

Phone Number:[redacted]

Fax Number: [redacted]

Email: ______________________________

Our organization represents the following constituencies:

__________________Detroit residents; southwest Detroit residents seeking job search assistance and job training services/program.

____

____

Optional

☐ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☐ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed:______________________________

0107

SIGNATURE PAGE

Name of Organization: Resident - Works

Signed: [redacted]

Name: [redacted]

Position: Res. Advocate

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: None

Email: None

Our organization represents the following constituencies:

Optional

☑ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☑ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0108

SIGNATURE PAGE

Name of Organization: CLARK PARK COALITION

Signed: [redacted]

Name: [redacted]

Position: PRESIDENT

Contact Person [redacted]

Address: [redacted]

Phone Number: [redacted]

Fax Number: [redacted]

Email: [redacted]

Our organization represents the following constituencies:

CLARK PARK COMMUNITY RESIDENT

USERS OF FACILITIES

Optional

☒ Our organization is opposed to a new Detroit River crossing located next to the Ambassador Bridge.

☒ Our organization is opposed to a river crossing which is not controlled by a public entity.

Signed: [redacted]

0109

They have made this recommendation based on environmental, economic, security, congestion, and other quality of life factors that would impact the region as a whole. The Detroit International Bridge Company have not used the same factors in their proposal, instead theirs is primarily a revenue protection and growth plan.

A few other points:

The security of the bridge crossing should be the highest concern. Placing two spans next to each other would be illogical and unsafe. Where is the Department of Homeland Security on this issue? (As an aside, currently there are no vehicle security checks until after the border crossing is made – this is beyond comprehension!)

The Bridge Company's proposed use as a pedestrian and bicycle path for the old span is specious at best. Given the security, maintenance, costs to operate the construction project, and the low volume of expected users, the owners would be hard pressed to make a business case to keep this arch open. Although it will create good politics, it will never actually happen. Instead, this span would be better suited to handle passenger vehicle traffic only to promote commerce between Detroit and Windsor, while truck and transport traffic would be routed to the downriver facility and onto I-75 at that point to ease congestion in the downtown areas.

I do see where the Detroit International Bridge Company's revenues and survival would be greatly at risk if they were to lose truck traffic to the downriver bridge. I suspect they would spend any amount they have to in order to block competition.

According to the study, ultimately two bridges will be required to handle the increased traffic volume sometime after 2010. The short term conclusion by the Detroit International Bridge Company, that a second bridge may not even be required, is self serving and misleading. The demand may be delayed somewhat due to the recent economic performance in the region, but population and national economic growth trends overall will continue and a second bridge will be required. If anything, the current conditions allow for more thoughtful consideration of where and what to build. This should not be a "race"; it's a strategy for growth in this region.

The congestion on the Windsor side of the bridge is magnitudes worse than in Detroit. I have witnessed the gradual increase of traffic (we have a cottage in Leamington, Canada), and the hundreds of trucks that wait to clear Customs, sometimes three or four miles back on Huron Church. The traffic, thick with diesel fumes and noise, disrupts the everyday life of the residents of the surrounding region. The residents of Windsor have a right to be concerned with this private plan which will have significant impact on their already interrupted quality of life. As their international neighbors, we should be in support of a solution that benefits us all.

I strongly believe that government should be left out of most aspects of our free market economy, as private industry has always proven to be more efficient in profit making and benefiting society in most areas. But in areas of security, defense, infrastructure and road building, the government should be held responsible and accountable to serve our needs. The verdict on where and when to build the additional border crossing should be made by the governments of the United States and Canada with ownership being retained by both. A decision on the location for a second span, that will affect this region for many future generations, should not be abdicated by our political leadership, made for expediency and convenience, and certainly shouldn't be left to a private concern as an exercise in growth and profiteering. Our lawmakers need to be visible on this issue and held accountable to act in the best interests of their constituents.

Sincerely,

[redacted]

Northville, Michigan
Leamington, Ontario

RECEIVED 1 JUNE 2007

SIERRA CLUB

FOUNDED 1892

Commander (dpb)
Ninth Coast Guard District
1240 E. 9th Street – Room 2025
Cleveland, Ohio 44199-2060

May 31, 2007

Dear Sir:

Thank you for the opportunity to comment on the Draft Environmental Assessment (EA) prepared by the Detroit International Bridge Company ("DIBC") for its application to build a second span of the Ambassador Bridge ("Bridge"). The Sierra Club is a nation-wide grassroots environmental organization dedicated to protecting our communities. The Sierra Club and its members in the Detroit metropolitan area are concerned about the environmental impacts of a second span of the Ambassador Bridge.

The proposed "Ambassador Bridge Enhancement Project" involves a second bridge span between Detroit, MI and Windsor, Ontario, adding six lanes to the existing four. We are focusing these comments on two sets of impacts which would result from this project which the Draft EA does not adequately consider. They are (1) Air Quality and (2) Environmental Justice Issues. We urge the Coast Guard to complete a full and thorough analysis of these impacts and to incorporate that analysis into its further consideration of the proposed bridge project.

Air Quality Impacts

The Draft EA does not adequately consider all of the standards and requirements set by the Environmental Protection Agency for $PM_{2.5}$ non-attainment areas. When an area is designated in non-attainment, certain transportation projects must undergo a review for localized impact for $PM_{2.5}$ also known as a "HotSpot" analysis.[1] This standard was developed by the Environmental Protection Agency to ensure that areas that have failed to attain national standards are reviewing projects that may exacerbate the negative impact of that pollutant on air quality and human health. This standard should not be ignored in the Coast Guard's Draft EA for the expansion of the Ambassador Bridge. Due to the 150% increase in the size of the existing Bridge and the correlation between traffic and $PM_{2.5}$, the Coast Guard must consider the

[1] 71 Fed. Reg 12467.

0649

potential impact of $PM_{2.5}$ emissions from the project on nearby communities, not solely Wayne County as a whole. The federal $_{2.5}$ hotspot analysis is a relevant standard to apply.

The discussion of air quality impacts in the Draft EA is incomplete. The science regarding localized air quality impacts is replete with conclusions regarding the adverse effect of car and truck emissions on human health. In light of this science, the Coast Guard Draft EA does not sufficiently evaluate the potential air quality impacts of six added lanes to the existing traffic corridor, a 150% increase in the roadway capacity of the existing Ambassador Bridge

The connection between air pollution from traffic and human health is undeniable. The environmental impact of highways has been a source of concern since the 1960s and was even cited as a major factor behind the enactment of NEPA.[2] Air pollution from transportation sources includes a toxic mixture of particulate matter measuring 2.5 microns in diameter ($PM_{2.5}$), carbon monoxide, nitrogen oxides (NOx), volatile organic compounds (VOCs), and mobile source air toxics including diesel particulate matter. $PM_{2.5}$ is often linked to increased mortality, hospitalization for respiratory problems, decreased lung function, and increased respiratory symptoms[3] as well as cardiovascular and pulmonary causes of death.[4] Exposure to this toxic mixture from exposure to vehicular traffic in urban areas may increase the risk of a heart attack in susceptible persons.[5] Fine particulates are more likely to be mixtures of chemicals and metals that result from combustion sources (such as gasoline or diesel engines) and can penetrate deeper into lung tissue and even enter the blood stream. $PM_{2.5}$ and mobile source air toxics are the subject of a growing body of scientific evidence linking these pollutants to substantial adverse human health impacts.

The impact of mobile source air pollution on children is particularly acute. Some studies have shown a correlation between asthma and attending school near major roadways. A study in California's East Bay was designed to determine the relationship of the proximity of middle schools to freeways and adverse health effects.[6] The study found that the closer the schools were to the freeways, the higher the concentrations of $PM_{2.5}$ and diesel exhaust. Also higher, was the prevalence of asthma and bronchitis among students at the schools most affected by motor vehicle emissions.[7] Another study followed school children in 12 California communities, finding large deficits in lung function among those students living in communities with high pollutant concentrations.[8] Reductions in lung function and other health complications connected

---

[2] Bob Yuhnke, *NEPA's Uncertainty Principle in the Federal Legal Scheme Controlling Air Pollution From Motor Vehicles*, 35 E.L.R 10273 (2005).

[3] N. Kunzli, et al, *Ambient Air Pollution and Atherosclerosis in Los Angeles, National Institute of Environmental Health Sciences* (Nov 2004). Exhibit B.

[4] Michael Jerrett, et. al., *Spatial analysis of Air Pollution and Mortality in Los Angeles*, Epidemiology, Vol. 16 No. 6 (Nov. 2005). Exhibit C.

[5] Annete Peters, et. al, *Exposure to Traffic and the Onset of Myocardial Infarction*, N. Engl. J. Med Vol 351 No. 17 (Oct. 21, 2004). Exhibit D.

[6] Janice J. Kim et al., *Traffic-Related Air Pollution Near Busy Roads: The East Bay Children's Respiratory Health Study*, 170 Am. J. Respiratory & Critical Care Med. 520 (2004). Exhibit E.

[7] See also W. James Gauderman et. al., Childhood Asthma and Exposure to Traffic and Nitrogen Dioxide, Epidemiology, Vol. 16 No.6 (Nov 2005) (examining the association between traffic-related pollution and childhood asthma) Exhibit F.

[8] J.W. Gauderman et al., *The Effect of Air Pollution on Lung Development From 10-18 Years of Age*, 351 New Eng. J. Med. 1057 (2004). Exhibit G.

6550

to exposure to air pollution were expected to impact those children for the remainder of their lifetimes. Yet another important study found that preliminary data suggested that concentrations of pollutants primarily generated by motor vehicle fuel combustion were higher in areas of close proximity to roadways with higher vehicle density.[9]

The U.S. Environmental Protection Agency ("EPA") recognizes that air pollution levels near major roadways are significantly higher than at locations farther away:

> Urban-scale assessments done in Houston, TX and Portland, OR illustrated steep gradients of air toxic concentrations along major roadways, as well as better agreement with monitor data. Results of the Portland study show average concentrations of motor vehicle-related pollutants are ten times higher at 50 meters from a road than they are at greater than 400 meters a road. These findings are consistent with pollutant dispersion theory, which predicts that pollutants emitted along roadways will show highest concentrations nearest a road, and concentrations exponentially decrease with increasing distance downwind. These near-road pollutant gradients have been confirmed by measurements of both criteria pollutants and air toxics, and they are discussed in detail in Chapter 3 of the RIA.[10]

Studies show that these elevated levels of ambient air pollution near major roadways result in a commensurate increase in indoor air pollution near roadways. Citing a leading study that assessed children's exposure to traffic-related air pollution while attending schools near roadways, the EPA notes:

> Overall results indicate that indoor pollutant concentrations are significantly correlated with traffic density and composition, percentage of time downwind, and distance from major roadways.[11]

The American Academy of Pediatrics has warned that children and infants are among the most susceptible to the harmful effect of air pollution.[12] The AAP notes:

> In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies have found links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma.[13]

The AAP reports that these harmful health effects result in large part, from motor vehicle pollution:

---

[9] Northeast States for Coordinated Air Use Management, Indoor/Outdoor School Air Monitoring Pilot Project. (Sept. 13, 2002). Exhibit H.

[10] 71 Fed. Reg. 15804 (citations omitted).

[11] 71 Fed. Reg. 15804 (citations omitted).

[12] American Academy of Pediatrics (AAP), *Ambient Air Pollution: Health Hazards to Children. Committee on Environmental Health,* Pediatrics Vol. 114 Pp 1699-1707 (2004). Exhibit I.

[13] AAP, *Ambient Air Pollution: Health Hazards to Children. Committee on Environmental Health,* Pediatrics Vol. 114 Pp 1699-1707 (2004).

0651

Motor vehicles represent the principal source of air pollution in many communities, and concentrations of traffic pollutants are greater near major roads.[14]

Air quality impacts on children's respiratory health are often compounded when these pollutants are present in high concentrations on playgrounds and athletic fields, where children are at even higher risk during physical activity.[15]

The connection between adverse health impacts in children and mobile source air pollution is especially relevant to the Ambassador Bridge Enhancement Project. The Border Transportation Partnership, a group proposing another bridge across the Detroit River, has published a map locating all of the schools in southwest Detroit.[16] This map shows half a dozen schools located at the foot of the existing Ambassador Bridge. These schools range from elementary through high schools, with the presence of children from the ages of roughly 5 through 18 who will be exposed to ambient concentrations of these harmful pollutants from increased traffic resulting from the new span of the Ambassador Bridge. This is in addition to the many children who may be living nearby who would be subject to these impacts in their neighborhood.

In addition to the risks to children and developing respiratory function, serious cancer risk is attributed to mobile source air pollution. A 2000 study done in the Los Angeles air basin measured exposures to 30 toxic air pollutants a 22 locations in the basin.[17] This study, known as MATES II, found that 90% of cancer risk attributed to air pollutants came from mobile sources. Logically, this risk was more pronounced near freeways and other locations dominated by mobile sources.[18] [19]

Detroit already has its fair share of air quality problems. The Detroit area is currently a non-attainment area for the National 8-hour ozone standards, as well as for National standards for $PM_{2.5}$, two criteria pollutants that carry serious human health concerns.[20] In addition to air quality problems, the city has identified capacity problems associated with the projected increases in vehicle and truck traffic over the next 30 years. Health related air quality impacts must be considered within this context. An additional six lane bridge, coupled with the necessary infrastructure to manage the increased vehicle capacity will lead to increased mobile source air pollution in southwest Detroit.

---

[14] AAP, *Ambient Air Pollution: Health Hazards to Children. Committee on Environmental Health,*Pediatrics Vol. 114 Pp 1699-1707 (2004).
[15] Kenneth W. Rundell, et. al., *Vehicular Air Pollution, Playgrounds, and Youth Athletic Fields,* Inhalation Toxicology, Vol. 18 Page 541-547 (2006). Exhibit J.
[16] See Central Area Alternatives Map. Exhibit K. *Also available at* www.partnershipborderstudy.com.
[17] South Coast Air Quality Management District, *Multiple Air Toxics Exposure Study-II* (March 2000), *available at* http://www.aqmd.gov/matesiidf/matestoc.htm.
[18] See also Amir Sapkota and Timothy J. Buckly, *The Mobile Source Effect on Curbside 1,3-Butadiene, Benzene, and Particle-Bound Polycyclic Aromatic Hydrocarbons Assessed at a Tollbooth,* Journal of the Air & Waste Management Association, Vol. 53 (June 2003) (examining traffic counts and vehicle class combined with curbside concentrations of environmental carcinogens). Exhibit L.
[19] See Also, AAP(2004) noting the cancer risk resulting from diesel exhaust.
[20] 69 Fed. Reg 56697 (Marginal non-attainment for 8-hour ozone); 70 Fed. Reg. 943 (non-attainment for $PM_{2.5}$)

The Draft EA asserts that an increase in traffic is not anticipated as a result of the construction of additional lanes across the river. However, there is evidence to the contrary, suggesting that increased lane miles actually does result in an overall increase in traffic, and therefore, an increase in mobile source pollution.[21] NEPA analysis is required to ascertain how the proposed project would effect traffic levels. Rather than summarily concluding that a 150% increase in capacity will not result in an increase in traffic, the agency must perform appropriate modeling to quantify anticipated traffic levels. This modeling must account for the phenomenon of induced travel.[22]

The air quality and resulting health impacts of this bridge cannot be ignored. Increased lane miles lead to increased traffic. Increased traffic will lead to increases in mobile source air pollution including $PM_{2.5}$ and other air toxics which have been repeatedly linked to reduced lung function in developing children, heart attacks in susceptible populations, certain cancers as well as lasting health impacts from this exposure. The consensus among the environmental health professionals about the seriousness of this problem suggests that a six lane increase to a Bridge that has several schools positioned near its base is a project that has potentially significant, potentially life threatening impacts on human health and should be analyzed for those impacts.

Environmental Justice Issues

In addition to investigating the locally desired social, economic, or other environmental conditions, it is important for the Coast Guard to take into consideration their legal mandate to give consideration to the issues of environmental justice. The Coast Guard, as a federal agency, shall make achieving environmental justice part of its mission by identifying and addressing "disproportionately high and adverse human health or environmental effects" on low-income or minority populations resulting from its programs and activities.[23]

The area of southwest Detroit is already burdened by the adverse environmental impacts of the existing Ambassador Bridge and the infrastructure that surrounds it, and the Draft EA does not provide conclusive evidence that this project will not exacerbate an existing problem. In addition to the air pollution attributable to the traffic corridor, Wayne County is one of the dirtiest counties in the Country.[24] The list of existing sources of pollution is long and includes oil, automobile, steel, wastewater and power industries to name a few. Southwest Detroit is made up of African American, Hispanic and low-income neighborhoods. The Draft EA asserts that the project will have no impact on environmental justice considerations. It fails, however, to include any assessment of the very important health considerations associated with the cumulative effects of a new source of air pollution on surrounding neighborhoods as a result of a significant increase in highway use. This issue is deserving of special attention as the Coast Guard assesses the burdensome environmental impacts a new bridge will produce on top of a long legacy of environmental devastation.

---

[21] Robert B. Noland and Lewison L. Lem, *A Review of the Evidence for Induced Travel and Changes in Transportation and Environmental Policy in the US and the UK,* Transportation Part D, 7 (2002). Exhibit M.
[22] See Id.
[23] Exec. Order No.12,898, 59 Fed. Reg. 7629 (Feb. 11, 1994).
[24] www.scorecard.org.

Conclusion

In conclusion, the Sierra Club and its members in the Detroit metropolitan area urge the Coast Guard to revise its environmental analysis based on the above information and to provide the public further opportunity to comment on that revised analysis.

Thank you for your consideration of the Sierra Club's comments.

[redacted]

Midwest Region Staff Director
Sierra Club
400 W. Front Street, Suite 204
Traverse City, MI 49684
231.922.2201
231.922.2909 (Fax)

0654

Rcvd (dpb)
5/31/07

[redacted]

Commander (dpb)
[redacted]
Ninth Coast Guard District
1240 E. 9th St.
Room 2025
Cleveland OH 44199-2060

May 27, 2007

Dear Sir,

I am writing to express my utmost opposition to the DIBC proposal to construct a 6 lane cable stayed bridge over the Detroit River just west of the existing bridge.

I have several reasons for opposing this plan.

1. Our neighbors in Windsor lack the needed infrastructure to support it and have repeatedly declared their opposition to the project.

2. Concentration of all shipping lanes represents a grave security risk to our city and our nation's economy. Imagine the damage that could be done both in terms of lives and dollars, if the proposed hyperconcentrated facilities were the target of a terrorist attack. Why on earth would you allow an entire international border crossing to be controlled by *one individual*?

3. The company that owns and operates the current facility has a long record of lying to the residents of the neighborhood about their intentions. Over ten years ago, they promised to restore the long vacant Michigan Central Depot, which has been *open to trespass* for all of the years that they have owned it. They have repeatedly begun construction projects without even bothering to pull permits, and are currently in litigation with the city of Detroit for repeated violations of building and construction codes. They have shown themselves to be terrible neighbors and completely untrustworthy. They own a number of buildings in the area, and their buildings can be distinguished by the lack of windows and the fact that all are open to trespassers.

Please note that (I have lived near the bridge on and off for twenty years. I am currently at the address listed above while I await the purchase agreement for the next property that I will be redeveloping in the Hubbard-Richard Neighborhood.

Sincerely,

[redacted]

The Wyandot of Anderdon Nation
P.O. 68 Trenton Michigan
48183

Rcvd (dpb)
5/18/07

May 11th 2007
United States Coast Guard 9th District
1240 E. Ninth St. Room 2025
Cleveland, Ohio
41999-2060
Attn: Chief of Staff Captain Joseph R. Castillo

RE: Ambassador Bridge project Sandwich Ontario site

Kwe (Hello) [redacted]

The Wyandot Nation is very concerned by the potential impact and destruction to our ancestral burial grounds on Sandwich Ontario lands due to future development of the proposed Ambassador Bridge project.

We also agree with and are in support of the local Windsor residents who have voiced concerns on environmental and cultural issues in this area as well due to this pending project.

Having documented proof of Wyandot ancestral remains in the very area of proposed development; we are requesting these burial sites not be disturbed as these remains of our ancestors are sacred to our way of life.

0657

We anticipate in short order your response on how this unfortunate situation will be handled going forward.

Grand Chief / CEO
The Wyandot of Anderdon Nation
[redacted]

CC:
Detroit River Wyandot Nation
Director [redacted]
Project Manager [redacted]

Grand Chief of Wendake Nation
[redacted]
Grand Chief of Wyandotte - Oklahoma Nation
[redacted]
Chief of Wyandot - Kansas Nation
[redacted]

0658

Rcvd (dpb)
5/22/07

Commander (dpb)
Ninth Coast Guard District
1240 E. 9th Street - Room 2025
Cleveland, Ohio 44199-2060

May 14, 2007

Dear Sir,

Pursuant to your Public Notice requesting comments on the proposed construction of an additional bridge span next to the Ambassador Bridge:

We oppose the project for the following reasons:

1) Additional lanes (six vs. the present four) will ultimately lead to additional traffic volume which would have an unacceptable impact on our neighborhood in terms of deterioration of roads, noise level, and travel difficulties, which we are already experiencing and which will only get worse.

2) Homeland security should dictate that a redundant river crossing should not be immediately alongside the existing crossing, but far enough away that an incident at one bridge would not affect the other.

3) The DRIC has ruled out this location as viable and their study should not be ignored.

4) The appearance of the proposed bridge will detract from the historical look of the old bridge and negatively impact the historic communities around it.

5) A new crossing should be publicly owned rather than owned by a private company with a track record as a bad corporate citizen that holds itself above the law and disregards the people of the community, the building and safety department of the City of Detroit, and which only wants to protect its monopoly power.

Sincerely, [redacted]

[redacted]

0659

Gateway Communities Development Collaborative

C/o Southwest Detroit Business Association
7752 W. Vernor Hwy.
Detroit, MI 48209
(313) 842-0986 (phone)
(313) 842-6350 (fax)

Member Organizations

Bagley Housing Association

Bridging Communities, Inc.

Greater Corktown Development Corporation

Mexicantown Community Development Corporation

Michigan Avenue Business Association

Neighborhood Centers, Inc.

Southwest Detroit Business Association

Southwest Detroit Environmental Vision

Southwest Housing Solutions

May 8, 2007

U.S. Coast Guard
Office of Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street
Cleveland, OH 44199

Re: Request for 90-day Extension of Comment Period for Draft Environmental Assessment for the Detroit International Bridge Company's Proposed Second International Border Crossing

Dea[redacted]

This letter is on behalf of the nine member organizations of the Gateway Communities Development Collaborative (GCDC), the Delray Community Council (Delray), People's Community Services (PCS) and the Hubbard Farms Neighborhood Association (Hubbard Farms). We are writing to request a 90-day extension for the comment period on the draft Environmental Assessment for the Detroit International Bridge Company's Proposed Second International Border Crossing.

GCDC is an association of nine non-profit community development organizations that are working to improve the quality of life in Southwest Detroit. All are engaged in housing, economic development or environmental work to create a community where people want to live, work, shop and play. Over the last five years, GCDC member organizations and their partners have invested nearly $22 million in commercial and economic development projects, over $92 million in housing development projects, and $18.5 million in infrastructure, parks and greenway improvements. GCDC also works in partnership with other community organizations like Delray and Hubbard Farms to be actively involved in the discussions regarding a second international border crossing.

GCDC requires the full 90 day period to properly analyze the materials provided to the public in the draft EA document, as well as to address issues that were entirely neglected by the EA, but which legally should have been part of it. We believe that our request for a 90-day extension of the comment period is warranted in light of the scope, complexity, and controversial nature of the proposed project, which will have a myriad of environmental, historical, economic, and developmental impacts on our Southwest Detroit community. Further, the requested extension is consistent with the National Environmental Policy Act (NEPA)'s purpose of ensuring full public participation and an open review process for NEPA documents. Given the scope and controversy of the twinning of the Ambassador Bridge, a full 90 day comment period is necessary to enable the public in general, and GCDC in particular, to review this project.

We appreciate your sincere consideration of this request. Please feel free to contact [redacted] at [redacted] or at [redacted] if you have any questions or to communicate your decision regarding our request.

Sincerely,

[redacted]

Southwest Detroit Environmental Vision
GCDC Executive Committee Member

[redacted]

People's Community Services

[redacted]

Delray Community Council

Cc U.S. Senator Carl Levin
U. S. Senator Debbie Stabenow
Cong. John Dingell
Cong. John Conyers
Rep. Steve Tobocman

To receive copy of the Draft EA, please download and copy from:

www.ambassadorbridge.com/ambassador-project.html

0662

Public Responses
to
Draft EA

Rcvd(dpb)
10 May 2007

May 8, 2007

Gateway Communities Development Collaborative

C/o Southwest Detroit Business Association
7752 W. Vernor Hwy.
Detroit, MI 48209
(313) 842-0986 (phone)
(313) 842-6350 (fax)

Member Organizations

Bagley Housing Association

Bridging Communities, Inc.

Greater Corktown Development Corporation

Mexicantown Community Development Corporation

Michigan Avenue Business Association

Neighborhood Centers, Inc.

Southwest Detroit Business Association

Southwest Detroit Environmental Vision

Southwest Housing Solutions

[redacted]
U.S. Coast Guard
Office of Commander (dpw-3)
Ninth Coast Guard District
1240 E. Ninth Street
Cleveland, OH 44199

Re: Request for 90-day Extension of Comment Period for Draft Environmental Assessment for the Detroit International Bridge Company's Proposed Second International Border Crossing

Dear [redacted]

This letter is on behalf of the nine member organizations of the Gateway Communities Development Collaborative (GCDC), the Delray Community Council (Delray), People's Community Services (PCS) and the Hubbard Farms Neighborhood Association (Hubbard Farms). We are writing to request a 90-day extension for the comment period on the draft Environmental Assessment for the Detroit International Bridge Company's Proposed Second International Border Crossing.

GCDC is an association of nine non-profit community development organizations that are working to improve the quality of life in Southwest Detroit. All are engaged in housing, economic development or environmental work to create a community where people want to live, work, shop and play. Over the last five years, GCDC member organizations and their partners have invested nearly $22 million in commercial and economic development projects, over $92 million in housing development projects, and $18.5 million in infrastructure, parks and greenway improvements. GCDC also works in partnership with other community organizations like Delray and Hubbard Farms to be actively involved in the discussions regarding a second international border crossing.

GCDC requires the full 90 day period to properly analyze the materials provided to the public in the draft EA document, as well as to address issues that were entirely neglected by the EA, but which legally should have been part of it. We believe that our request for a 90-day extension of the comment period is warranted in light of the scope, complexity, and controversial nature of the proposed project, which will have a myriad of environmental, historical, economic, and developmental impacts on our Southwest Detroit community. Further, the requested extension is consistent with the National Environmental Policy Act (NEPA)'s purpose of ensuring full public participation and an open review process for NEPA documents. Given the scope and controversy of the twinning of the Ambassador Bridge, a full 90 day comment period is necessary to enable the public in general, and GCDC in particular, to review this project.

We appreciate your sincere consideration of this request. Please feel free to contact [redacted] or at [redacted] if you have any questions or to communicate your decision regarding our request.

Sincerely,

[redacted]
Southwest Detroit Environmental Vision
GCDC Executive Committee Member

[redacted]
People's Community Services

[redacted]
Delray Community Council

Cc U.S. Senator Carl Levin
U. S. Senator Debbie Stabenow
Cong. John Dingell
Cong. John Conyers
Rep. Steve Tobocman

12th House District
Southwest Detroit

H-153 CAPITOL
P.O. BOX 30014
LANSING, MI 48909-7514

(517) 373-0823
1-877-STEVE-12
FAX: (517) 373-5993
stevetobocman@house.mi.gov

STEVE TOBOCMAN
MICHIGAN HOUSE OF REPRESENTATIVES
MAJORITY FLOOR LEADER

Rcvd (dpb)
10 May 2007

May 8, 2007

[redacted] Bridge Program Manager
U.S. Coast Guard
Office of Commander (dpw 3)
Ninth Coast Guard District
1240 E. Ninth Street
Cleveland, OH 44199-2060

Dear [redacted]

As the State Representative for the 12th District located in Southwest Detroit, I am writing to request a 90 day extension on the comment period on the Draft Environmental Assessment (EA) for the Ambassador Bridge Enhancement Project proposed by the Detroit International Bridge Company. An extension of the comment period on the proposed Ambassador Bridge Enhancement Project is certainly with precedent. Following the U.S. Coast Guard notice for public comment on the preliminary determination that the proposed project qualified for a categorical exclusion last summer, an extension of the comment period was requested and granted. As you are well aware, the proposed project continues to cause confusion and significant controversy in the 12th District where there are two competing border crossing projects. Finally, each of the permits processed thus far for the proposed project have required public notice and comment; and each associated comment period has been extended to accommodate and encourage full discussion and debate on such a critical project – not only to the 12th District – but to the relationship with one of our strongest trading partners. A thirty-day comment period is simply not sufficient to accommodate a thorough and proper review of the Draft EA.

Please do not hesitate to contact me if you have any questions or would like to discuss this matter.

Sincerely,

Steve Tobocman
House Majority Floor Leader
State Representative, 12th District – Detroit

cc: Senator Carl Levin
Senator Debbie Stabenow
Congressman John Dingell

C666

Coast Guard
Letters
and
application
letter

U.S. Department of
Homeland Security

United States
Coast Guard

Commander (dpb)
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060

Phone: (216) 902-6085
FAX: (216) 902-6088

May 10, 2007

PUBLIC NOTICE 09-03-07

The U.S. Coast Guard (USCG), as the lead federal agency for the proposed project, announces the availability of the Draft Environmental Assessment (EA) for the construction of an additional bridge span to be constructed to the west side of the existing bridge spans of the Ambassador Bridge, between Detroit, Michigan and Windsor, Ontario, Canada. The USCG solicits comments as part of the National Environmental Policy Act (NEPA) process. The EA evaluates the environmental and socioeconomic impacts of the Proposed Action. The USCG also solicits additional comments as part of the public involvement process under Section 106 of the National Historic Preservation Act (NHPA).

The Michigan State Historical Preservation Officer (SHPO) has determined, in a letter to the project applicant dated March 26, 2007, that the proposed project would result in an adverse effect to the existing Ambassador Bridge due to visual and other aesthetic impacts. The existing bridge structure is eligible for listing for the National Register of Historic Places. The Coast Guard requests public comments on the proposed design of the planned bridge and potential impacts to the existing Ambassador Bridge.

The Draft EA is available for viewing or downloading on the Ambassador Bridge web site at:

www.ambassadorbridge.com/ambassador-project.html

Comments should be submitted in writing and must reach the Coast Guard by June 1, 2007 at the following address:

Commander (dpb)
Ninth Coast Guard District
1240 E. 9th Street - Room 2025
Cleveland, Ohio 44199-2060

ALSO, TAKE NOTICE that the Detroit International Bridge Company (DIBC) will host a Public Workshop on Thursday, May 24th, 2007, at 6:30 p.m. at Earhart Middle School located at 1000 Scotten Street, Detroit, Michigan 48209. The workshop will be an open design charrette to solicit public input on alternative project designs. The U.S. Coast Guard is serving as the lead agency for the Environmental Assessment review process. The Coast Guard issued a Draft Environmental Assessment on May 1, 2007. Written comments on that draft are due on June 1, 2007. A copy of the Draft Environmental Assessment has been posted on the DIBC website at www.ambassadorbridge.com/ambassador-project.html
At the May 24 workshop, information will be provided and comments will be received on alternative designs within the Proposed Ambassador Bridge Enhancement Project. In part, comments will be received to provide public input as part of the Section 106 consultation process currently taking place. The Section 106 process is being conducted by the Michigan State Historic Preservation Office. Persons attending the May 24 workshop may also provide comments or ask questions about the Draft Environmental Assessment. Coast Guard officials will be present at the meeting.

U.S. Department of
Homeland Security

United States
Coast Guard

Commander (dpw-3)
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199-2060

Phone: (216) 902-6085
FAX: (216) 902-6088

July 28, 2006

PUBLIC NOTICE 09-03-06

All interested parties are notified that an application has been received from the agent of the Detroit Ambassador Bridge Company (DIBC) by Commander, Ninth Coast Guard District, for approval of location and plans for construction of a second (twin) fixed highway bridge over a navigable waterway of the United States adjacent to the existing Ambassador Bridge.

WATERWAY AND LOCATION: Ambassador Bridge over Detroit River, Mile 19.5, between the city of Detroit, Wayne County, Michigan, United States, and Windsor, Ontario, Canada.

CHARACTER OF WORK: Construction of a second (twin) fixed highway bridge adjacent to, and immediately south of, the existing Ambassador Bridge in an approved corridor.

MINIMUM NAVIGATIONAL CLEARANCES:

Proposed

Horizontal: 1868 feet normal to the axis of the navigational channel.

Vertical: Minimum 155 feet 7 inches above Low Water Datum, IGLD 1985, Lake St. Clair, Michigan (572.3 feet).

ENVIRONMENTAL CONSIDERATIONS:

The U.S. Coast Guard, the lead federal agency, has made a tentative determination that the proposed action is a categorical exclusion for purposes of the National Environmental Policy Act (NEPA) because it satisfies criteria for such actions listed in the Coast Guard's NEPA Implementing Instructions. This preliminary determination is based on the information provided by the applicant to date. The documents currently held by the Coast Guard are available for review at the above address, Monday through Friday, 7:00 a.m. to 3:00 p.m.

The applicant has requested, and received, permission from the United States Department of State to construct a second (twin) structure adjacent to the existing bridge in an already approved international corridor.

No fendering system will be utilized. The piers of the proposed bridge will not be placed in the waterway.

44199, through **August 30, 2006**. These comments will be made part of the case record.

Robert W. Bloom, Jr.
ROBERT W. BLOOM, JR.
Bridge Program Manager
By direction of Commander,
Ninth Coast Guard District

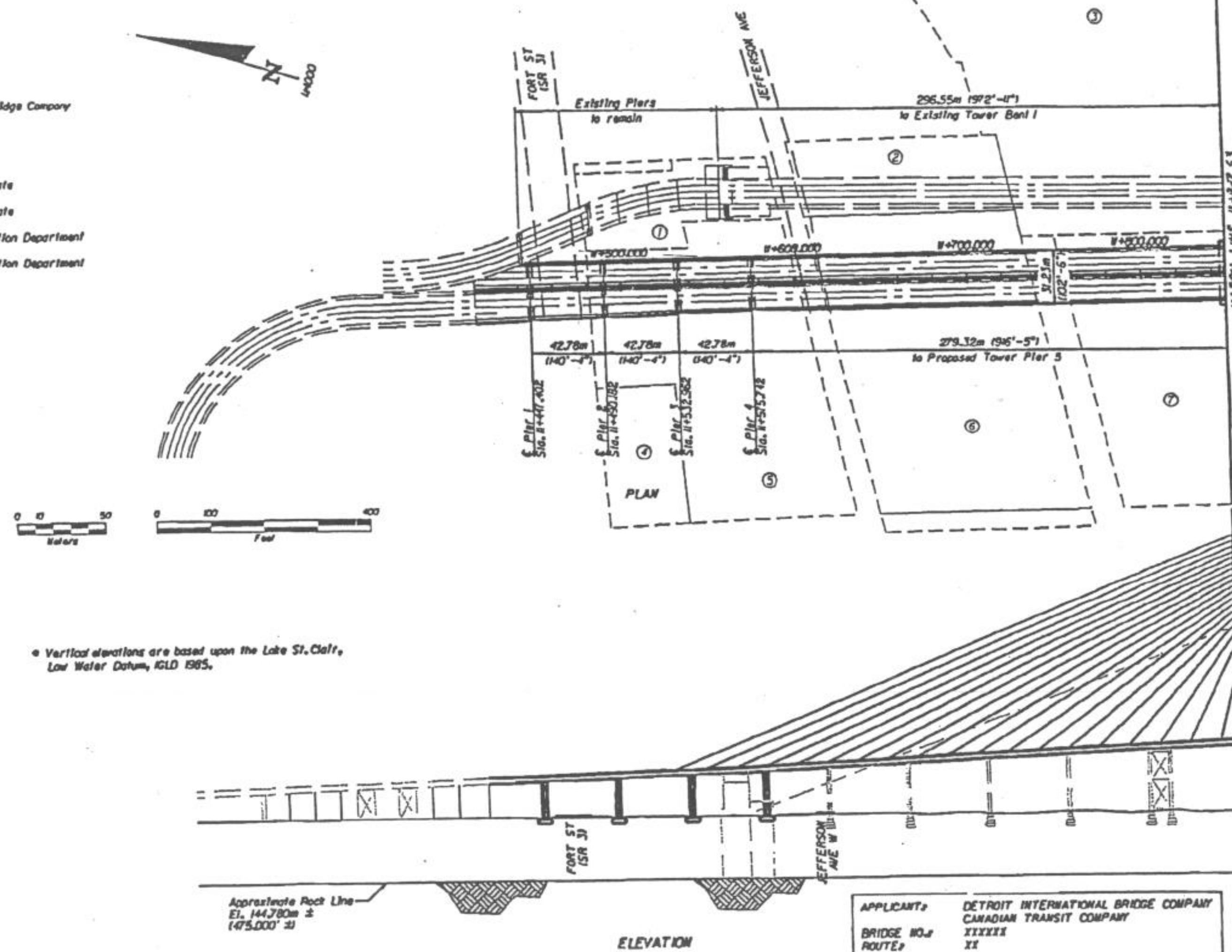
Map of location and plans attached.

NOTICE TO POSTMASTER: It is requested the above notice be conspicuously and continuously posted until **August 30, 2006**.

0672

PROPERTY OWNERS:

1. Detroit International Bridge Company
2. CSX Transportation
3. CSX Transportation
4. Mexican Town Real Estate
5. Mexican Town Real Estate
6. City of Detroit Recreation Department
7. City of Detroit Recreation Department



* Vertical elevations are based upon the Lake St. Clair, Low Water Datum, IGLD 1985.

350	(1148.294')
325	(1066.273')
300	(984.252')
275	(902.231')
250	(820.210')
225	(738.189')
200	(656.168')
175	(574.147')
150	(492.126')
125	(410.105')

APPLICANT:	DETROIT INTERNATIONAL BRIDGE COMPANY CANADIAN TRANSIT COMPANY
BRIDGE NO.:	XXXXXX
ROUTE:	XX
WATERWAY:	DETROIT RIVER
MILE #:	19.5
MUNICIPALITIES:	DETROIT, MICHIGAN - WAYNE COUNTY WINDSOR, ONTARIO - ESSEX COUNTY
DATE:	JUNE 23, 2006

PLAN AND ELEVATION (1 OF 3)

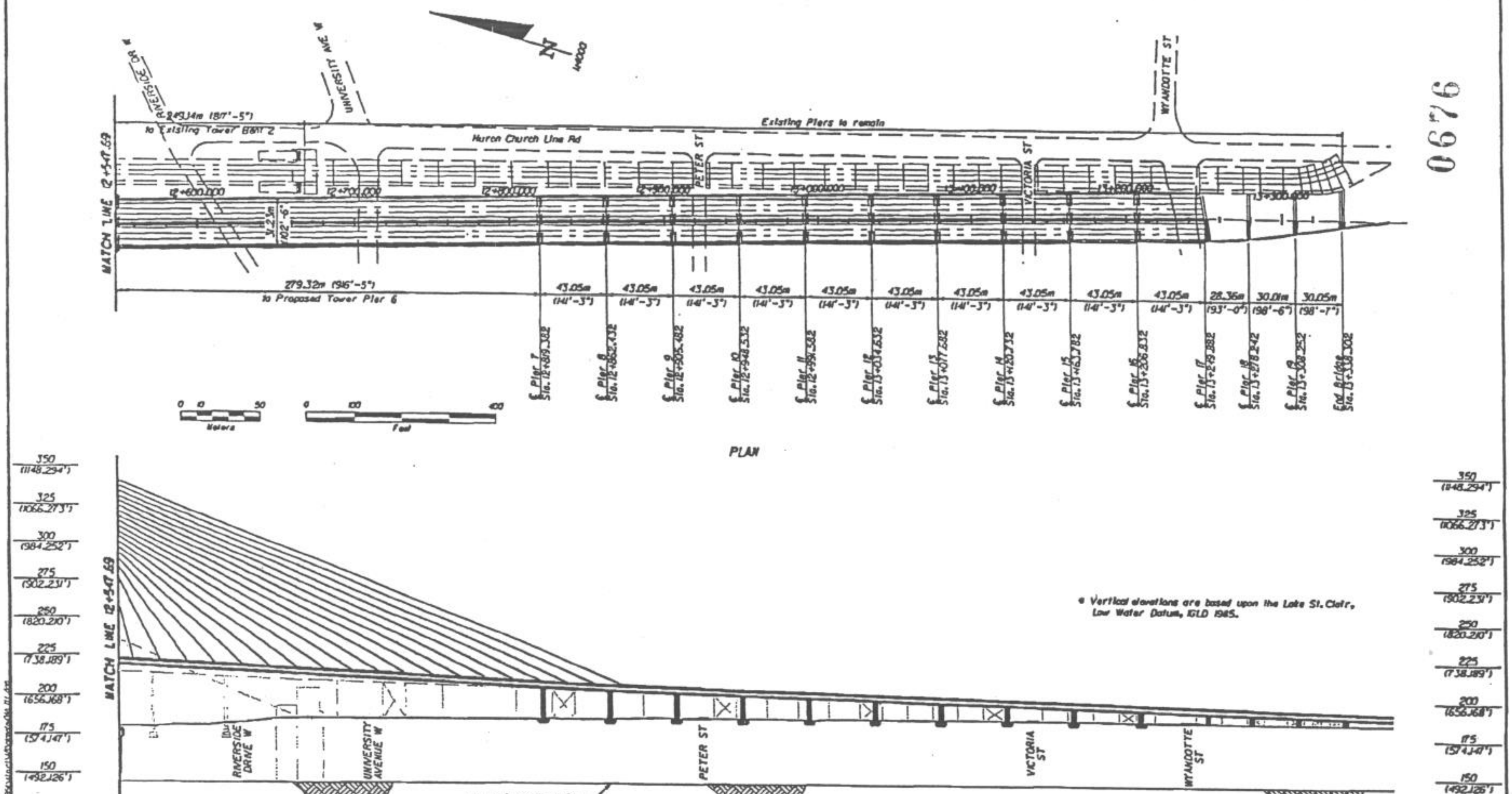
American Consulting Professionals of Michigan, PLLC

AMBASSADOR

PROPOSED BRIDGE OVER DETROIT RIVER
DETROIT, MICHIGAN - WAYNE COUNTY
WINDSOR, ONTARIO - ESSEX COUNTY

SHEET NO. 2 OF 4

0674



0676

APPLICANT:	DETROIT INTERNATIONAL BRIDGE COMPANY CANADIAN TRANSIT COMPANY
BRIDGE NO.:	XXXXXX
ROUTE:	XX
WATERWAY:	DETROIT RIVER
MILE at	19.5
MUNICIPALITIES:	DETROIT, MICHIGAN - WAYNE COUNTY WINDSOR, ONTARIO - ESSEX COUNTY
DATE:	JUNE 23, 2006

PLAN AND ELEVATION (3 OF 3)

American Consulting Professionals of Michigan, PLLC

AMBASSADOR

PROPOSED BRIDGE OVER DETROIT RIVER
DETROIT, MICHIGAN - WAYNE COUNTY
WINDSOR, ONTARIO - ESSEX COUNTY

SHEET NO. 4 of 4

0678

STEPTOE & JOHNSON LLP

ATTORNEYS AT LAW

[redacted]

1330 Connecticut Avenue, NW
Washington, DC 20036-1795
Tel 202.429.3000
Fax 202.429.3902
steptoe.com

July 13, 2006

Commander
Ninth Coast Guard District
United States Coast Guard
1240 East 9th Street
Cleveland, Ohio 44199-2060

Attn: [redacted]

Re: Application of Detroit International Bridge Company for Construction of Second Span to Ambassador Bridge

Dear Sir:

Pursuant to the Bridge Act of 1906, and the regulations of the U.S. Coast Guard ("USCG") at 33 CFR Part 115, Application is hereby made by the Detroit International Bridge Company ("DIBC"), a Michigan corporation headquartered at 12225 Stephens Road, Warren, Michigan 48089, for approval by the Commandant, U .S. Coast Guard, of the location and plans for the construction of a cable-stayed second span to the Ambassador Bridge. That second span would be constructed across the Detroit River, just west of, and adjacent to, the current Ambassador Bridge, linking Detroit, Michigan with Windsor, Ontario. The new span would be constructed by DIBC in coordination with its commonly-owned Canadian counterpart, The Canadian Transit Company ("CTC"), an Ontario corporation. Both DIBC and CTC are owned by Centra, Inc., a Michigan corporation.

The Ambassador Bridge was completed in 1929, and currently serves as the busiest international crossing between the U.S. and Canada. The bridge was constructed pursuant to a 1921 federal statute authorizing the American Transit Company, a legal predecessor to DIBC, to build a bridge at that location, as well as comparable authorizing legislation enacted by the Canadian Government. DIBC became the assignee of the rights under this federal authorization in 1927, and has controlled the U.S. portion of the Ambassador Bridge since that time.

DIBC has determined that in light of the demands of modern transportation and security needs, that the public would benefit from a new span. That new span, which will consist of a total of no less than six lanes, would provide dedicated truck lanes for commercial traffic being transported under the

FAST and NEXUS programs, which programs are designed to enhance the flow of cross-border traffic consistent with modern security demands. The new span will thus improve efficiency and security, while serving the commercial demands for vital cross-border U.S.-Canada traffic for decades to come.

DIBC believes that its proposal for a second span proximate to the existing bridge offers the best location and highway connections for a new span across the Detroit River. Since the area where the second span would be located already accommodates the existing bridge, construction and operation of a new span would result in minimal disruption to the local community. In addition, substantial public and private resources have been devoted to improving and expanding the plaza areas at the foot of the Ambassador Bridge (the so-called Gateway Project) in anticipation of the construction of a second span. These improvements, already approved by federal and state authorities and now under construction, will enhance the efficiency of the clearance process and improve access between the bridge and I-75, which runs very close to the Ambassador Bridge and links the Bridge to the Interstate Highway System. The new span will share these same links, obviating the need to construct new highway and connector roads.

In addition, construction of a second span by DIBC will be undertaken entirely with private funds. Thus, public resources can be devoted to other projects and the construction project will not be dependent on federal or state appropriations. This will also enhance the speed with which the second span can be constructed. In that regard, DIBC anticipates that construction of the bridge could begin shortly after all authorizations are granted by the U.S. and Canada, and that the new span could be operational by 2009.

U.S. legal authority for the proposed second span is found in the 1921 Congressional authorization to construct the Ambassador Bridge, as well as in the authorization sought by this application under the Bridge Act of 1906. Further, by the attached letter, the U.S. State Department has confirmed that no Presidential Permit need to be sought for the construction of the second span. Since the second span would be an international bridge, the laws of the State of Michigan do not require DIBC to obtain state approval for the location of the second span.

Plans and specifications for the new span have previously been provided to your office by DIBC, consistent with the USCG's regulations and guidelines for applications for new bridges. These materials demonstrate that the planned new span will not pose an impediment to navigation.

Apart from the approval sought by this application from the USCG, DIBC is not aware of any other U.S. federal agencies that must grant approvals, easements or take other actions for this project to proceed. DIBC has consulted, and will continue to consult with, other federal agencies that it believes would have an interest in the project, including the Federal Highway Administration, Department of Homeland Security (including the Bureau of Customs and Border Protection), U.S. Fish and Wildlife Bureau, General Services Administration and the U.S. Army Corps of Engineers. In addition, DIBC has previously submitted a Joint Permit Application to the Michigan Department of Environmental Quality under the provisions of the Clean Water Act and Michigan's Natural Resources and Environmental Protection Act, and a copy of that application has been previously supplied to USCG. DIBC and CTC are also consulting with Canadian Government entities and seeking appropriate approvals as is required from Canadian agencies.

With respect to environmental impacts, DIBC, through its consultants, has previously provided USCG with a March 31, 2006 document entitled, "Project Description and Type 2 Categorical Exclusion Environmental Documentation" ("March 31 Environmental Document"). This Document describes the environmental impacts of the second span, which are expected to be minimal. The Document also explains the basis on which USCG might determine that the construction of a second span meets the requirements for a categorical exclusion from further environmental review under the National Environmental Policy Act of 1969, as amended. Should USCG determine that any further environmental documentation is required for the project, DIBC is prepared to work with USCG to prepare that documentation. DIBC is also working with the Canadian Environmental Assessment Agency and has begun consultations with that agency and others on environmental review in Canada.

As far as DIBC is aware at this time, there are no publicly owned lands and no park, recreational areas, or wildlife or waterfowl refuge, or any land on which there are historic (including known archaeological) sites, that would be directly or significantly impacted by the proposed second span in the United States. The March 31 Environmental Document further addresses these matters, and notes while two parks are near the project area, they are not close enough to be affected. DIBC intends to consult with the State Historic Preservation Office concerning its project, and has already supplied information about the project to the SHPO. The project will not result in displacements or relocations (residences, businesses, people) in the United States and will not disproportionately affect minority or low-income populations under Environmental Justice requirements.

We look forward to your response to this Application letter and the other materials previously submitted to USCG by DIBC in connection with it. We also understand that notice of the Application will be published in the Federal Register.

Of course, should you have any questions, or require more information, please advise.

Respectfully,

[redacted]

Attorney for Detroit International
Bridge Company

cc: [redacted] USCG
[redacted] DIBC
[redacted], American Consulting Group