

Bonner, Cindy L CSNR:EX

From: Hobenshield, Lexa [Lexa_Hobenshield@kindermorgan.com]
Sent: Wednesday, February 8, 2012 10:23 AM
To: 'S22 Van Velzen, Wayne ENV:EX
Cc: S22 S22 ; 'John.Wilmshurst@pc.gc.ca'; Droppo, Mike; Back, Scott ENV:EX; Zimmerman, Ted FLNR:EX; 'terry@salmoconsult.com'; 'amsyslak@cpaws.org'; 'Thea.Mitchell@pc.gc.ca'; 'georgesmith@dccnet.com'; Goetz, Peter ENV:EX
Subject: Re: Agenda for Feb 1 TMLF meeting

Someone from JNP should confirm, but my understanding was that they spent their portion as part of the Pacific Palisades Centre. Don't have further details and should be confirmed.

----- Original Message -----

From: Roy Howard [mailto:S22]
Sent: Wednesday, February 08, 2012 11:18 AM
To: Van Velzen, Wayne ENV:EX <Wayne.VanVelzen@gov.bc.ca>
Cc: 'Niki Wilson' S22 ; 'Dave Poulton' <S22>; 'John Wilmshurst' <John.Wilmshurst@pc.gc.ca>; Hobenshield, Lexa; Droppo, Mike; Back, Scott ENV:EX <Scott.Back@gov.bc.ca>; Zimmerman, Ted FLNR:EX <Ted.Zimmerman@gov.bc.ca>; 'Terry Antoniuk' <terry@salmoconsult.com>; 'Anne-Marie Syslak' <amsyslak@cpaws.org>; 'Thea Mitchell' <Thea.Mitchell@pc.gc.ca>; 'George Smith' <georgesmith@dccnet.com>; Goetz, Peter ENV:EX <Peter.Goetz@gov.bc.ca>
Subject: Re: Agenda for Feb 1 TMLF meeting

Thank you Wayne!
-Roy

On Feb 8, 2012, at 9:49 AM, Van Velzen, Wayne ENV:EX wrote:

> Hello Roy,
>
> I'm not sure what the program is on the Jasper side but I can provide some details for the Mount Robson portion.
>
> Our 350K is in a fund administered by the Vancouver Foundation. The fund is known as the Mount Robson Provincial Park World Heritage Endowment Fund. The objectives of the fund are:
>
> - To increase public awareness, understanding and commitment to Mount Robson Provincial Park and its role as a World Heritage Site.
> - To support and increase the understanding of the conservation, education, scientific study and outdoor recreation values and activities in Mount Robson Provincial Park.
> - To develop and strengthen stewardship activities and partnership opportunities that comply with the park management plan and applicable legislation and support the park by encouraging local government, First Nations, private sector, community group and non-government contributions.
>
>
> The fund will sit and earn interest and hopefully collect additional donations until 2018 and then additional income and interest will be utilized on an annual basis to deliver on the objectives by means of an Advisory Group.
>
> All the best,
>

>
> Wayne Van Velzen
> Area Supervisor / BC Parks / Mount Robson BC Parks and Conservation
> Officer Service Division Ministry of Environment
> Phone: 250-566-4325
> Fax: 250-566-9777
> E Mail: wayne.vanvelzen@gov.bc.ca
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>
> -----Original Message-----
> From: Roy Howard [mailto: S22
> Sent: Friday, February 3, 2012 1:31 PM
> To: Niki Wilson
> Cc: Dave Poulton; John Wilmshurst; Lexa Hobenshield; Mike Droppo;
> Back, Scott ENV:EX; Zimmerman, Ted FLNR:EX; Terry Antoniuk; Anne-Marie
> Syslak; Thea Mitchell; George Smith; Van Velzen, Wayne ENV:EX
> Subject: Re: Agenda for Feb 1 TMLF meeting

>
> Hi folks,
> Thank you for a very productive meeting on Wednesday.
> It's a full-on sunny day in the Robson Valley and I'll bet you can
> even see the whole of Mt Robson. Lots of electrons going into my
> battery bank today! (for a change)

>
> Something I had thought of before but forgot at the meeting (George Smith reminded me when
I updated him) was to ask about the \$350K sums given to each of the parks. What specific
projects were undertaken and what role did the TMLF funding play in them? Did it totally fund
each project or was it just a portion of the total needed for what was accomplished? I think
this should be posted on our website in addition to everything else we have so far agreed to.

>
> Thanks.
> -Roy

>
> On Jan 30, 2012, at 1:51 PM, Niki Wilson wrote:

>> Hi all,
>>

>> Attached is the agenda for this Wednesday's meeting. Please let us know ASAP if we've
overlooked anything.

>>
>> I will be bringing lunch with me from Jasper. I have ordered an array of sandwiches/wraps,
including a vegetarian option. I will bring some coffee, a pot for boiling hot water for tea,
bottled water, and some baking, yogurt and fruit for snacks. There will not be a place nearby
to get anything else (closed for winter), so if there's something extra you need, please
either let me know, or bring it along. I, for one, do not travel without dark chocolate.

>>
>> The gas station will also be closed - Jasper and Valemount are the closest fill-ups.

>>
>> I'm looking forward to seeing you all. Travel safely, and we'll see you at 9:00am, PST in
Mount Robson. Call me with any questions.

>>

>> Best,
>> Niki
>>
>> <Trans Mountain Legacy Fund Steering Committee Agenda.docx>
>> _____ Niki Wilson BSc MEDES Box 344 Jasper, AB T0E 1E0
>> (o) 780-852-2269
>>
>> S22 !
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>>
>

Bonner, Cindy L CSNR:EX

From: Hobenshield, Lexa [Lexa_Hobenshield@kindermorgan.com]
Sent: Monday, January 30, 2012 3:12 PM
To: Zimmerman, Ted FLNR:EX; Back, Scott ENV:EX
Subject: RE: Travel to Mount Robson

Thanks Ted

I've already made my travel plans for tomorrow so will catch a ride bright & early with Scott on Wednesday.

Many thanks! Lexa.

-----Original Message-----

From: Zimmerman, Ted FLNR:EX [<mailto:Ted.Zimmerman@gov.bc.ca>]
Sent: Monday, January 30, 2012 2:51 PM
To: Hobenshield, Lexa; Back, Scott ENV:EX
Subject: Re: Travel to Mount Robson

Hi Lexa

I'm planning to leave tomorrow afternoon (Tues) so if that works better for you you're welcome to join me. Scott will be leaving on Wednesday AM as per his original plan.

I haven't booked accommodation yet but will likely stay at the Best Western in Valemount.

Cheers! Ted

----- Original Message -----

From: Hobenshield, Lexa [mailto:Lexa_Hobenshield@kindermorgan.com]
Sent: Monday, January 30, 2012 02:27 PM
To: 'Terry Antoniuk' <terry@salmoconsult.com>; 'Niki Wilson' S22 ;
'Dave Poulton' < S22 >; 'John.Wilmshurst@pc.gc.ca' <John.Wilmshurst@pc.gc.ca>
Cc: Zimmerman, Ted FLNR:EX; Back, Scott ENV:EX
Subject: RE: Travel to Mount Robson

Hi guys

I'm going to catch a ride from Prince George with Ted & Scott. We're planning to leave PG bright & early at 530am on Wednesday.

Cheers! Lexa.

-----Original Message-----

From: Terry Antoniuk [<mailto:terry@salmoconsult.com>]
Sent: Monday, January 30, 2012 2:15 PM
To: 'Niki Wilson'; 'Dave Poulton'; John.Wilmshurst@pc.gc.ca; Hobenshield, Lexa
Subject: RE: Travel to Mount Robson

The current plan is for us all to carpool in my truck. I'll plan to pick up Niki and food at 08:00, Lexa and Dave at Park Place Lodge at 08:20.

John you'll be stop number 2 at about 8:15 - where should we meet you?

T.M. (Terry) Antoniuk P.Biol., RPBio.

Salmo Consulting Inc.
PO Box 61071, Kensington RPO
Calgary, AB T2N 4S6
Phone: (403)-266-6363
Fax: (403)-266-6353

s22

"old mental models and decision habits are deeply ingrained; they do not change just because of a logical argument." (J.W. Forrester 1995).

-----Original Message-----

From: Niki Wilson [mailto:S22]
Sent: January-30-12 11:35 AM
To: Terry Antoniuk; Dave Poulton; John.Wilmshurst@pc.gc.ca
Subject: Travel to Mount Robson

Hello all,

I've heard from Terry and John this morning, both about coordinating a drive to the meeting in Robson. Terry has room for us all - John and Dave, does this work for you?

We will gain an hour, so if we leave here around 8:30 that would give us plenty of time. I have to pick up food from Coco's so if anyone would like me to pick up breakfast for them there, just let me know - we can pre-order, or meet there.

Terry - I called Anne-Marie, and she isn't coming to the meeting. She will follow up with Dave.

Cheers,
Nik

Niki Wilson BSc MEDes
Box 344
Jasper, AB
T0E 1E0
(o) 780-852-2269

S22

Bonner, Cindy L CSNR:EX

From: Hobenshiel, Lexa [Lexa_Hobenshiel@kindermorgan.com]
Sent: Thursday, January 26, 2012 10:49 AM
To: Back, Scott ENV:EX; Zimmerman, Ted FLNR:EX
Subject: RE: Feb 1 meeting

s22 I have booked a 1225pm flight back to Vancouver on the 2nd. I know that will be very tight if we stay in Valemount but can change it if need be.

To confirm, departure time 530am?

s22

Thanks much! Lexa.

-----Original Message-----

From: Back, Scott ENV:EX [<mailto:Scott.Back@gov.bc.ca>]
Sent: Tuesday, January 24, 2012 1:38 PM
To: Hobenshiel, Lexa; Zimmerman, Ted FLNR:EX
Subject: RE: Feb 1 meeting

We can pick you up at your hotel. Just let us know where you will be staying. Let's say we will travel back on Wednesday but depending on weather and time, we should leave the option open for staying overnight.

Thanks,

Scott Back
Planning Section Head
Northern Region - Omineca
Ministry of Environment - BC Parks
250-614-9919 office
250-565-6940 fax

-----Original Message-----

From: Hobenshiel, Lexa [mailto:Lexa_Hobenshiel@kindermorgan.com]
Sent: Tuesday, January 24, 2012 1:25 PM
To: Back, Scott ENV:EX; Zimmerman, Ted FLNR:EX
Subject: RE: Feb 1 meeting

I am fine with leaving early in the morning. WRT traveling back, I will leave it to you as I just appreciate tagging along.

I will make arrangements to fly to Prince George on Tuesday evening & return fly back on the 2nd. Just let me know where you want me to meet you on Wednesday morning.

Cheers! Lexa.

-----Original Message-----

From: Back, Scott ENV:EX [<mailto:Scott.Back@gov.bc.ca>]
Sent: Tuesday, January 24, 2012 1:21 PM
To: Hobenshiel, Lexa; Zimmerman, Ted FLNR:EX

Subject: RE: Feb 1 meeting

Hi Lexa and Ted,

s22

I will

be leaving at 5:30am on Wednesday morning. I was hoping for a later start but that's okay.

Are you both okay with that or do you prefer going out on Tuesday?

Also, Niki booked the meeting until 4pm but she doesn't think it will take that long. If you do come out with me, do you want to come back same day or stay overnight in Valemount on Wednesday?

Thanks,

Scott Back
Planning Section Head
Northern Region - Omineca
Ministry of Environment - BC Parks
250-614-9919 office
250-565-6940 fax

-----Original Message-----

From: Hobenshiel, Lexa [mailto:Lexa_Hobenshiel@kindermorgan.com]
Sent: Monday, January 23, 2012 6:54 PM
To: Back, Scott ENV:EX; Zimmerman, Ted FLNR:EX
Subject: Re: Feb 1 meeting

Thank you. I believe the meeting starts at 9am.

Please let me know what your travel plans are and I'll book my flight accordingly.

Cheers! Lexa.

----- Original Message -----

From: Back, Scott ENV:EX [<mailto:Scott.Back@gov.bc.ca>]
Sent: Monday, January 23, 2012 06:10 PM
To: Hobenshiel, Lexa; Zimmerman, Ted FLNR:EX <Ted.Zimmerman@gov.bc.ca>
Subject: RE: Feb 1 meeting

Hi Lexa,

I am sure you can catch a ride with us from PG. I don't know the start time but hoping we can drive out on the same day. Coming back will depend on meeting length.

Ted: I will book a vehicle tomorrow.

Thanks,
Scott

From: Hobenshiel, Lexa [Lexa_Hobenshiel@kindermorgan.com]
Sent: January 23, 2012 2:17 PM
To: Zimmerman, Ted FLNR:EX; Back, Scott ENV:EX

Subject: Feb 1 meeting

Gentlemen

Are you two planning to attend the Feb 1 TM Legacy Fund meeting at Mt Robson?

Would it work for me to tag along? If so, what are your travel plans?

I need to decide how I am getting to Mt. Robson &

s22

s22

Thanks!

Lexa Hobenshield

s15

Manager, External Relations

o: 604.268.3013

s22

7815 Shellmont Street

Burnaby, BC V5A 4S9

Goetz, Peter ENV:EX

From: Ferguson, Donna [Donna_Ferguson@kindermorgan.com]
Sent: Thursday, March 1, 2012 12:44 PM
To: Van Velzen, Wayne ENV:EX
Cc: Toth, Greg; Goetz, Peter ENV:EX
Subject: RE: Mount Robson Park Use Permit
Attachments: image001.jpg

I too will have to do some investigative work. If it falls within our original 60 ' (18.2m) r/w then it would be 166.68 square metres. If we are within this and strictly in the restorative phase, should the annual fees not be based on this instead? I'm not sure when construction was completed.

We do not pay an annual fee for PG9710006 – I believe it was paid upfront for the full period. In Clause 3.01 the Permit Fee is stated as “non-applicable” until at least renewal as of June 30, 2029. I guess I was confused why another Permit was issued since PG971006 covers “laying down, construction operation, maintenance, inspection, alteration, removal, replacement, reconstruction and/or repair of one or more pipelines”. I would have thought there would have just been an addendum.

I'll get back to you with respect to the present ha.

Thanks.

From: Van Velzen, Wayne ENV:EX [<mailto:Wayne.VanVelzen@gov.bc.ca>]
Sent: Thursday, March 01, 2012 12:09 PM
To: Ferguson, Donna
Cc: Toth, Greg; Goetz, Peter ENV:EX
Subject: RE: Mount Robson Park Use Permit

Hello Donna,

As you know, there are 2 permits.

PG9710006 - July 1, 1999 – June 30, 2029. It authorizes the **operation** of one or more pipelines and as you can see, is long term. As near as I can tell, the annual fee is \$1,000 but I need to check on that. The \$1,000 annual fee does not seem to comply with Schedule K, Part 3, Item 4 Column 3 of the Park, Conservancy and Recreation Area Regulation.

PG0710287 (101929) – August 1, 2007 – July 31, 2013. It authorizes everything associated with the **construction** of the pipeline. The fact that it goes to 2013 is to cover the term of the post construction restoration. The annual fee for this permit is \$13,801.20 based on the rate of \$1,000 per year or \$60 per hectare, whichever is greater. As 216.3 ha were required during the construction phase, the greater of the two fees applied.

The total ha in PG0710287 included extra work space, additional access point etc. I would expect that the total ha would be somewhat less now that construction is complete.

Could Kinder Morgan provide a figure for total ha for what is on the land now. That would be ROW width X ROW length = total ha. That will influence the permit fee.

I will check with the Permit Bureau on the annual fee for PG9710006 to determine if a flat rate applies or if a per hectare rate applies.

I hope that clears things up Donna.

All the best,

Wayne Van Velzen

Area Supervisor / BC Parks / Mount Robson
BC Parks and Conservation Officer Service Division
Ministry of Environment
Phone: 250-566-4325
Fax: 250-566-9777
E Mail: wayne.vanvelzen@gov.bc.ca

From: Ferguson, Donna [mailto:Donna_Ferguson@kindermorgan.com]
Sent: Thursday, February 23, 2012 10:55 AM
To: Van Velzen, Wayne ENV:EX
Subject: FW: Mount Robson Park Use Permit

s22

What's the status on this? Were you able to determine if one is defunct now?

From: Ferguson, Donna
Sent: Wednesday, February 01, 2012 8:51 AM
To: 'Van Velzen, Wayne ENV:EX'
Subject: RE: Mount Robson Park Use Permit

Just wanted clarification between this Permit 101929 and PG9710006 – do we still have both or does this new one replace the PG one. Also, wanted confirmation about the yearly fees. I wasn't involved in the Anchor Loop but since this new Permit commences August 1, 2007 I presume payments or something was made until these new fees for 2010/2011?

From: Van Velzen, Wayne ENV:EX [<mailto:Wayne.VanVelzen@gov.bc.ca>]
Sent: Wednesday, February 01, 2012 8:20 AM
To: Ferguson, Donna
Subject: RE: Mount Robson Park Use Permit

Hello Donna,

Could you please document key areas of concern / discussion for me then we can go from there.

Thanks,
Wayne

From: Ferguson, Donna [mailto:Donna_Ferguson@kindermorgan.com]
Sent: Tuesday, January 31, 2012 8:58 AM
To: Van Velzen, Wayne ENV:EX
Subject: Mount Robson Park Use Permit

Wayne, what would be the best time for Bob Love and I to give you a quick call to discuss the draft Permit? Thanks.

Donna Ferguson
Land & Right-of-Way Representative
Trans Mountain Pipelines



7815 Shellmont Street
Burnaby, BC V5A 4S9
Direct Tel: (604) 268-3094
Fax: (604) 268-3001
Cell: (604) 999-6334



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From: Mears, Margaret [Margaret_Mears@kindermorgan.com]
Sent: Thursday, March 8, 2012 2:57 PM
To: Van Velzen, Wayne ENV:EX; 'Thea.Mitchell@pc.gc.ca'
Cc: Leier, Ryan; Droppo, Mike
Subject: 2012 Anchor Loop Team

Hi Wayne and Thea

I wanted to give you a heads up that Kinder Morgan is in the process of transitioning Ryan Leier, EHS Coordinator to manage the Post Construction Monitoring and remedial restoration field programs for 2012.

Mike Droppo, Manager EHS will provide senior review and advice. My focus will be shifting to planning future development projects. Ryan had a considerable amount of involvement in the programs last year and is familiar with the issues and processes we have in place. David Novak and Amanda Schultz from TERA Environmental will continue to provide excellent leadership to our field crews. Scott Balanytne will continue to manage the weed control program and has worked with Ryan on operational weed programs. We will be using the same weed control contractors again this year: West Country Oilfield for chemical control and Ken Dutkiwich Trucking for mechanical control.

If you have any questions please give me a call or send an email.

All the best,

Margaret Mears, M.Sc. P.Biol
Environmental Lead
(403) 514-6462

Web: www.kindermorgan.com/pipelinesafety
Call Before You Dig
BC One Call: 1.800.474.6886 or cell *6886
Alberta One-Call: 1.800.242.3447

Not Responsive

Not Responsive

Not Responsive

From: David Poulton [mailto: S22 |]
Sent: Tuesday, January 24, 2012 1:20 PM
To: Van Velzen, Wayne ENV:EX
Subject: FW: TMX Anchor Loop Net Benefits Paper

Hi Wayne,

I hope you are doing well. Many apologies for this, but I seem to have left you off the mailing list when I sent this note out yesterday. I would certainly appreciate your feedback on the direction I am taking with this paper.

I will be in your shop on Feb 1 for meeting of the KMC Legacy Steering Committee. Hopefully we can talk then if not before.

Cheers,

Dave

s22

From: David Poulton [mailto: S22]
Sent: January-23-12 3:01 PM
To: George Smith (georgesmith@dccnet.com); Antoniuk Terry (terry@salmoconsult.com); Howard Roy (roy@fraserheadwaters.org); Wilson Niki (S22); Phillipe Reicher (preicher@cepa.com); Thomas Ifan (ifan.thomas@pc.gc.ca); Heffler Howard s22 ; Rob McManus (Rob.McManus@ercb.ca)
Cc: Lexa Hobenshield (lexa_hobenshield@kindermorgan.com)
Subject: TMX Anchor Loop Net Benefits Paper

Hi everyone, especially to those who I have not seen in a while,

I have been accepted to present a paper on the TMX Anchor Loop net benefits experience to the International

Pipeline Conference in Calgary at the beginning of September. I am attaching a copy of the abstract I submitted to the conference organizers, and a detailed outline of my current plan for the paper.

I intend to put my head down and do the bulk of the writing on this in the next couple of weeks. I may be contacting you to hear your version of events, or get your general thoughts, so I hope you can find a bit of time for me if needed. On the other hand, if this stimulates some thoughts which you can't wait to share, feel free to call me first.

Cheers,

Dave

s22

PS: Philippe, please feel free to share this with Brenda if you wish.

February 23, 2012

Margaret Mears
Environmental Lead
Kinder Morgan Canada Inc.
2700, 300 – 5th Avenue S.W.
Calgary, Alberta T2P 5J2

Dear Mrs. Mears,

**RE: Kinder Morgan Canada Inc., TMX - Anchor Loop Pipeline Project
Erosion and Sediment Control Plan to be Implemented at Seven Disturbances Located at
Five Sites (KL 419.5, KL 419.7, KL 424.65, KL 424.95 and KL 425.95) Adjacent to the CN and
TMX – Anchor Loop Rights-of-way in Mount Robson Provincial Park, British Columbia**

1.0 INTRODUCTION AND PROJECT OVERVIEW

TERA Environmental Consultants (TERA) was requested by Kinder Morgan Canada Inc. (Kinder Morgan) to develop an erosion and sediment control (ESC) plan for the installation of a reinforced silt fencing (RSF) measure on seven disturbances at the following five sites on the TMX - Anchor Loop Project (the Project) right-of-way and the CN right-of-way in Mount Robson Provincial Park (MRPP) (see Figure 1):

- Site 1 – KL 419.5 (CN Albreda Mile 25.5);
- Site 2 – KL 419.7 (CN Albreda Mile 25.6);
- Site 3 – KL 424.65 (CN Albreda Mile 28.6);
- Site 4 – KL 424.95 (CN Albreda Mile 28.75); and
- Site 5 – KL 425.95 (CN Albreda Mile 29.4).

It has been observed that the soils located at the five sites have not stabilized. During the spring of each year, snow meltwater saturates the surface soils (soils have developed on highly erodible glaciolacustrine material) causing them to flow downslope, uprooting the grass vegetation that had established during the previous growing season. Non-reinforced silt fencing installed at a number of these sites in 2009 was observed to have contained the eroding soil (sediment), although the weight of the soil had collapsed the fencing at locations along its length.

Kinder Morgan wishes to use a RSF measure to effectively shorten the slope length, reduce the velocity of overland water flow and enable sediment to accumulate behind the RSF without the risk of measure failure (collapse). It is anticipated that the implementation of this measure will reduce soil erosion sufficiently to allow for the establishment of perennial vegetation and stabilization of the surface soils at the seven disturbances addressed in this plan.

TERA understands that Kinder Morgan will submit this plan to CN for their review and approval, and that the plan will include the following information:

- details of the ESC measure to be installed;
- figures depicting the measure installations at the seven right-of-way disturbance locations; and
- the program work plan for work to be completed on Kinder Morgan and CN rights-of-way in MRPP.

Kinder Morgan understands:

- that vehicle travel will be required along the CN right-of-way existing gravel road to access the five sites;
- CN representatives will be notified in advance of travel on CN lands;
- all work is north of the CN gravel access that runs parallel to the tracks; and
- where work is within 8 m of the nearest track, Kinder Morgan will arrange for a CN Protection Foreman prior to the work occurring.

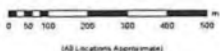
Based on discussions with Kinder Morgan, TERA assumes that Kinder Morgan will acquire all required site access and insurance prior to the commencement of the field program.

The attached Photoplates 1 to 7 depict the soil disturbances at each of the slopes which approximate locations of proposed silt fences sketched in.

FIGURE 1
ESC MEASURE INSTALLATION
AT FIVE DISTURBANCE SITES

- LEGEND
- Disturbance Site
 - TMX - Anchor Loop Project Pipeline
 - TMX - Anchor Loop Project Footprint
 - Existing Trans Mountain Pipeline (TMPL)
 - Klamath River (KR) on both Existing and Proposed Pipeline
 - Klamath Loop (KL) on Proposed Pipeline
 - Klamath River (KR) on Existing Pipeline
 - Potential Temporary Workspace and Storage Area
 - Proposed Construction Access Route
 - CN Lands
 - Existing Access Road
 - Water Well
 - Visual Barrier
 - Wildlife Crossing/Trench Plug
 - Wildlife Feature
 - Rare Plant Location
 - Rare Plant Community End Point
 - Heritage Resource
 - Proposed Valve Location
 - Soil Break
 - Soil Investigation Site
 - Soil Sampling Site
 - Trans Mountain Pipeline Pump Station
 - Log Landing
 - Direction of Skidding
 - Slope Direction
 - Roadway
 - Trail and Cutline
 - Hydrology (Fisheries Potential)
 - Parks and Protected Areas

SCALE: 1:12,000



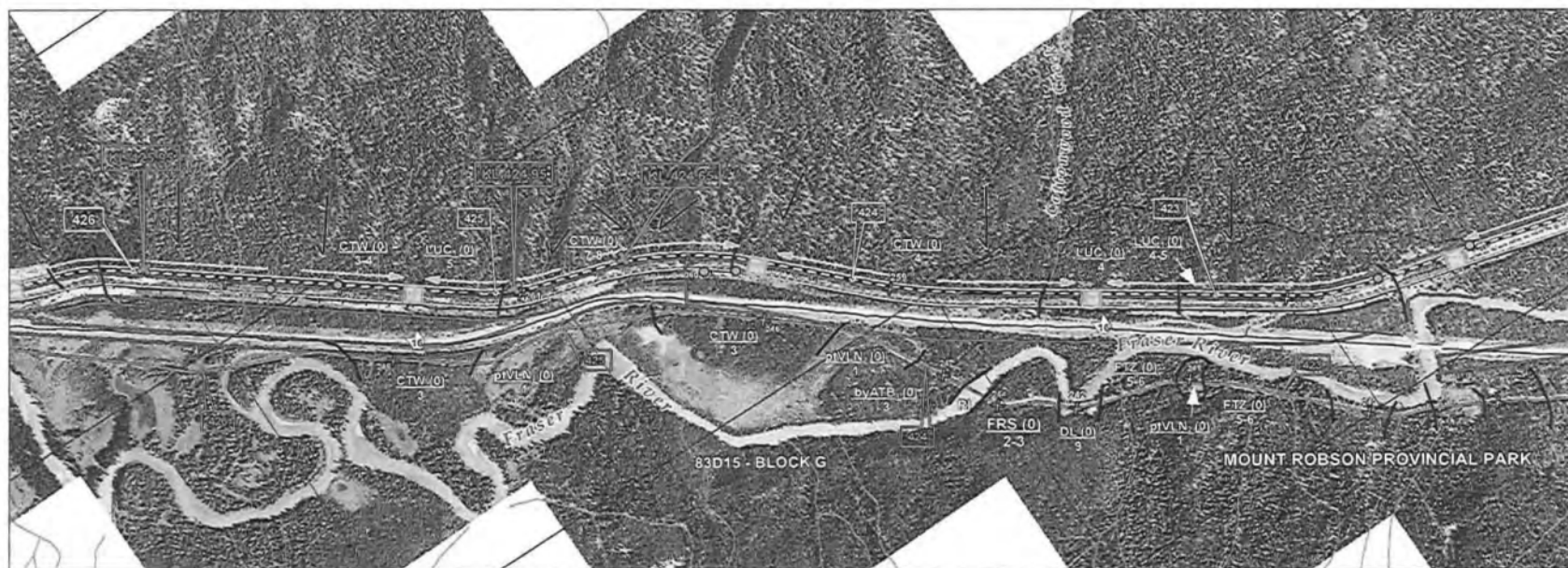
February 2012 8155

tera
ENVIRONMENTAL CONSULTANTS

PHOTOGRAPHY: KINDER MORGAN CANADA INC.
DATE OF PHOTOGRAPHY: 2005

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

8155_N_3739_Fig1_Rev1_21Feb2012.mxd



2.0 SITE DESCRIPTION

2.1 General Description

The seven disturbances are located on the Kinder Morgan TMX – Anchor Loop and CN rights-of-way between KL 419.5 and KL 425.95 of the Project right-of-way in MRPP. The Project right-of-way was constructed parallel, to the north and upslope of the CN right-of-way in 2008. During construction, grading was required on the steep right-of-way side slopes to facilitate pipe installation; as expected, these activities also disturbed portions of the CN right-of-way located downslope of the Project right-of-way. As a result of construction clearing and grading activities, right-of-way segments that contain highly erodible glaciolacustrine material were exposed on slope gradients that range from 50%-90%. During construction final clean-up and restoration, the disturbed bank cuts were recontoured, track packed (textured), and seeded with native grass seed mix and native grass cover crop seed. Beginning in the spring of 2009, snow melt water originating from upslope closed coniferous forests, has saturated the surface soils within the disturbance locations and resulted in soil erosion. This seasonal process, in addition to the sparse vegetation that has established, steep slope gradients and a southwest aspect that reduces rain and snowmelt water infiltration into the soil, have contributed to the challenge of establishing vegetation under current conditions.

An access road parallels the CN rail line and is located at the base of the slope adjacent to the five sites. A minimum of four sites will require measure installation directly adjacent to the access road on CN right-of-way land.

Soil erosion events that have occurred each spring since the completion of final clean-up and restoration activities in fall 2008 have deposited sediment into the bar ditch between the CN access road and toe of the slope.

2.2 Site Details

Seven disturbances at five sites located on the CN and Kinder Morgan rights-of-way will receive RSF and native grass seed mix/cover crop seeding measures in the spring of 2012 adjacent to the CN rail line in MRPP. Plates 1 to 7 provide an approximate visual depiction of the planned RSF measures installation at the seven disturbance sites.



Plate 1 View northwest of the approximately 25 m wide by 15 m long disturbance located at KL 419.5 (May 24, 2011).



Plate 2 View east of the approximately 20 m wide by 7 m long disturbance located at KL 419.7 (May 24, 2011).



Plate 3

View west of the approximately 50 m wide by 6 m long disturbance at the toe of the slope located at KL 424.65 (May 24, 2011).

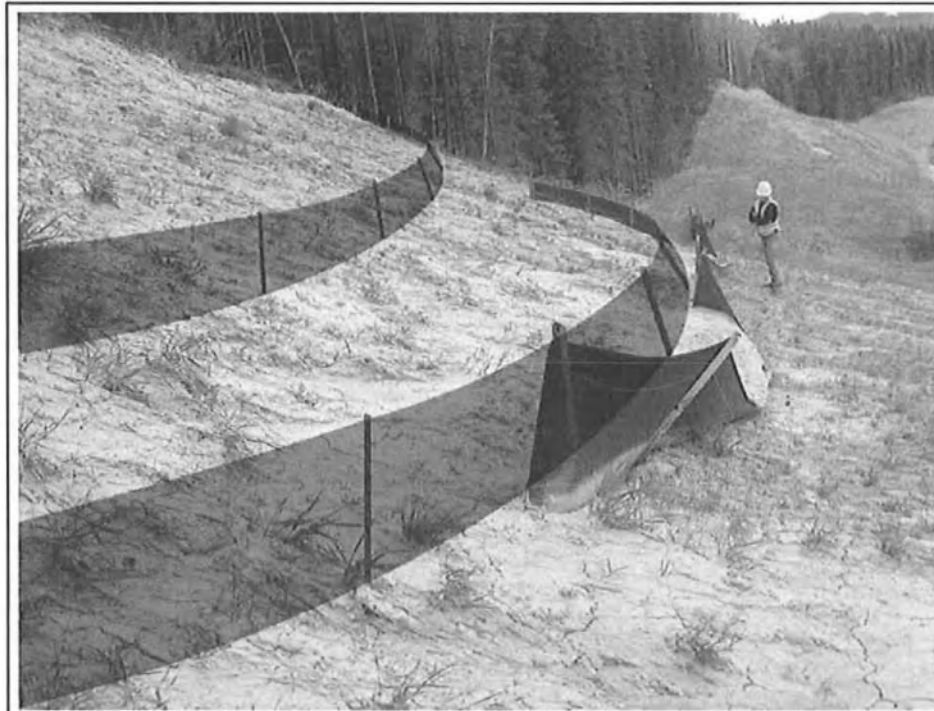


Plate 4

View east of the approximately 40 m wide by 20 m long disturbance at the top of the slope located at KL 424.65 (May 24, 2011).



Plate 5 View north of the approximately 25 m wide by 20 m long disturbance at the east side of the slope located at KL 424.65 (May 24, 2011).

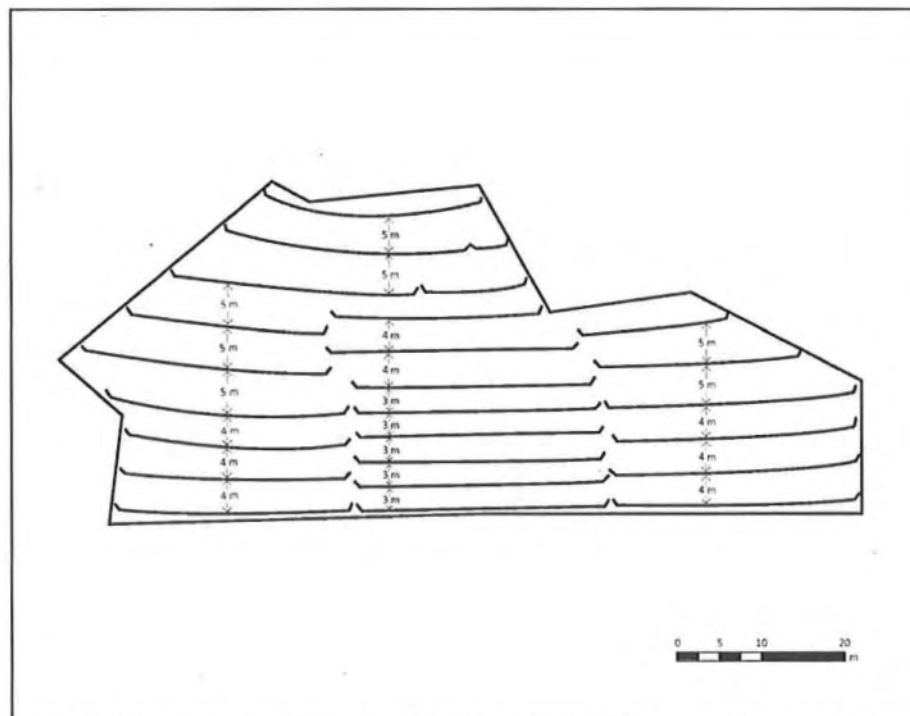


Plate 6 Illustration of the approximately 80 m wide by 45 m long disturbance polygon and proposed RSF spacing at the slope located at KL 424.95.

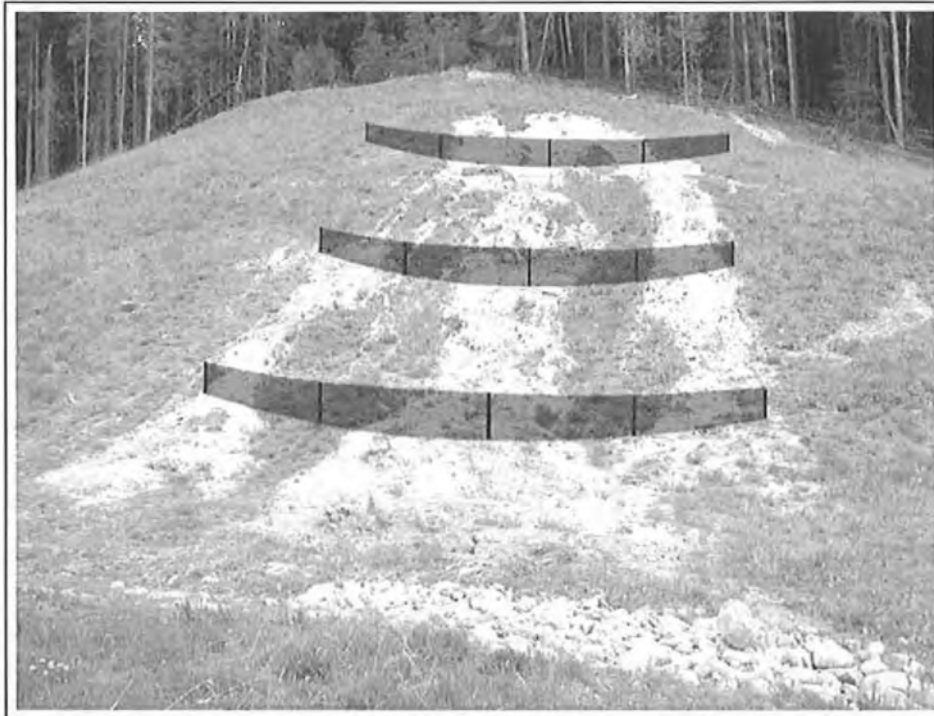


Plate 7 View northeast of the approximately 15 m wide by 25 m long disturbance at the slope located at KL 425.95 (May 24, 2011).

3.0 SCOPE OF WORK

Vegetation establishment at the seven disturbances has been monitored since 2009. Monitoring has indicated that soil erosion occurs each spring despite the modest grass establishment that occurs during the growing season of each year. Therefore, soil erosion control measures are required to facilitate the establishment of *permanent* vegetation at these disturbances. Silt fencing effectively reduces slope length (*i.e.*, reduces water velocity and erosion potential) and has been shown to capture sediment that would otherwise be transported to the bottom of the slope. The scope of work is detailed as follows.

- All CN and Kinder Morgan safety and operational procedures pertaining to work on sloping terrain, where a ground disturbance will be created or where work will be conducted adjacent to a CN rail line, will be discussed and implemented prior-to and during the program activities.
- Appropriate spacing of RSF will be determined to achieve the objectives of the program at each disturbance.
- Only manual or mechanical hand tools will be required to efficiently and effectively install RSF and in particular, soil anchors and t-posts into the slope soils. The only large machinery will be vehicles used to travel the sites on the existing CN access adjacent to the tracks.
- All garbage and materials will be removed from all work sites and disposed of appropriately.
- RSF monitoring will be conducted to verify the effective operation of the RSF and to determine the effect of the RSF installation on permanent vegetation establishment on the disturbances.

3.1 CN and Kinder Morgan Safety

Kinder Morgan contractors are required to complete the CN Contractors Orientation Course each year. The CN training, in addition to the Kinder Morgan safety guidelines established for the TMX – Anchor Loop Project, Trans Mountain Pipeline operational safety guidelines and the Job Safety Analysis that is completed each morning and updated throughout the day as required by the contractor, will ensure that program activities are conducted in a safe manner. Program safety procedures for work adjacent to the CN rail line are as follows:

- Kinder Morgan will work with its contractors to ensure all facilities are marked prior to program implementation and ground disturbance procedures are followed and documented;
- Kinder Morgan will provide a schedule of activities to CN for the program and these activities will be confirmed with the CN representation each morning prior to the commencement of work; and
- should the scheduling or nature of the program activities change at any time, Kinder Morgan will notify the CN representative and discuss with them the proposed work plan changes.

3.2 Reinforced Silt Fencing Measure

A RSF measure has been chosen to achieve the program goals of reducing soil erosion at the seven disturbances, reducing sedimentation of the bar ditch adjacent to the CN access road and the slope toe, effectively accumulating sediment on the uphill side of the RSF and modifying the slope soil/water dynamics that would enable vegetation to permanently establish.

Components

The RSF measure is comprised of five components as follows (see Drawing 8155-1):

- permeable geo-synthetic UV stabilized filter fabric allows for the free passage of surface water while retaining sediment;
- 16 gauge wire mesh is used as filter fabric backing to allow added sediment support;
- 120 cm high steel t-posts spaced 3 m along the length of the RSF to provide vertical support;
- duck bill soil anchors are driven into the soil uphill of the silt fencing to provide support to the t-posts; and
- steel cable connects the soil anchor to the top of the t-posts.

The RSF components have been designed to create an integrated system that, when installed correctly, effectively filters overland water flow and stores sediment.

Spacing Requirements

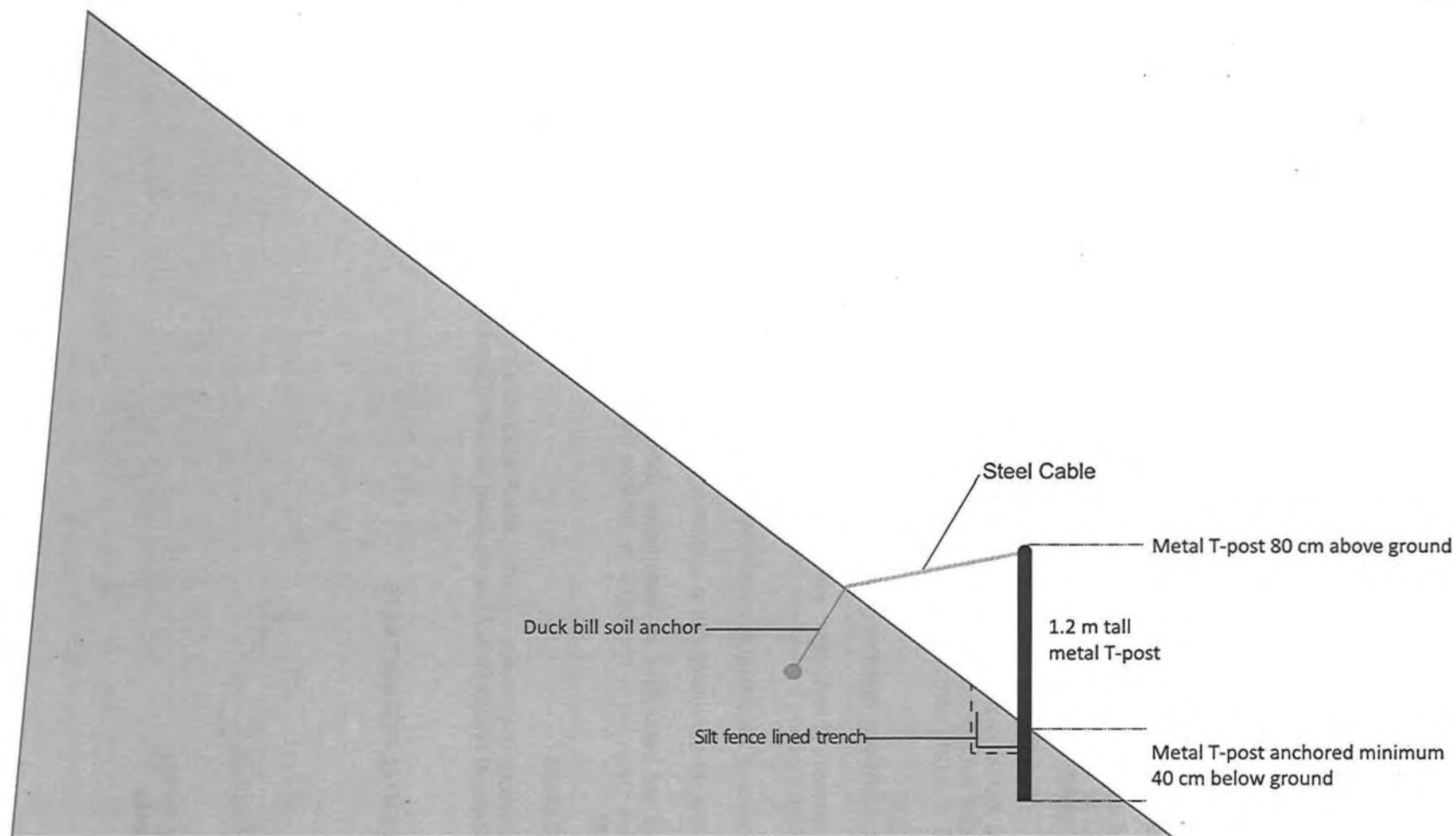
Industry best management practices information was used to determine the appropriate spacing requirements for the RSF measure on the seven disturbances (see Plates 1 to 7). Due to the steep slope gradient and long slope length (increasing the potential for the production of sediment) observed at the disturbance located at KL 424.95, the Revised Universal Soil Loss Equation (RUSLE) was used to estimate the expected yearly loss of soil from the disturbed slope before and after measure installation. Using slope data collected at the KL 424.95 site in May 2011, the RUSLE equation estimates an 85% reduction of soil loss from the slope following the installation of the RSF measure at the prescribed slope spacing.

Installation Procedure

Kinder Morgan and its contractor(s) will ensure that all safety requirements have been addressed each day prior to the commencement of work on or adjacent to the CN right-of-way.

The RSF measure installation at the seven disturbance locations will be completed by implementing the sequence of activities as follows:

- delineate (with pin-flags) the position of the t-posts along the contour of the slope;
- hand excavate a trench 15 cm deep by 15 cm wide adjacent to and upslope of the pin-flags along the contour of the slope, minor soil recontouring is required (removal of erosion rills) where RSF is to be installed to eliminate the potential for undermining of the RSF by surface water;
- unroll a length of RSF and position the integrated t-posts in approximately the same position as where the pin-flags are located adjacent to the excavated trench;
- drive the t-posts into the slope soil to a depth of approximately 40 cm using a sledgehammer or hand held post-pounder, ensuring the t-posts remain in a vertical position and the filter fabric/wire mesh is tight between the t-posts;
- place the bottom portion of the filter fabric/wire mesh along the sides and bottom of the excavated trench and then backfill the trench with the excavated soil and walk over the trench to firm the soil;
- at a location directly upslope and at approximately the same horizontal height as the top of the t-post, secure the duckbill soil anchor (probe and cable) to the installation rod and then drive the probe (with cable attached)/rod combination into the soil to a depth of 60-75 cm using a sledgehammer or Hilti-hammer at an angle that is approximately perpendicular to the slope, unscrew the rod from the anchor probe and remove the rod from the soil – leaving the probe in the soil and the anchor cable exposed; and
- secure the anchor cable to the top of the t-post (add another length of cable if the anchor cable does not reach to the top of the t-post) and tighten.



TMX - Anchor Loop Pipeline Project

Reinforced Silt Fence

Dwg. 8155 - 1

February 23, 2012

KINDER MORGAN

tera
ENVIRONMENTAL CONSULTANTS
MOE-2012-00085

3.3 Native Grass Seeding

A non-attractant (grass species with reduced palatability to wildlife) native grass seed mix and native grass cover crop seed will be sown (broadcast) on all disturbances following the installation of the RSF measure at a rate of 20 kg/ha and 10 kg/ha, respectively. It is anticipated that the RSF measure installation will reduce soil erosion sufficiently that native grasses will have the opportunity to establish and stabilize surface soils.

3.4 Site Clean-up

Following the completion of program activities each day, materials, equipment and garbage will be removed from the work sites. Garbage will be deposited at an approved location.

3.5 Program Site Monitoring

During the year of measure installation (2012), success and effectiveness monitoring by TERA will be conducted in July as part of the scheduled Post-Construction Monitoring Program for the Project, following notable rainfall events and in the late summer/fall to observe grass establishment after one growing season.

It is recommended that monitoring of the seven disturbances be conducted in May of each subsequent year and again in late summer until the surface soils have stabilized sufficiently. Monitoring will include an evaluation of RSF measure performance, erosion control and grass establishment/soil stability at the disturbances.

The objectives of the follow-up monitoring are to:

- document the success of restoration and enhancement measures as determined by site stability and whether or not the measure installations are functioning as designed;
- assess the success of vegetation re-establishment (initiation of an early successional trajectory); and
- identify areas that remain susceptible to erosion or difficult to revegetate.

Areas of continued soil instabilities or revegetation deficiencies may result in the need to implement additional corrective measures in the future to achieve the Project's revegetation and erosion control goals for these sites.

4.0 CLOSING

If you have any questions or concerns regarding this Erosion and Sediment Control Plan, do not hesitate to contact me by phone at (403) 930-8222 or via email (dnovak@teraenv.com).

Sincerely,

TERA ENVIRONMENTAL CONSULTANTS



David Novak P.Ag, CPESC
Reclamation Specialist



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January 25, 2012

BC Ministry of Environment
P.O. Box 579
Valemount, British Columbia V0E 2Z0

To: **Wayne Van Velzen**
Mount Robson Area Supervisor

Dear Mr. Van Velzen

RE: **Trans Mountain Pipeline L.P. TMX - Anchor Loop Project**
Compensation Effectiveness Monitoring: 2011

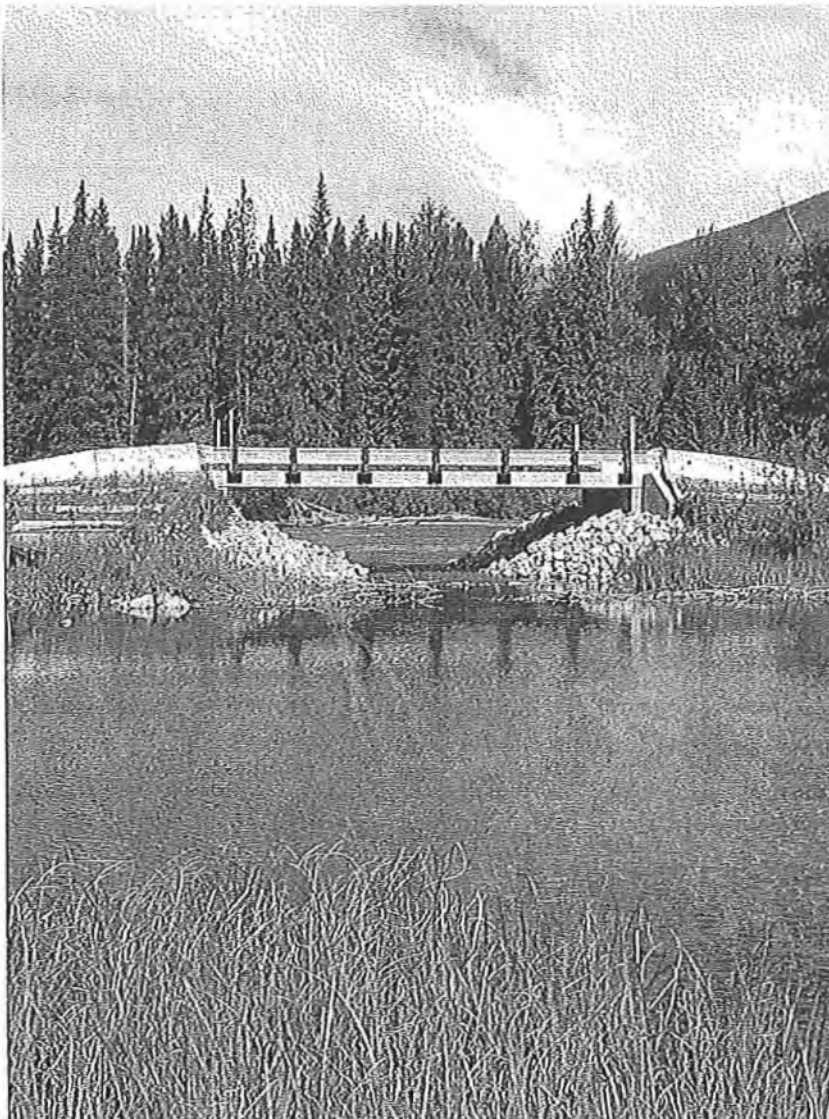
Kinder Morgan Canada Inc. (Kinder Morgan) has completed monitoring the HADD compensation sites in BC and a HADD Compensation Effectiveness report was prepared for Fisheries and Oceans. Please find one copy enclosed for your information.

Should you have any questions, please feel free to contact me by phone at (403) 514-6462 or by email at margaret_mears@kindermorgan.com.

Sincerely,
Kinder Morgan Canada Inc.

Margaret Mears, M.Sc., P.Biol.
Environmental Lead
TMX Anchor Loop Project

COMPENSATION EFFECTIVENESS MONITORING: 2011
For the TMX – Anchor Loop Project:
Mount Robson Provincial Park and British Columbia



Submitted to:

**Kinder Morgan
Canada Inc.**
Calgary, Alberta

Submitted by:

**GeoMarine
Environmental
Consultants Ltd.**

Calgary, Alberta

December 2011
File: GeoM11-02

DFO Authorization No:
ED-05-1582

COMPENSATION EFFECTIVENESS MONITORING: 2011
For the TMX – Anchor Loop Project:
Mount Robson Provincial Park and British Columbia

Submitted to:

Kinder Morgan Canada Inc.
Calgary, Alberta

Submitted by:
C. Bonnington

GeoMarine Environmental Consultants Ltd.
Calgary, Alberta

December 2011
File: GeoM11-02



DFO Authorization No:
ED-05-1582

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1 Project Compensation	1
1.2 Monitoring of Compensation Effectiveness – Rationale and Approach	4
Rationale	4
Determining Effectiveness	4
Approach	4
2.0 MRPP & BRITISH COLUMBIA COMPENSATION	5
2.1 Yellowhead Lake - Lucerne Station Road	5
Pre-Construction Fish Habitat	5
Compensation Works	5
Continued Compensation Effectiveness and Changes from Previous Year	5
2.2 Yellowhead Creek at Highway 16	6
Pre-Construction Fish Habitat	6
Compensation Works	6
Continued Compensation Effectiveness and Changes from Previous Year	6
2.3 Fraser River Back Channel	7
Pre-Construction Fish Habitat	7
Compensation Works	7
Continued Compensation Effectiveness and Changes from Previous Year	8
2.4 Tributary to Fraser River	8
Pre-Construction Fish Habitat	8
Compensation Works	8
Continued Compensation Effectiveness and Changes from Previous Year	9
3.0 SUMMARY	9
3.1 Maintenance Completed in 2011	9
3.2 Overall Compensation Effectiveness	9
4.0 REFERENCES	10

LIST OF FIGURES

FIGURE 1	REGIONAL LOCATION OF THE TMX – ANCHOR LOOP PROJECT, AND COMPENSATION SITES	3
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LIST OF TABLES

TABLE 1	FISH HABITAT COMPENSATION PROJECTS IN MRPP & BC FOR THE TMX - ANCHOR LOOP PROJECT	2
---------	---	---

APPENDICES

APPENDIX A	COMPENSATION SITE DATA AND PHOTOGRAPHIC RECORD	12
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LIST OF PLATES (WITHIN APPENDIX A)

PLATE 1	YELLOWHEAD LAKE: VIEW NORTHWEST (DOWNSTREAM) TOWARDS NEW BRIDGE (AUGUST 7, 2011).	15
---------	---	----

PLATE 2	YELLOWHEAD LAKE: VIEW NORTHEAST ACROSS DOWNSTREAM FACE OF NEW BRIDGE (AUGUST 7, 2011).	15
PLATE 3	YELLOWHEAD LAKE: VIEW NORTH ALONG BRIDGE APPROACH RAMP (AUGUST 7, 2011).	16
PLATE 4	YELLOWHEAD LAKE: VIEW SOUTH ALONG UPSTREAM CORNER OF LEFT BANK, SHOWING ESTABLISHING RIPARIAN PLANTING (AUGUST 7, 2011).	16
PLATE 5	YELLOWHEAD CREEK: VIEW DOWNSTREAM FROM HIGHWAY 16 SHOWING OUTLET POOL DEPTH UNDER MODERATE FLOW (AUGUST 7, 2011).	19
PLATE 6	YELLOWHEAD CREEK: VIEW DOWNSTREAM TOWARDS CULVERT INLETS UNDER HIGHWAY 16 (AUGUST 7, 2011).	19
PLATE 7	YELLOWHEAD CREEK: VIEW DOWNSTREAM THROUGH WEST CULVERT UNDER MODERATE FLOW CONDITIONS SHOWING TURBULENCE CREATED BY BAFFLES (AUGUST 7, 2011).	20
PLATE 8	YELLOWHEAD CREEK: VIEW UPSTREAM TOWARDS CULVERT OUTLETS SHOWING INUNDATION OF BOTH CULVERT OUTLETS (AUGUST 7, 2011).	20
PLATE 9	YELLOWHEAD CREEK: MATURE RAINBOW TROUT REARING IN CULVERT OUTLET POOL (AUGUST 7, 2011).	21
PLATE 10	FRASER BACK CHANNEL: VIEW UPSTREAM THROUGH NEW CHANNEL SHOWING THE TWO LOG WEIRS AND COBBLE LINED POOL CREATED UNDER BRIDGE DECK (AUGUST 7, 2011).	24
PLATE 11	FRASER BACK CHANNEL: VIEW DOWNSTREAM FROM EAST EDGE OF BACK CHANNEL (AUGUST 7, 2011).	24
PLATE 12	FRASER BACK CHANNEL: VIEW NORTH ALONG LEFT BANK APPROACH RAMP SHOWING REGENERATING VEGETATION ON RAMP SHOULDERS (AUGUST 7, 2011).	25
PLATE 13	FRASER BACK CHANNEL: VIEW ALONG INSIDE EDGE OF RIGHT BANK BRIDGE APPROACH SHOWING ESTABLISHED RIPARIAN PLANTING (AUGUST 7, 2011).	25
PLATE 14	FRASER BACK CHANNEL: VIEW UPSTREAM ALONG LEFT BANK OF FRASER RIVER SHOWING SALVAGED AND PLANTED RIPARIAN VEGETATION (AUGUST 2, 2010).	26
PLATE 15	FRASER BACK CHANNEL: AS FOR PLATE 14, SHOWING SALVAGED AND PLANTED RIPARIAN VEGETATION GROWTH FROM PREVIOUS YEAR (AUGUST 7, 2011).	26
PLATE 16	FRASER BACK CHANNEL: VIEW INTO BACK CHANNEL FROM BRIDGE SHOWING PARTIAL BEAVER DAMN AUGMENTATION OF WEIRS AND COBBLE/BOULDER RIFFLE (OCTOBER 17, 2011).	27
PLATE 17	FRASER BACK CHANNEL: VIEW DOWNSTREAM ACROSS CHANNEL OUTLET SHOWING ACCESS INTO BACK CHANNEL FROM FRASER RIVER UNDER TYPICAL FALL LOW FLOWS (OCTOBER 17, 2011).	27
PLATE 18	FRASER TRIBUTARY: VIEW UPSTREAM THROUGH RESTORED CHANNEL SHOWING END OF LOGS PLACED ALONG THE TOE OF THE LEFT BANK SCOUR (AUGUST 10, 2011).	30
PLATE 19	FRASER TRIBUTARY: VIEW DOWNSTREAM THROUGH RESTORED CHANNEL FROM CORNER OF LEFT BANK (AUGUST 10, 2011).	30
PLATE 20	FRASER TRIBUTARY: VIEW TOWARDS LEFT BANK AND RESTORATION WORKS FROM RIGHT BANK (AUGUST 10, 2011).	31
PLATE 21	FRASER TRIBUTARY: VIEW TOWARDS RIGHT BANK FROM TOP OF LEFT BANK SHOWING GROWTH OF POPLAR STAKES IN PHOTO FOREGROUND (AUGUST 10, 2011).	31
PLATE 22	FRASER TRIBUTARY: VIEW TOWARDS UPSTREAM END OF LEFT BANK SHOWING POOL AND DEPTH THROUGH OUTSIDE OF MEANDER BEND (AUGUST 10, 2011).	32
PLATE 23	FRASER TRIBUTARY: VIEW DOWNSTREAM TOWARDS RESTORED BANK SHOWING COBBLE/GRAVEL BAR AT UPSTREAM EDGE OF RESTORED CHANNEL RIGHT-OF-WAY (OCTOBER 17, 2011).	32
PLATE 24	FRASER TRIBUTARY: VIEW OF LEFT BANK APPROACH SHOWING ESTABLISHING CEDAR ADDED TO RIPARIAN AREA IN 2011 (OCTOBER 17, 2011).	33
APPENDIX B	DFO AUTHORIZATION	34

1.0 INTRODUCTION

The TMX - Anchor Loop Project (the Project) involved construction of 8 km of 762-mm (30-inch) outside diameter (OD) pipe from west of Hinton, Alberta (KL 310.1) to the Hinton Pump Station (KL 317.7) and 151 km of 914-mm (36-inch) OD pipe from the Hinton Pump Station to a location near Rearguard, British Columbia (BC) (KL 468.0) (Figure 1). The pipeline traverses federal, provincial, and private lands, including Jasper National Park (JNP) in Alberta and Mount Robson Provincial Park (MRPP) in BC. Construction of the Project commenced in August 2007 and was completed in the fourth quarter of 2008.

A fish population and riverine habitat inventory was completed at each watercourse to determine the potential effects of trenched crossings of watercourses in Jasper National Park and Mount Robson Provincial Park (AAR 2005a, b, c, d, e, f and g). These data were presented to Fisheries and Oceans Canada (DFO) for review. DFO deemed that certain crossings would trigger harmful alteration, disruption, or destruction of fish habitat (HADD) given the instream work window or open-cut crossing method proposed. Kinder Morgan applied for, and was granted, Authorization under the *Fisheries Act* for those specific crossings (Authorization No. ED-05-1582) (Appendix B).

1.1 Project Compensation

A part of the HADD Authorization process requires the proponent develop an appropriate fish habitat compensation plan to offset any habitat lost or disrupted. A plan needs to ensure DFO's 'No Net Loss' guiding principle is met (DFO 1986, 1998). To this end, a compensation plan was developed for the TMX - Anchor Loop Project, presented to DFO, and subsequently approved (AAR 2007a, b).

As per Conditions 5.1 of the Authorization, the objective of the BC compensatory works is to increase productivity by enhancing fish habitat through the improvement of fish passage, construction of rock and woody debris instream structures and/or planting of riparian vegetation. These works will allow fish access to areas that were previously inaccessible either seasonally or permanently, and transform generally lower quality and degraded fish habitat to areas of higher quality habitat for spawning and/or rearing with functional riparian zones.

Implementation of the first of the four BC compensation projects began in late-2007 at the unnamed tributary to the Fraser River. Additional work was required at this site in 2009 to reinstall the compensation works. This additional work and implementation of the compensation projects at the other three sites was completed in fall 2009. Monitoring of the implementation of each project was previously reported to DFO in December of 2009 (AAR 2009). Monitoring carried out in 2010, the first year following implementation of each project, was reported to DFO in December, 2010 (AAR 2010). Monitoring in 2011 is therefore considered to be "year 2" for each site. Table 1 provides a summary of the compensation projects implemented.

TABLE 1

**FISH HABITAT COMPENSATION PROJECTS IN MRPP & BC
FOR THE TMX - ANCHOR LOOP PROJECT**

	Site Name and Waterbody	Compensation Project
1	Lucerne Station Road Yellowhead Lake	Replaced seven culverts with a single-span bridge
2	Yellowhead Creek at Highway 16	Constructed a series of stepped K/V-weir and pools to raise water levels at culvert exit
3	Fraser River Back Channel along TMPL right-of-way	Removed culvert / standpipe, replaced with single-span bridge and log weirs
4	Unnamed Tributary to Fraser River	Removed collapsed log bridge and restored and enhanced instream and riparian habitat

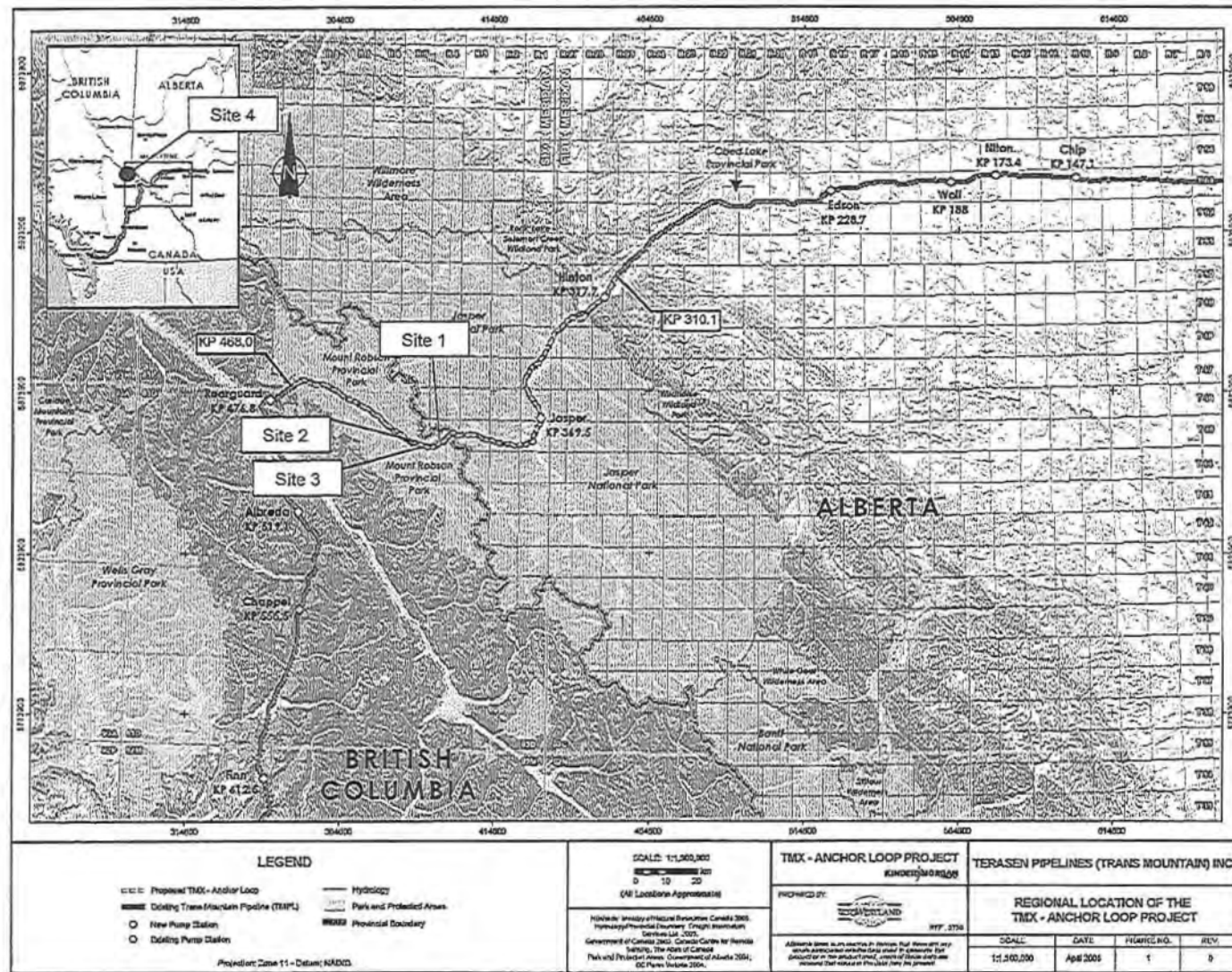


Figure 1 Regional Location of the TMX – Anchor Loop Project, and MRPP and BC Compensation Sites

1.2 Monitoring of Compensation Effectiveness – Rationale and Approach

Rationale

The Authorization requires post-construction monitoring of all BC compensatory habitat areas be conducted following high flows in the spring of years 1, 2, 3, and 5, following construction, with a cursory visit in year 10 (Appendix B). In addition, a second monitoring visit during fall low flow period in each monitoring year is also required. The purpose of the fall investigation during low flow is to confirm fish passage through each of the compensation sites, and that compensation objectives are being met under low flow conditions.

Determining Effectiveness

All compensatory habitat will be deemed to be functioning as intended if, in the opinion of DFO, the works or habitat are physically stable and it is apparent that the works are providing functional fish passage and instream habitat. Specific to BC within the Authorization, monitoring is also required to document enhanced habitat values, improved passage to fish, habitat usage, water quality parameters and physical stability of the works (Appendix B).

Condition 5.4 of the Authorization requires that riparian planting at compensation sites in BC show:

- a) That rooted stock be planted at a minimum density of 1 plant per 2 square meters,
- b) Tree and shrub species shall be comprised of species native to the local biogeoclimatic conditions, and
- c) 90% survival of all vegetation planted or replanted must be attained for a period of at least five years following planting

If monitoring indicates that 90% survival has not been achieved for the monitoring year, replacement planting shall be undertaken as soon as possible and before July 1st of that year. The number of plants requiring replacement must be documented annually.

In recognition of the poor vegetation growing conditions (poor soils, low soil moisture regime and exposure to drying winds) observed at the compensation sites in BC, it was determined that losses of planted rooted stock would be in excess of that outlined in 5.4c of the Authorization. To achieve the required minimum plant density after 5 years, the number of rooted stock that were installed at the four sites exceeded the *minimum plant density of 1 plant per 2 square meters* by up to 4 times.

Approach

Observations of the stability and structural integrity of each compensation site were made and compared to that documented immediately following implementation of each project (e.g., restored bed and banks, enhanced instream habitat, absence of movement barriers to fishes, stability of bridge abutments, and riparian areas). Water quality parameters including temperature, conductivity, pH and dissolved oxygen were measured at each site with a YSITM 556 Multi Parameter meter. Visual observations of fishes within restored habitat were made and deemed sufficient to show that restored (enhanced) habitat is being used and therefore functional.

A photographic record was collected from each site. Photos were taken from control points established during monitoring of the implementation of each compensation project and show the extent of the works and restoration achieved at each site. A comparison can also be made with those taken pre-construction (AAR 2009).

GeoMarine Environmental Consultants Ltd. (GeoMarine) was retained by Kinder Morgan to monitor the relative success of measures installed at each of the compensation sites. A Qualified Aquatic Environment Professional (QAEP) and field technician visited each site once during 7-10 August, 2011, and then again in the fall on 17 October, 2011.

2.0 MRPP & BRITISH COLUMBIA COMPENSATION

2.1 Yellowhead Lake - Lucerne Station Road

Pre-Construction Fish Habitat

Fish habitat at this site prior to construction was reported previously by AAR (2009). Culverts under Lucerne Station Road disrupted aquatic connectivity between east and west sub-basins of Yellowhead Lake. Removing all seven culverts and spanning the centre three with a bridge would increase connectivity between the sub-basins of Yellowhead Lake, improve access to nursery habitat, summer feeding and wintering habitat for all fishes within Yellowhead Lake. Improved connectivity between lake basins would not only benefit fishes, but all ecosystem components within Yellowhead Lake.

Compensation Works

Removal of all seven culverts and installation of a single-span bridge created a 6.0 m wide channel with a mean depth of 0.76 m at the time of construction (Appendix A: Plate 1 and 2). The channel was lined with gravel, cobble, and boulders to improve fish passage. Areas of gravel suitable for spawning were left at the downstream end of the channel. All benthic habitat outside of the constructed channel and revetment toe was left unaltered (*i.e.*, the deep hole downstream from the original centre culverts remains).

Continued Compensation Effectiveness and Changes from Previous Year

All compensation works carried out remain structurally sound, with materials as positioned at the time of implementation and no sign of erosion. Mature and juvenile rainbow trout were again observed moving upstream through the restored section of channel, and rearing (holding) at the downstream outlet and within the restored channel. Consequently, restored habitat is considered functional. Aquatic connectivity within Yellowhead Lake has been restored, with other aquatic species (*e.g.*, mergansers, Canada geese, and other species of fish) previously seen moving through the new channel (AAR 2009, 2010).

Depths within the restored section of channel at the time of the fall site visit ranged from 0.5-1.0 m, 0.25 m lower than depths recorded during the summer investigation.

Riparian vegetation continues to establish well at this exposed location (Appendix A: Plate 4). A current density of 1.8 plants per m² has been achieved to date. No additional plant material was added to the site this year. Birch and balsam poplar in particular, have established well at the base of each planting area. Grasses were also now present across the face of each slope. Observations of this site in 2011 indicate that the continued establishment of existing and

planted vegetation will in time emulate the adjacent riparian plant community in species, density and distribution.

2.2 Yellowhead Creek at Highway 16

Pre-Construction Fish Habitat

Fish habitat at this site prior to construction was reported previously by AAR (2009). During periods of high flow in Yellowhead Creek, two large culverts under Highway 16 were velocity barriers for fishes. At times of low flow, culverts outlets would become perched and a barrier to fishes migrating upstream. As such, fishes from the Fraser River and populations of fishes below the culverts had trouble gaining access to habitat available in Yellowhead Creek above Highway 16 and in Yellowhead Lake.

Compensation Works

A contractor was retained by Kinder Morgan to install baffles in the western most culvert underneath Highway 16 and construct a boulder weir and section of riffle at the outlet pool immediately downstream from the culverts. These measures were designed to reduce the hydraulic gradient within the culverts and also raise water levels and inundate their outlets during periods of low flow to ensure fish passage year-round. Addition of baffles to one of the culverts provided velocity breaks and improved fish passage upstream during periods of high flow. The installation of offset baffles also incorporated existing boulder clusters, which were found in the culvert at the time of construction.

As part of the compensation, construction of the boulder weir also increased the useable habitat downstream from the Highway 16 culverts, by increasing the pool depth and area of pool at the outlets. This pool is considered valuable rearing and wintering habitat for fishes within this reach of Yellowhead Creek. The weir now causes water to flow over the left bank gravel bar situated downstream from the culvert outlet pool, during all flow conditions (Appendix A: Plate 5). Before habitat enhancement, this gravel bar was often dry. Now, it will frequently be available as rearing habitat for juvenile rainbow trout and sculpin. Boulders were also installed downstream from the weir crest to provide instream velocity breaks (resting habitat) for fishes traveling upstream over the weir.

Continued Compensation Effectiveness and Changes from Previous Year

All compensation works carried out remain structurally sound, with materials as positioned at the time of implementation and no signs of erosion. There was also no evidence of debris caught by baffles within the west culvert.

No barriers (velocity or height) were observed during either the summer or fall site visit. Velocity immediately inside the inlets of both culverts was reported in 2010 (AAR 2010). During the fall low-flow visit in 2011, a depth of 0.1 m was recorded in the entrance of the east culvert (culvert without baffles), and the outlet to both culverts was inundated by 0.2 m. Coupled with the relatively low velocity, this would allow movement of both juvenile and adult fishes through the east culvert. The presence of a boundary layer was again observed against the corrugated walls of the western culvert, aided by the turbulence generated by the baffles. This would greatly improve the ability of smaller fishes to traverse this culvert during even moderate flows;

as was observed when several mature rainbow trout immediately moved upstream through the culvert following installation of the baffles (AAR 2009).

Young-of-the-year rainbow trout were observed rearing within the shallow pools along the margins of habitat made available by the control weir installed at the pool immediately downstream from the culvert outlets (Appendix A: Plate 5 and 8). Mature rainbow trout were observed within the outlet pool and enhanced riffle (Appendix A: Plate 9). Fish passage has been improved and all restored fish habitat is considered functional.

The addition of riparian vegetation to this site was not part of the original compensation plan, and no credit for this has been sought. Riparian vegetation is establishing well at this location. A current density of 1.5 plants per m² has been achieved to date.

2.3 Fraser River Back Channel

Pre-Construction Fish Habitat

Fish habitat at this site prior to construction was reported previously by AAR (2009). The Fraser River back channel is shallow, spring fed and flooded seasonally by the Fraser River. Multiple springs converge into this tributary that had been dammed and separated from the Fraser River by a causeway to provide access to the existing Kinder Morgan TMPL ROW. Flow between the back channel and the Fraser River was controlled via a vertical standpipe, perforated to maintain a minimum water level within the pond (back channel). The standpipe holes were small and the structure acted as a permanent barrier to fishes. Replacing the culvert with a 4.8 m wide channel and single-span bridge would restore connectivity between the back channel and Fraser River and could provide good spawning habitat for bull trout (and other fishes). The riparian area around the back channel is a valuable wetland, bounded by sedges and willows. Boreal toad and wood frog were observed during the initial audit of the site (AAR 2007b).

Compensation Works

Two, v-notched, log weirs, formed by bundling three ~350 mm diameter hemlock logs together, were installed to control water levels within the back channel to preserve wetland ecosystem that fringes the back channel (Appendix A: Plate 10 and 11). An additional boulder v-weir, closer to the new channel inlet, was also constructed. The weirs have created step-pools and velocity breaks for fishes to navigate easily between the river and back channel. The boulder v-weir improves substrate stability, making it more resistant to the high velocity scouring during spring freshet as well as forming a pool on the upstream side. Both sides of the weirs were sloped with cobble and gravel to create a riffle and remove any potential barrier to fishes. Notches were carved out of the log weirs to concentrate flow at those points to ensure adequate depth for fish movement upstream. Cover within the back channel was enhanced further with several sections of a felled fir added to the northern edge of the back channel.

In addition to opening up a section of Fraser River back channel, the compensation project also created new fish habitat previously occupied by the causeway and standpipe. The channel bed between the downstream log weir and the Fraser River was replaced with usable cobble and boulder substrate (Appendix A: Plate 10 and 17).

Continued Compensation Effectiveness and Changes from Previous Year

All compensation works carried out remain structurally sound, with materials as positioned at the time of implementation and no sign of erosion. With the exception of material added to the log weirs by beavers in 2009 (Appendix A: Plate 16), all weirs remain as built, with no barriers to the movement of fishes. No further beaver activity has occurred since the initial works reported in 2010 (AAR 2010).

Unidentified young-of-the-year were previously observed rearing within the sedges along the margins within the back channel (AAR 2010). Amphibians and wading birds (dippers) were observed feeding within the back channel marsh habitat. These observations, coupled with the adult mountain whitefish recorded accessing the back channel during implementation of the compensation works (AAR 2009), demonstrates that connectivity and restored aquatic habitat is functional for a range of aquatic species. During the fall low-flow visit, no barriers (velocity or height) were observed at any of the weirs or within the section of new channel (Appendix A: Plate 16 and 17).

Riparian vegetation has established in all areas where planted, with marked growth from the 2010 Investigations (Appendix A: Plates 12-15). A current density of 1.2 plants m² has been achieved to date.

2.4 Tributary to Fraser River

Pre-Construction Fish Habitat

Fish habitat prior to construction was reported previously by AAR (2009). BC Ministry of Environment (MOE) identified the collapsed bridge on this unnamed tributary to the Fraser River as a compensation opportunity. Partial collapse of the single-span timber bridge had forced flow into the left bank, scouring the upstream side of the bridge abutment and creating a loss of riparian habitat. It was expected that complete collapse of the timber bridge would compromise migration of resident or fluvial fishes in the area and pose a significant threat to the CN Rail bridge immediately downstream.

Compensation Works

Initial work to remove the bridge and restore the left bank took place on November 7, 2007, and was reported previously in an interim compensation completion report, submitted to DFO in March 2009 (TERA & AAR 2009). During a post-construction monitoring assessment in the summer of 2009, an issue with the restoration work carried out in 2007 was noticed. During spring freshet, water had undermined the downstream log used to protect the toe of the left bank. This continued sloughing and scouring along the bank, which the restoration had aimed to halt.

Additional restoration works were carried out in the fall of 2009 to correct the issues noted during the summer monitoring visit. Because the left bank at this location is on the outside of a meander bend, it is susceptible to higher velocities and erosion during spring freshet and storm events. To prevent further erosion of this bank, large cedar logs were used to armour the left bank (Appendix A: Plates 20, 22, and 23). Several coniferous trees were placed instream and an existing log repositioned to aid in deflecting flow away from the left bank (Appendix A: Plate

22). Given the scale of the additional restoration work carried out in 2009, 2010 was considered to be 'year one' of the monitoring.

Continued Compensation Effectiveness and Changes from Previous Year

All compensation works carried out remain structurally sound, with materials as positioned at the time of the fall 2009 restoration, and no sign of further erosion to the left bank. The placement of logs and trees in front of the eroding bank continues to successfully deflect flows away from the toe of the bank and also continues to encourage sediment deposition within the placed trees.

During the 2010 site investigations, juvenile chinook and sockeye salmon were observed rearing within the restored habitat (AAR 2010). No fishes were observed within the restored channel section during visits in 2011. No barriers to the movement of fishes were observed during either the summer or fall low-flow visit. Given the habitat available and previously document presence of fishes, restored fish habitat continues to remain functional.

Riparian vegetation placed on the left bank has established at this location. Balsam poplar stakes in particular continue to thrive (Appendix A: Plates 20-22). A current density of 0.67 plants per m² has been achieved to date. This includes 170 additional cedar added to the site this year (Appendix A: Plate 24). Overall, the site appears to be on trajectory to achieve a plant species composition, density and distribution similar to the adjacent riparian plant community.

3.0 SUMMARY

3.1 Maintenance Completed in 2011

No maintenance to any compensation structure in MRPP or BC was required in 2011. All physical components of each compensation project remained intact and functioning as-built at the time of implementation in 2009.

Supplemental riparian planting was carried out at only one of the four BC compensation sites in 2011. A total of 170 cedars were added to the left bank of the tributary to the Fraser River to improve both the diversity and overall density of riparian plantings at this site.

3.2 Overall Compensation Effectiveness

All BC compensation projects were found to be stable physically and functioning as designed. In particular, all instream habitat was functioning, with fishes observed, or previously recorded using enhanced and/or restored habitat at every site. Connectivity to habitat previously unavailable has also been achieved as each respective site, with fishes documented within habitat that was previously non-fish-bearing (AAR 2010). Other aquatic species, including migratory aquatic birds were again observed using areas of restored habitat.

Riparian vegetation has established at all sites, with continued growth from 2010 documented at each site. As a result of the initial "over-planting" strategy, in addition to replanting, where warranted, monitoring indicates that vegetation survival to date is expected to exceed the minimum plant density and after five years, as specified in the Authorization. In general,

establishing riparian vegetation is on course to match the plant species composition, density and distribution of adjacent riparian vegetation at each site.

Conditions within DFO Authorization ED-05-1582 are being met (Appendix B).

REFERENCES

- Applied Aquatic Research Ltd. 2005a. TMX - Anchor Loop Project: Fish and Fish Habitat Investigations, Alberta, Jasper National Park, Mount Robson Provincial Park and British Columbia.
- Applied Aquatic Research Ltd. 2005b. TMX - Anchor Loop Project: Fish Bearing Atlas, Existing Trans Mountain Pipeline Route, Alberta, Jasper National Park, Mount Robson Provincial Park and British Columbia.
- Applied Aquatic Research Ltd. 2005c. TMX - Anchor Loop Project: Fish Bearing Atlas, Proposed Route, Alberta, Jasper National Park, Mount Robson Provincial Park and British Columbia.
- Applied Aquatic Research Ltd. 2005d. TMX - Anchor Loop Project: Non-fish bearing Report, Proposed Route - Volume I, Alberta and Jasper National Park.
- Applied Aquatic Research Ltd. 2005e. TMX - Anchor Loop Project: Non-fish bearing Report, Proposed Route - Volume II, Mount Robson Provincial Park and British Columbia.
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- Applied Aquatic Research Ltd. 2007a. Compensation Plan for the Alberta Portion of Trans Mountain L.P. TMX Anchor Loop Project. Revision 1.
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- Applied Aquatic Research Ltd. (AAR). 2009. Compensation Implementation Monitoring in Mount Robson Provincial Park and British Columbia: TMX - Anchor Loop Project. Submitted to Kinder Morgan Canada Inc. 106 pp, plus Appendices.
- Applied Aquatic Research Ltd. (AAR). 2010. Compensation Effectiveness Monitoring: For the TMX - Anchor Loop Project: Mount Robson Provincial Park and British Columbia. Provided to Kinder Morgan Canada Inc. November, 2010, submitted to DFO December, 2010. 10 pp, plus Appendices.
- Department of Fisheries and Oceans Canada (DFO). 1986. The Department of Fisheries and Oceans Policy for the Management of Fish Habitat.

Department of Fisheries and Oceans Canada (DFO). 1998. Habitat Conservation and Protection Guidelines, Second Edition (1998). *Developed from the Policy for the Management of Fish Habitat (1986)*.

TERA Environmental Consultants and Applied Aquatic Research Ltd. 2009. Fisheries and Oceans Canada Interim Compensation Completion Report for the Trans Mountain Pipeline L.P. TMX – Anchor Loop Project. File ED-05-1582. Prepared for Kinder Morgan Canada Inc.

APPENDIX A

COMPENSATION SITE DATA AND PHOTOGRAPHIC RECORD

Site: Yellowhead Lake – Lucerne Station Road		
11 U 395202 5857504, NAD 83	Monitoring Visits: August 7*, and October 17, 2011	Year 2

Water Quality*			
Temperature: 12.7 °C	DO: 9.9 mg/L	Conductivity: 123 µS	pH: 7.8

Compensation		
<i>Restoration:</i> Remove all seven culverts, span centre three with a single-span bridge, restore instream habitat		
	<i>Prior to Compensation</i>	<i>Following Compensation (Yr 2)</i>
<i>Bank Shape</i>	Sloping. With culverts.	Sloping into open channel.
<i>Bank Stability</i>	High – Compacted cobble and fill.	High – Channel armoured with rip-rap. All material remains as placed.
<i>Channel Substrate</i>	Cobble and boulder along road edge. No substrate within culverts.	Rip-rap along margins. Boulder and cobble/gravel substrate through new channel.
<i>Habitat Complexity</i>	Moderate. Culverts a velocity barrier to juvenile fishes. Large scour pool at culvert outlets. Cryptic habitat within boulders for juvenile fishes.	Moderate. New channel provides functional habitat with flow. Increase in boulder habitat for juveniles. Depth at downstream end of new channel. Cryptic habitat along rip-rap toe providing refuge for juvenile fishes.
<i>Habitat Functionality</i>	Moderate. Cover from depth and boulder habitat available.	Moderate – high. Aquatic connectivity improved between lake sub-basins. Increased refuge for juveniles. Mature and juvenile rainbow trout were again observed swimming upstream through the channel.

Riparian Vegetation			
Planting Area:	110 m ²		
Target Plant Density:	1 plant per 2 m ² (0.5 plants per m ²), or 55 plants		
<i>Species Planted</i>	<i>Number of Rooted Stock Initially Planted</i>	<i>Number of Stock Replaced in 2011</i>	<i>Number of Establishing Plants</i>
Willow	47	0	14
Alder	106	0	8
Birch	45	0	64
Aspen	30	0	46
Spruce	71	0	3

Balsam poplar	0	0	58
Current Plant Density:	1.8 plants per m ²		Total of 193 plants
Overall: Planted stock continues to establish well given this exposed location. A plant density of 1.8 plants per m ² has been achieved to date, with a native grass cover also becoming established.			

General Comments

The seven culverts have been successfully replaced with a single-span bridge. Aquatic connectivity between the sub-basins of Yellowhead Lake has been restored, as is evident by the fishes and various aquatic birds that have been seen using the new habitat. Fishes were again observed swimming both upstream and downstream through the restored channel, and holding behind boulders placed within the new channel. Riparian vegetation is slowly becoming established.



Plate 1 Yellowhead Lake: View northwest (downstream) towards new bridge (August 7, 2011).



Plate 2 Yellowhead Lake: View northeast across downstream face of new bridge (August 7, 2011).



Plate 3 Yellowhead Lake: View north along bridge approach ramp (August 7, 2011).



Plate 4 Yellowhead Lake: View south along upstream corner of left bank, showing establishing riparian planting (August 7, 2011).

Site: Yellowhead Creek – At Highway 16		
11 U 392485 5856880, NAD 83	Monitoring Visits: August 7*, and October 17, 2011	Year 2

Water Quality*			
Temperature: 13.4 °C	DO: 10.3 mg/L	Conductivity: 131 µS	pH: 7.8

Compensation		
<i>Restoration:</i> Install offset baffles in west-most culvert. Install boulder and riffle across outlet pool to inundate culvert outlets and flood gravel bar.		
	Prior to Compensation	Following Compensation (Yr 2)
<i>Bank Shape</i>	Sloping. With culverts.	Sloping. With culverts
<i>Bank Stability</i>	High – Boulder and compacted fill.	High – Boulder and compacted fill.
<i>Channel Substrate</i>	Cobble and boulder with gravel in outlet pool. Small number of boulders within culverts.	Cobble and boulder with gravel in outlet pool. Boulders retained within culverts. Baffles throughout western culvert.
<i>Habitat Complexity</i>	Moderate. Large scour pool at culvert outlets. Cryptic habitat within boulders for juvenile fishes.	Moderate - high. Large scour pool at culvert outlets. Cryptic habitat within boulders for juvenile fishes. Increase in riffle and rearing habitat along margins.
<i>Habitat Functionality</i>	Moderate. Culverts a velocity barrier to juvenile fishes under high flows, and vertical barrier to fishes under low flows. Cover from depth and boulder habitat available along margins.	Moderate – high. Culverts likely still a velocity barrier to juvenile fishes under peak flows. However, both culverts available to fishes under low flows. No velocity or height barriers to fishes under low flow conditions. Increase in area of rearing habitat along margins. Juvenile rainbow trout (young-of-the-year) again observed rearing within shallow pools along margins of newly flooded habitat.

Riparian Vegetation			
Planting Area:	20 m ²		
Target Plant Density:	1 plant per 2 m ² (0.5 plants per m ²), or 10 plants		
<i>Species Planted</i>	<i>Number of Rooted Stock Initially Planted</i>	<i>Number of Stock Replaced in 2011</i>	<i>Number of Establishing Plants</i>
Alder	23	0	3
Spruce	10	0	7

Balsam poplar	0	0	19
Current Plant Density:	1.5 plants per m ²		Total of 29 plants
Overall: Planted stock has established at this site. A plant density of 1.5 plants per m ² has been achieved in 2011.			

General Comments

Movement through the Yellowhead Creek culverts under Highway 16 has been greatly improved through the installation of baffles and raising the outlet pool depth with the use of a control weir. While velocity during high flow is likely still a barrier to juveniles, the movement of adult rainbow during these high spring flows has been greatly improved. Fish passage during low flow conditions is now possible for all fishes as a result of the culvert outlets being inundated at all times, and lower velocities recorded in the eastern culvert. Increased water level resulting from the control weir immediately downstream from the culvert outlet has flooded the large cobble/gravel bar against the left bank, and provided functional instream habitat along both margins; as shown by young-of-the-year salmonids observed within these shallow fringe pools. Riparian vegetation has established well where planted on the downstream right banks. No debris jams was observed within either culvert.



Plate 5 Yellowhead Creek: View downstream from Highway 16 showing outlet pool depth under moderate flow (August 7, 2011).



Plate 6 Yellowhead Creek: View downstream towards culvert inlets under Highway 16 (August 7, 2011).



Plate 7 Yellowhead Creek: View downstream through west culvert under moderate flow conditions showing turbulence created by baffles (August 7, 2011).



Plate 8 Yellowhead Creek: View upstream towards culvert outlets showing inundation of both culvert outlets under fall low-flow conditions (October 17, 2011).

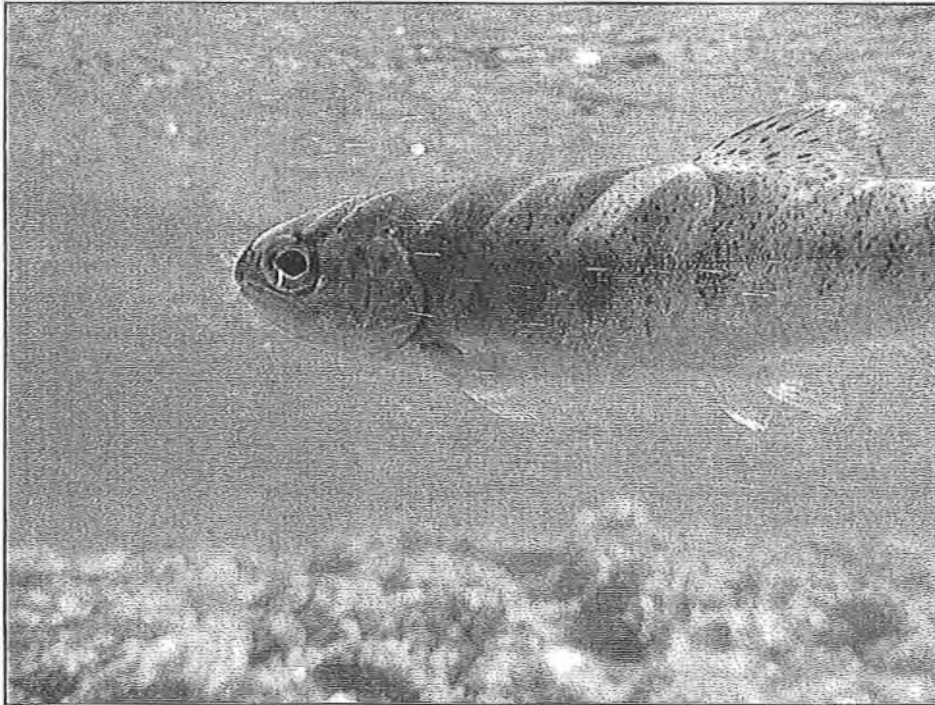


Plate 9 Yellowhead Creek: Mature rainbow trout rearing in culvert outlet pool (August 7, 2011)

Site: Fraser River Back Channel		
11 U 387342 5858613, NAD 83	Monitoring Visits: August 7*, and October 17, 2011	Year 2

Water Quality*			
Temperature: 6.1 °C	DO: 10.8 mg/L	Conductivity: 201 µS	pH: 7.8

Compensation		
<i>Restoration:</i> Remove causeway and vertical standpipe culvert, install log and boulder weirs, restore channel.		
	<i>Prior to Compensation</i>	<i>Following Compensation (Yr 2)</i>
<i>Bank Shape</i>	Sloping. With culvert.	Sloping into open channel.
<i>Bank Stability</i>	Moderate – Boulder and compacted fill.	High – Rip-rap and native boulder used for revetment. All material, including weirs remains as built.
<i>Channel Substrate</i>	Predominantly fines within back channel. Boulder at base of causeway.	Cobble and boulder lined channel into wetland. Fines within back channel.
<i>Habitat Complexity</i>	Low. No channel between back channel and Fraser. Substrate within back channel dominated by fines.	Moderate - high. Cobble/boulder channel between back channel and Fraser River created. Depth within back channel retained. Access created to spring fed channel and spawning habitat upstream.
<i>Habitat Functionality</i>	Low. No connectivity with Fraser River. Isolated back channel functioning as a wetland. Non-fish-bearing.	Moderate – high. All barriers to fishes removed. Weirs retaining wetland depth within back channel. Juveniles previously reported rearing within back channel (AAR 2010).

Riparian Vegetation			
Planting Area:	150 m ²		
Target Plant Density:	1 plant per 2 m ² (0.5 plants per m ²), or 75 plants		
<i>Species Planted</i>	<i>Number of Rooted Stock Initially Planted</i>	<i>Number of Stock Replaced in 2011</i>	<i>Number of Establishing Plants</i>
Willow	35	0	32
Alder	225	0	63
Balsam poplar	42	0	54
Spruce	40	0	18
Prickly Rose	-	-	3

Thimbleberry	-	-	3
Current Plant Density:	1.2 plants per m ²		<i>Total of 173 plants</i>

Overall: Planted stock has established at this site. A plant density of 1.2 plants per m² has been achieved to date. This includes naturally regenerating prickly rose and thimbleberry.

General Comments

Connectivity between this back channel and the Fraser River has been reestablished through installation of a single-span bridge and removal of the causeway and standpipe culvert. Rearing young-of-the-year fishes were observed within the back channel in 2010. No additional beaver activity was noted in 2011. Initial work by beavers to create a dam on top of the log weirs was noted previously (2010). This work has not been continued since. However, the more complete dam found upstream at the end of the back channel was still intact and remains a temporary barrier to fishes. Riparian vegetation has established and showed considerable growth from the 2010 investigation.



Plate 10 Fraser Back Channel: View upstream through new channel showing the two log weirs and cobble lined pool created under bridge deck (August 7, 2011).



Plate 11 Fraser Back Channel: View downstream from east edge of back channel (August 7, 2011).



Plate 12 Fraser Back Channel: View north along left bank approach ramp showing regenerating vegetation on ramp shoulders (August 7, 2011).



Plate 13 Fraser Back Channel: View along inside edge of right bank bridge approach showing established riparian planting (August 7, 2011).



Plate 14 Fraser Back Channel: View upstream along left bank of Fraser River showing salvaged and planted riparian vegetation (August 2, 2010).



Plate 15 Fraser Back Channel: As for Plate 14, showing salvaged and planted riparian vegetation growth from previous year (August 7, 2011).

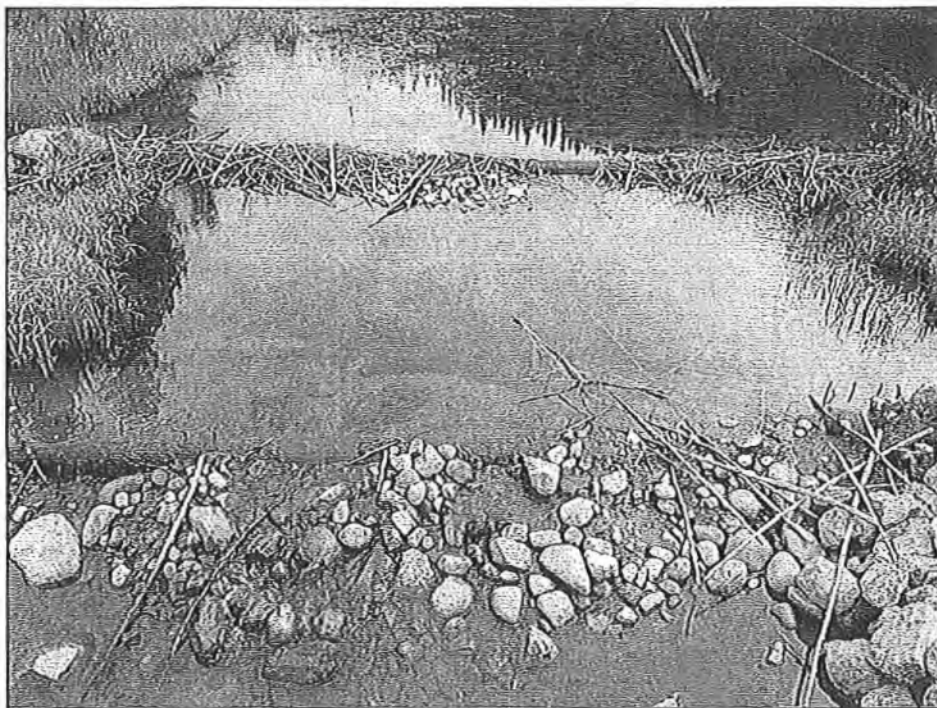


Plate 16 Fraser Back Channel: View into back channel from bridge showing partial beaver dam augmentation of weirs and cobble/boulder riffle (October 17, 2011).

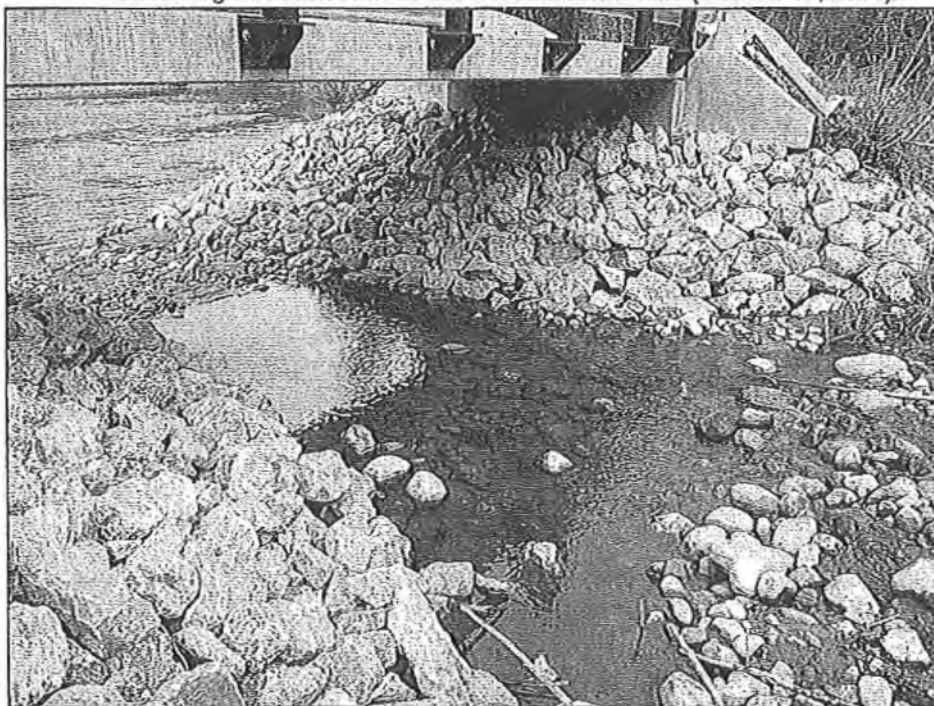


Plate 17 Fraser Back Channel: View downstream across channel outlet showing access into back channel from Fraser River under typical fall low flows (October 17, 2011).

Site: Tributary to Fraser River		
10 U 661945 5930881, NAD 83	Monitoring Visits: August 10*, October 17**, 2011	Year 2

Water Quality			
*Temperature: 8.9 °C	DO: 11.7 mg/L	Conductivity: 99 µS	pH: 7.4
**Temperature: 3.0 °C	DO: 13.1 mg/L	Conductivity: 187 µS	pH: 7.8

Compensation		
Restoration: Remove fallen bridge and prevent scour and erosion to bank through, restore and enhance instream habitat.		
	Prior to Compensation	Following Compensation (Yr 2)
Bank Shape (left bank)	Vertical.	Sloping - vertical with log crib at base.
Bank Stability	Low - With erosional scarp.	Moderate - Log terraces used to stabilize slope. Logs and whole trees placed along toe to deflect flows and prevent scour. Sediment deposition along toe of revetment and base of crib wall
Channel Substrate	Cobble/boulder with gravel.	Cobble/boulder with gravel.
Habitat Complexity	Moderate. No significant pools within Right-of-Way.	Moderate - high. Root wads and logs providing cover. Step pools into deeper run through Right-of-Way.
Habitat Functionality	Moderate. Rearing for juveniles along margins.	High. No barriers to fishes. Juvenile sockeye and chinook salmon previously found rearing within habitat created. No fishes observed during 2011 investigations. Suitable depth now available for overwintering fishes.

Riparian Vegetation			
Planting Area:	500 m ²		
Target Plant Density:	1 plant per 2 m ² (0.5 plants per m ²), or 250 plants		
Species Planted	Number of Rooted Stock Initially Planted	Number of Stock Replaced in 2011	Number of Establishing Plants
Willow (stakes)	100	0	20
Balsam poplar (stakes)	100	0	120
Spruce	50	0	2
Willow	0	0	25

Cedar	-	-	170
Current Plant Density:	0.67 plants per m ²		Total of 337 plants
Overall: Planted stock has established at this site. Poplar stakes in particular are well established with continued growth from previous investigations. A current density of 0.67 plants per m ² has been achieved in 2011. This includes 170 cedar added to the site this year to match adjacent species and meet desired planting densities.			

General Comments
<p>All components of the fallen bridge have been removed and are no longer threatening the CN Rail bridge downstream or causing erosion. Log crib wall and trees added to the base of the restored bank continue to successfully deflect flow and prevent scour of the bank toe. Trees with attached foliage placed in front of logs continue to successfully encouraged sediment deposition in front of restored bank. No barriers to fishes were observed during either site visit. No fishes were observed within habitat created. Based on previous observations of fishes using restored habitat, and the availability of instream habitat, restoration is considered to have created functional fish habitat. Previously planted riparian vegetation has established well.</p>



Plate 18 Fraser Tributary: View upstream through restored channel showing end of logs placed along the toe of the left bank scour (August 10, 2011).



Plate 19 Fraser Tributary: View downstream through restored channel from corner of left bank (August 10, 2011).



Plate 20 Fraser Tributary: View towards left bank and restoration works from right bank (August 10, 2011).

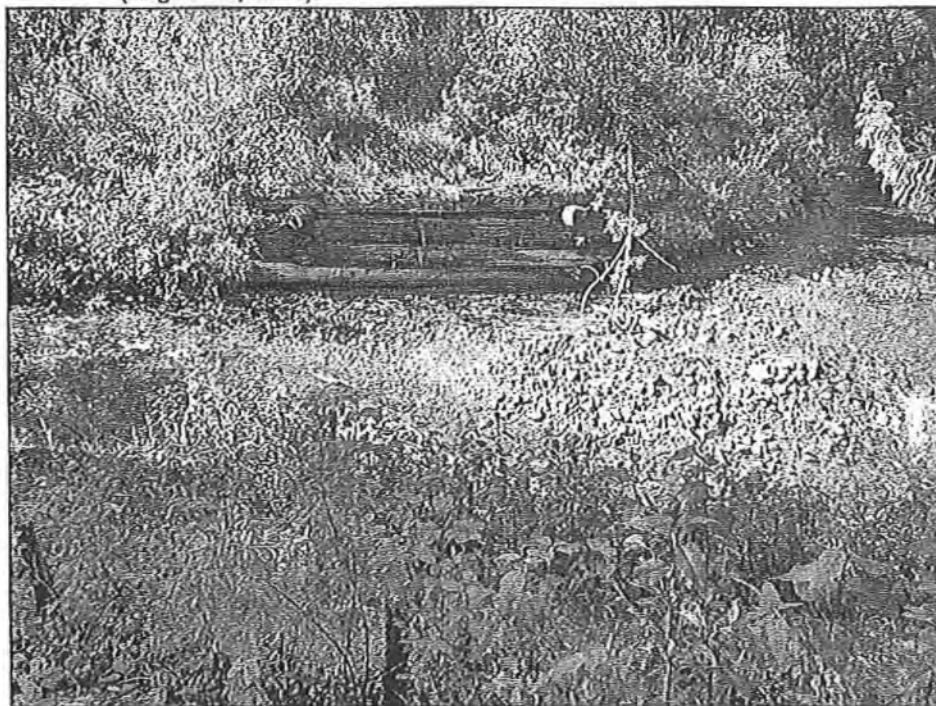


Plate 21 Fraser Tributary: View towards right bank from top of left bank showing growth of poplar stakes in photo foreground (August 10, 2011).



Plate 22 Fraser Tributary: View towards upstream end of left bank showing pool and depth through outside of meander bend (August 10, 2011).



Plate 23 Fraser Tributary: View downstream towards restored bank showing cobble/gravel bar at upstream edge of restored channel right-of-way (October 17, 2011).



Plate 24 Fraser Tributary: View of left bank approach showing establishing cedar added to riparian area in 2011 (October 17, 2011).

APPENDIX B
DFO AUTHORIZATION



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

**Authorization issued to:
Autorisation délivrée à:**

Name: Trans Mountain Pipeline L.P.
Address: 2700-300 5 Avenue SW
Calgary, AB
T2P 5JY

Telephone No.: (403) 514-6462
Facsimile No.: (403) 514-6423

Location of Project / Emplacement du projet

Pipeline watercourse crossings for the TMX Terasen Pipeline within the provinces of Alberta and British Columbia:

Crossing	Location	Crossing	Location
Fiddle River	SW 10-49-27 W6M	Miette River	NW 14-45-3 W6M
Athabasca River	SW 35-48-28 W6M	Derr Creek	SE 20-45-3 W6M
Devon Creek	NW 13-48-1 W6M	Miette River	SW 24-45-4 W6M
Pretty Creek	NW 21-47-1 W6M	Unnamed channel	399179 E 5859266N
Unnamed channel	NE 17-47-1 W6M	Unnamed channel	396056 E 5857372 N
Snarling River	NE 32-46-1 W6M	Unnamed channel	395045 E 5856921 N
Snarling River side ch.	SE 32-46-1 W6M	Unnamed wetland	394624 E 5856753 N
Cabin Creek	NW 9-45-1 W6M	Yellowhead Creek	392811 E 5856956 N
Unnamed channel	SW 7-45-1 W6M	Grant Brook Creek	382452 E 5862152 N
Miette River	SE 12-45-2 W6M	Moose River	378906 E 5864967 N
Muhigan Creek	SW 11-45-2 W6M	Unnamed channel	362763 E 5874655 N
Meadow Creek	NE 8-45-2 W6M	Fraser River	357960 E 5876199 N
Clairvaux Creek	SW 13-45-3 W6M	Unnamed channel	355648 E 5876481-N



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

Valid Authorization Period / Période de validité

The valid authorization period for the harmful alteration, disruption or destruction (HADD) of fish habitat associated with the pipeline watercourse crossings is:

From: Date of Issuance To: March 31, 2009

The valid periods for other conditions of the authorization are as set out below.

**Description of Works or Undertakings (Type of work, schedule, etc.)
Description des ouvrages ou entreprises (Genre de travail, calendrier, etc.)**

The harmful alteration, disruption or destruction of fish habitat hereby authorized is the alteration of 42,253m² of in-stream and riparian habitats (26,672m² - Alberta and 15,693m² - British Columbia) for the aforementioned isolation and open cut pipeline crossings within Alberta and British Columbia (see Appendix A).

Conditions of Authorization / Conditions de l'autorisation

- 1.0 The conditions of this Authorization notwithstanding, should the above works or undertakings, due to weather conditions, different soil or other natural conditions, or for any other reason, appear, in the opinion of Fisheries and Oceans Canada, ("DFO"), likely to cause greater impacts than the parties previously contemplated, then DFO may direct Trans Mountain Pipeline LP the "Proponent", and its agents, and contractors, to suspend or alter works and activities associated with the project, to avoid or mitigate adverse impacts to fisheries resources. DFO may also direct the Proponent and its agents, and contractors, to carry out, at the Proponent's expense, any works or activities deemed necessary by DFO to avoid or mitigate further adverse impacts to fisheries resources. In circumstances where DFO is of the view that greater impacts may occur than were contemplated by the parties, DFO may also modify or rescind this Authorization. If the Authorization is to be changed, the Proponent will be given an opportunity to discuss any proposed modifications or rescission.
- 2.0 Conditions that relate to the Proponent plan:
- 2.1 The Proponent confirms that all plans and specifications relating to this Authorization have been duly prepared and reviewed by appropriate professionals working on behalf of the Proponent. The Proponent acknowledges that they are solely responsible for all design, safety and workmanship aspects of all the works associated with this Authorization.
- 2.2 The construction must comply with the criteria identified within this Authorization. Harmful alteration, disruption or destruction of fish habitat other than that specifically identified within this Authorization is not permitted.
- 2.3 Works will be conducted following the practices outlined in the following document(s):
- 2.3.1 TMX - Anchor Loop Project: Fish and Fish Habitat Investigations, submitted to TERA/Westland, by Applied Aquatic Research Ltd., dated November 2005.
 - 2.3.2 TMX - Anchor Loop Project: Fish Bearing Atlas Proposed Route, submitted to TERA/Westland, by Applied Aquatic Research Ltd., dated November 2005.
 - 2.3.3 Revised Compensation Plan for the Terasen Pipelines (Trans Mountain) Inc. TMX - Anchor Loop Project, prepared for Terasen Pipelines (Trans Mountain) Inc., by Applied Aquatic Research Ltd., dated June 2007.
 - 2.3.4 Revised Compensation Plan for the BC portion of the Terasen Pipelines (Trans Mountain) Inc. TMX - Anchor Loop Project, prepared for Terasen Pipelines (Trans Mountain) Inc., by Applied Aquatic Research Ltd., dated July 2007.
 - 2.3.5 Environmental Protection Plan for the Terasen Pipelines (Trans Mountain) Inc. TMX - Anchor Loop Project, prepared for Kinder Morgan Canada Inc., by TERA/Westland, dated June 2007.



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

- 2.3.6 Restoration Plan for the Terasen Pipelines (Trans Mountain) Inc. TMX - Anchor Loop Project, prepared for Kinder Morgan Canada Inc., by TERA/Westland, dated March 2007.
- 2.3.7 Email correspondence entitled DFO-AB Anchor Loop Details, from Jason Smith - TERA Environmental to Martyn Curtis - Fisheries & Oceans Canada, dated July 26, 2007.

2.4 The above document(s) are hereafter referred to as the "Plan". Where contradictions exist, the most recent version received by DFO shall apply.

3.0 Conditions that relate to the mitigation of potential harmful alteration, disruption or destruction of fish habitat.

- 3.1 No in-water work or construction activity shall occur within the Restricted Activity Period "RAP" for each watercourse previously mentioned (*see Location of Project*) to protect local fish populations during their sensitive periods (spawning, incubation, nursery), without specific permission from DFO-Edmonton.
- 3.2 Disturbance to the bed and banks of the stream shall be minimized and confined to the immediate work site. Any stream banks and approaches to the watercourse disturbed by any activity related to the work project shall be stabilized, revegetated and reclaimed as soon as possible.
- 3.3 In-stream work duration for the open cut crossings will be minimized by conducting installations during a period of low flow and reduced wetted area.
- 3.4 In-stream use of machinery shall be kept to a minimum and construction activities shall cease during heavy rain/flow events.
- 3.5 Downstream flow shall be maintained at all times. If a pump is used to maintain downstream flow, the intake shall be screened in accordance with DFO's Freshwater Intake End-of-Pipe Fish Screen Guidelines. The outlet shall have a diffuser or be placed in a location that is not subject to erosion from the outflow.
- 3.6 In-stream works shall be confined to the pipeline right-of-way.
- 3.7 The bed of the stream in the areas disturbed by the proposed pipeline installation shall be reclaimed and re-contoured to match the undisturbed watercourse bottom.
- 3.8 Only clean rock, appropriately-sized and free of deleterious substances will be utilized to backfill the trench. These materials will be stockpiled from the proposed trench excavation and/or obtained from an off-site location and will not be taken from below the average high water level of any watercourse (excluding stockpiled material resulting from the proposed trench excavation).
- 3.9 If the construction site needs to be dewatered, the water shall be released into a well-vegetated area or settling basin and not directly into the watercourse. Water returning to the watercourse shall be screened with a properly maintained screen of silt filter cloth such that all returning water is of equal or better quality than the water in the watercourse.
- 3.10 All spoil materials shall be stored above the high water mark and located such that they do not enter any watercourse or waterbody.
- 3.11 Effective, short term and long term erosion control measures shall be implemented on disturbed areas. These controls shall be in place prior to disturbance, during and after construction to prevent sediment from entering any watercourse or waterbody.
- 3.12 All sediment and erosion control measures shall be inspected regularly to ensure that they are functioning properly and are maintained and/or upgraded as required until complete revegetation of all disturbed areas is achieved.
- 3.13 The deposition of deleterious substances into water frequented by fish is prohibited under the *Fisheries Act*. Appropriate precautions will therefore be taken to prevent deleterious substances (e.g. gasoline, sediment, oil, wet concrete, etc.) from entering the watercourse. To this end, equipment operating in or near the water will be free of external fluid leaks, grease, oil and mud. The cleaning, fuelling, and servicing of equipment will be conducted in an area from which spills or wash water will not enter fish habitat. An emergency spill kit will be available at all times.
- 3.14 Reclamation, including seeding and planting of disturbed areas with native vegetation, shall be implemented as soon as possible after construction.



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

4.0 Conditions that relate to the compensation for the works within Alberta that will result in the alteration of 26,672m² of fish habitat:

- 4.1 The objective of the compensatory work is to increase productivity by enhancing fish habitat through the improvement of fish passage, construction of rock and woody debris instream structures and planting of riparian vegetation. These works will allow fish access to areas that were previously inaccessible either seasonally or permanently. The compensatory habitat construction will result in the enhancement or access to 26,672m² of fish habitat.
- 4.2 The compensatory fish habitat will be as summarized in Appendix B shall be completed as described more specifically in the Revised Compensation Plan for the Terasen Pipelines (Trans Mountain) Inc. TMX - Anchor Loop Project, prepared for Terasen Pipelines (Trans Mountain) Inc., by Applied Aquatic Research Ltd., dated June 2007.
- 4.3 All fish habitat compensatory works shall be completed before March 31, 2009.
- 4.4 The Proponent shall ensure that the compensatory works are functioning as intended pursuant to this Authorization. The compensatory habitat will be deemed to be functioning as intended if, in the opinion of DFO, the works or habitat is physically stable and it is apparent that the works are providing functional fish passage and instream habitat. "Functional habitat" for the instream work shall be defined as having an expected abundance and diversity of fish, comparable to similar natural habitats.
- 4.5 If at any time the Proponent becomes aware that the compensatory habitat is not completed and/or not functioning as described in the habitat compensation plan, the Proponent shall carry out any works which are necessary to ensure the compensatory habitat is completed and/or functioning as described in the habitat compensation plan.
- 4.6 The Proponent confirms that they shall leave the compensatory habitat undisturbed. After the compensatory habitat has been established the Proponent shall not carry on any work or undertaking that will adversely disturb or impact the compensatory habitat.

5.0 Conditions that relate to the compensation for works within British Columbia that will result in the alteration of 15,693 m² of fish habitat:

- 5.1 The objective of the compensatory work is to increase productivity by enhancing fish habitat through the improvement of fish passage, construction of rock and woody debris instream structures and planting of riparian vegetation. These works will occur at four locations and will allow fish access to and transform generally lower quality and degraded fish habitat to areas of higher quality habitat for instream rearing with functional riparian zones. The compensatory habitat construction will result in the enhancement or access to 17,685 m² of instream habitat and the creation of 360 m² of riparian habitat (see Appendix C).
- 5.2 The compensatory fish habitat, as summarized in Appendix C, shall be completed as described more specifically in drawings 1 through 4 of appendix B in the Compensation Plan for BC, Revision 1 (July 2007).
- 5.3 All fish habitat compensatory works shall be completed before March 31, 2009.
- 5.4 With respect to all riparian planting, the following conditions shall be met:
 - a) 360 m² of stream bank will be planted at site 4 with rooted stock at a minimum density of 1 plant per 2 square meters.
 - b) Tree and shrub species shall be comprised of species native to the local biogeoclimatic conditions.
 - c) 90% survival of all vegetation planted or replanted must be attained for a period of at least five years following planting.



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

- 5.5 A compensation completion report (As Built) detailing but not limited to the following will be submitted to DFO (Clearwater office) prior to June 30th, 2009. The compensation completion report shall include:
- survey and description of fish habitat prior to compensation,
 - Measurements of enhanced instream habitat and planted areas compared to table 4 of the Compensation Plan.
 - Number and species of rooted stock planted.
 - timing of the compensation project (start and completion of stages of the compensation project),
 - photo documentation of the compensation construction sites before, during and upon completion of the works,
 - description of any additional mitigation measures which were implemented and
 - description of any unforeseen issues encountered and how they were resolved.
- 5.6 The Proponent shall ensure that the compensatory works are functioning as intended pursuant to this Authorization. The compensatory habitat will be deemed to be functioning as intended if, in the opinion of DFO, the works or habitat is physically stable and it is apparent that the works are providing functional fish passage and instream habitat. "Functional habitat" for the instream work shall be defined as having an expected abundance and diversity of fish, comparable to similar natural habitats.
- 5.7 If at any time the Proponent becomes aware that the compensatory habitat is not completed and/or not functioning as described in the habitat compensation plan and this Authorization, the Proponent shall carry out any works which are necessary to ensure the compensatory habitat is completed and/or functioning as intended. This may include alternative compensatory works to achieve similar results.
- 5.8 If the Proponent wishes to transfer its interest in the Trans Mountain Pipeline and the transferee assumes the obligations for the compensation works in a form satisfactory to DFO, the Proponent shall thereafter be relieved of these obligations.
- 5.9 The Proponent confirms that they shall leave the compensatory habitat undisturbed. After the compensatory habitat has been established the Proponent shall not carry on any work or undertaking that will adversely disturb or impact the compensatory habitat.
- 6.0 Conditions that relate to the monitoring of the Proponent plan, the mitigation and the compensation (the "Monitoring Program") for works within Alberta:
- 6.1 The Proponent will undertake a Monitoring Program and will submit a written report to DFO-Edmonton indicating whether works were conducted within the schedule of the Proponent plan and whether the mitigation measures outlined in the Proponent plan and this authorization (Section 3) were followed, including:
- Crossing Works:*
- 6.1.1 For the open cut crossings of the Athabasca River, Snaring River, Meadow Creek and Fraser River, turbidity and Total Suspended Solids (TSS) shall be measured every 60 minutes during instream activities from 500 m downstream of the pipeline right-of-way to 1500 m downstream of the right-of-way at 250 m intervals, and upstream of the right-of-way in an appropriate location. If TSS concentrations exceed the Canadian Council for Ministers of the Environment (CCME) guidelines of 25mg/l above daily baseline readings, all instream activity will be directed at controlling TSS. When the source of the high sediment load is corrected and TSS drops below CCME (1999) guidelines, all instream construction activities may proceed. In the event that CCME guidelines are exceeded, a letter report shall be prepared documenting the TSS concentrations, their locations and associated durations and submitted to DFO as part of the Monitoring Report.
- 6.1.2 A photographic record, referencing file ED-05-1582 - Alberta, shall be taken of pre-construction, construction and post-construction periods, showing all works undertaken in stream and within the riparian areas for each watercourse. This shall include, but not be limited to short and long term erosion and silt suppression measures, spoil material storage places, and any isolation of instream construction. The photographs for each pre-construction, construction, and post-construction period shall be taken from the same vantage point(s), direction and angle of view for easy comparison. All photographs and required information shall be included in a report to be submitted to DFO on or before June 30, 2009.



AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

- 6.1.2 Post-construction monitoring of the project area shall be conducted following high flows in the spring of 2008, 2009, 2010, and 2011 to document the effectiveness of the mitigation, and evaluate revegetation, and identify any problem areas that require remedial action. The results shall be provided to DFO in a report submitted on or before December 31 of the monitoring year, referencing file ED-05-1582 - Alberta. If the post-construction monitoring identifies any concerns or problems, site-specific rehabilitation/remediation programs shall be established as appropriate.

Compensation Works:

- 6.1.3 Post-construction monitoring of all compensatory habitat areas shall be conducted following high flows in the spring of 2009, 2010, 2011, and 2012 to document the effectiveness of the mitigation, evaluate revegetation and compensation, and identify any problem areas that require remedial action. The results shall be provided to DFO in a report submitted on or before December 31 of the monitoring year, referencing file ED-05-1582 - Alberta. If the post-construction monitoring identifies any concerns or problems, site-specific rehabilitation/remediation programs shall be established as appropriate.

6.1.3.1 A photographic record shall be taken of pre-construction, construction and post-construction periods, showing all works undertaken in stream and within the riparian areas for the compensatory habitat. The photographs for each pre-construction, construction, and post-construction period shall be taken from the same vantage point(s), direction and angle of view for easy comparison. All photographs and required information shall be included in a report to be submitted to DFO on or before December 31 of the monitoring year referencing file ED-05-1582-Alberta.

- 6.1.4 Specific to Cottonwood Creek compensation activities, post construction monitoring of the log-boulder step-pool structures will be conducted following high flows in the late spring of 2009, 2010, 2011, 2012, and 2014 to document the effectiveness and stability of these structures.

6.1.4.1 A photographic record shall be taken of pre-construction, construction and post-construction periods, showing all works undertaken in stream and within the riparian areas for the Cottonwood Creek Compensation. The photographs for each pre-construction, construction, and post-construction period shall be taken from the same vantage point(s), direction and angle of view for easy comparison. All photographs and required information shall be included in a report to be submitted to DFO on or before December 31 of the monitoring year referencing file ED-05-1582 - Cottonwood Creek Compensation Monitoring. If the post-construction monitoring identifies any concerns or problems with any of these structures (i.e. requiring repairs or not allowing fish passage as designed) Proponent has committed to creating an additional 3,280m² of similar habitat (similar to the habitat found within the proposed Cottonwood Creek compensation area) elsewhere within Jasper National Park to satisfy the HADD's associated with this project.

- 6.1.6 The Proponent is responsible for ensuring that all compensation work is functioning as described in the Proponent plans for a period of 6 years as covered by the Monitoring Program. If at any time the Proponent or DFO-Edmonton becomes aware that the compensation works are not functioning as intended, the Proponent will carry out or cause to be carried out at its own expense, any repairs necessary to achieve the intended results.

- 7.0 Conditions that relate to the monitoring of the Proponent plan, the mitigation and the compensation (the "Monitoring Program") for works within British Columbia:

Crossing Works:

- 7.1 The Proponent will undertake a Monitoring Program and will submit a written report to DFO-Clearwater indicating whether works were conducted within the schedule of the Proponent plan and whether the mitigation measures outlined in the Proponent plan and this authorization (Section 3) were followed, including:

- 7.1.1 For the open cut crossings of the Fraser River, turbidity and Total Suspended Solids (TSS) shall be measured every 60 minutes during instream activities from 500 m downstream of the pipeline right-of-way to 1500 m downstream of the right-of-way at 250 m intervals, and upstream of the right-of-way in an appropriate location. If TSS concentrations exceed the Canadian Council for Ministers of the Environment (CCME) guidelines of 25mg/l above daily baseline readings, all instream activity will be directed at controlling TSS. When the source of the

Page 6 of 12



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

high sediment load is corrected and TSS drops below CCME (1999) guidelines, all instream construction activities may proceed. In the event that CCME guidelines are exceeded, a letter report shall be prepared documenting the TSS concentrations, their locations and associated durations and submitted to DFO as part of the Monitoring Report.

- 7.1.2 A photographic record shall be taken of pre-construction, construction and post-construction periods, showing all works undertaken in stream and within the riparian areas for each watercourse. This shall include, but not be limited to short and long term erosion and silt suppression measures, spoil material storage places, and any isolation of instream construction. The photographs for each pre-construction, construction, and post-construction period shall be taken from the same vantage point(s), direction and angle of view for easy comparison. All photographs and required information shall be included in a report to be submitted to DFO on or before June 30, 2009.
- 7.1.3 Post-construction monitoring of the project area shall be conducted following high flows in the spring of 2008, 2009, 2010, and 2011 to document the effectiveness of the mitigation and site rehabilitation and identify any problem areas that require remedial action. The results shall be provided to DFO in a report submitted on or before December 31 of the monitoring year. If the post-construction monitoring identifies any concerns or problems, site-specific rehabilitation/remediation programs shall be established as appropriate.

Compensation Works:

- 7.2 Post-construction monitoring of all compensatory habitat areas shall be conducted following high flows in the spring of 2009, 2010, 2011, and 2013 (yrs. 1,2,3 and 5) to document the effectiveness of the mitigation, evaluate revegetation and compensation, and identify any problem areas that require remedial action. The monitoring shall include a photographic record of pre-construction, construction and post-construction periods, showing all works undertaken in stream and within the riparian areas for the compensatory habitat. The photographs shall be taken from the same vantage point(s), direction and angle of view for easy comparison. All photographs and required information shall be included in a report to be submitted to DFO - Clearwater on or before December 31 of the monitoring year. If the post-construction monitoring identifies any concerns or problems, site-specific rehabilitation/remediation programs shall be established as appropriate.
- a) Vegetative – If monitoring indicates that 90% survival has not been attained for the monitoring year, replacement planting shall be undertaken as soon as possible and prior to July 1st of that year. The number of plants requiring replacement must be documented annually.
- b) Instream works – Monitoring must document enhanced habitat values, improved passage to fish, habitat usage, water quality parameters and physical stability of the works. The monitoring of fish passage works should consist of two assessments per sampling year; during the fall low flow period (bull trout migration and spawning) and during higher spring time flows (rainbow trout migration and spawning). These assessments will occur with consistent timing each monitoring year.
- c) In addition to the detailed monitoring on years 1,2,3 and 5, DFO-Clearwater requests that the noted compensation works be inspected on year 10 following completion. This would be a cursory inspection to confirm the long term functionality of the compensation.
- 8.0 Notification of the commencement of works or undertakings within Alberta shall be provided to DFO-Edmonton, habitat biologist, Martyn Curtis, at (780) 495-3362 at least 14 days prior to the initiation of those works or undertakings.
- 9.0 Notification of the commencement of works or undertakings within British Columbia shall be provided to DFO-Clearwater, habitat technologist, Tim Panko at (250) 674-2578 at least 14 days prior to the initiation of those works or undertakings.
- 10.0 Any deviation from the approved plan (Alberta), work schedule or mitigation, compensation and monitoring measures stated above shall be discussed with and approved by DFO-Edmonton (Alberta), prior to implementation.
- 11.0 Any deviation from the approved plan (British Columbia), work schedule or mitigation, compensation and monitoring measures stated above shall be discussed with and approved by DFO-Clearwater (British Columbia), prior to implementation.
- 12.0 All mitigation, compensation and monitoring measures shall be implemented to the satisfaction of DFO.

Page 7 of 12



AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. EO-05-1582

The holder of this authorization is hereby authorized under the authority of Section 35(2) of the Fisheries Act, R.S.C., 1985, c. F. 14, to carry out the work or undertaking described herein. This authorization is valid only with respect to fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

Failure to comply with any condition of this authorization may result in charges being laid under the Fisheries Act.

This authorization form shall be held on site and work crews shall be made familiar with the conditions attached.

Le détenteur de la présente est autorisé en vertu du paragraphe 35(2) de la Loi sur les pêches, L.R.C. 1985, ch. F. 14, à exploiter les ouvrages ou entreprises décrits aux présentes. L'autorisation n'est valide qu'en ce qui concerne l'habitat du poisson et pour aucune autre fin. Elle ne dispense pas le requérant de l'obligation d'obtenir la permission d'autres organismes réglementaires concernés ou de se conformer à leurs exigences.

En vertu de la Loi sur les pêches, des accusations pourront être portées contre ceux qui ne respectent pas les conditions prévues dans la présente autorisation.

Cette autorisation doit être conservée sur les lieux des travaux, et les équipes de travail devraient en connaître les conditions.

Date of issuance:

September 10, 2007

Approved by:

[Signature]
for Robert Lambe
Regional Director General
Central and Arctic Region

Approved by:

[Signature]
Paul Sprout
Regional Director General
Pacific Region

SEP 10 2007



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

Appendix A – HADD Summary for the pipeline watercourse crossings for the TMX Terasen Pipeline (Alberta and British Columbia)

Waterbody	KP/KL	Crossing Type Cause of HADD	Instream HADD (m ²)	Riparian HADD (m ²)	Total HADD (m ²)
Fiddle River	KL 327.8	Isolation Instream and a disruption to Instream and riparian habitat.	500	500	1000
Athabasca River	KL 337.4	Open Cut Instream and a disruption to Instream and riparian habitat.	2055	12656	14711
Devon Creek	KL 341.7	Isolation Instream and a disruption to Instream and riparian habitat.	23	514	537
Pretty Creek	KL 352.2	Isolation Instream and a disruption to Instream and riparian habitat.	35	488	523
Unnamed channel	KL 354.1	Isolation Instream and a disruption to Instream habitat.	15	0	15
Snaring River	KL 360.2	Open Cut Instream and a disruption to Instream and riparian habitat.	318	460	778
Snaring River side channel	KL 360.2	Isolation Instream and a disruption to Instream and riparian habitat.	83	597	605
Cabin Creek	KL 379.1	Isolation Instream and a disruption to Instream and riparian habitat.	35	276	311
Unnamed channel	KL 383.7	Isolation Instream and a disruption to Instream and riparian habitat.	13	829	842
Miette River	KL 383.2	Isolation Instream and a disruption to Instream and riparian habitat.	350	1140	1490
Muhigan Creek	KL 385.9	Isolation Instream and a disruption to Instream and riparian habitat.	40	410	450
Meadow Creek	KL 390.3	Open Cut Instream and a disruption to Instream and riparian habitat.	77	127	204

Page 9 of 12



AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

Clairvaux Creek	KL 394.8	Isolation Instream and a disruption to Instream and riparian habitat.	63	612	675
Miette River	KL 396.3	Isolation Instream and a disruption to Instream and riparian habitat.	0	1601	1601
Derr Creek	KL 400.2	Isolation Instream and a disruption to Instream and riparian habitat.	67	1309	1376
Miette River	KL 405.4	Isolation Instream and a disruption to Instream and riparian habitat.	0	1554	1554
Total HADD-AB					26,672
Unnamed channel	KL 409.1	Isolation Instream and a disruption to Instream and riparian habitat.	7	1415	1422
Unnamed channel	KL/KP 412.8	Loss of riparian habitat	0	565	565
Unnamed channel	KL/KP 413.9	Isolation Instream and a disruption to Instream and riparian habitat.	8	528	536
Unnamed wetland	KL/KP 414.4	Isolation Instream and a disruption to Instream	64	0	64
Yellowhead Creek	KL 416.4	Isolation Instream and a disruption to Instream and riparian habitat.	56	1584	1640
Grant Brook Creek	KL 428.6	Isolation Instream and a disruption to Instream and riparian habitat.	70	1799	1869
Moose River	KL 433.3	Isolation Instream and a disruption to Instream and riparian habitat.	305	970	1,275
Unnamed channel	KL 452.7	Isolation Instream and a disruption to Instream and riparian habitat.	44	917	961
Fraser River	KL 458.1	Open cut and a disruption to Instream and riparian habitat.	421	4347	4,768
Unnamed channel	KL 460.5	Isolation Instream and a disruption to Instream and riparian habitat.	67	2526	2,593



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

	<i>Total HADD-BC</i>	15,693
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Appendix B – Summary of Proposed Alberta Project-Specific Compensation

Site Name and Location	Waterbody	Barrier	Crossing Compensation	Actual HADD Compensation (m ²)
Brule Campsite Rd. 1.9	Unnamed Lake	Yes	Culvert to span bridge, enhance bed and banks	256
Brule Campsite Rd. 2.5a	Unnamed Channel	Yes	Culvert to span bridge, enhance bed and banks	256
Devona Sliding Rd. 2.2	Devona Creek	Yes	Culvert to span bridge, enhance bed and banks	289
Celestine Lake Rd. 25.9	Devona Creek	Yes	Culvert to span bridge, enhance bed and banks	289
Celestine Lake Rd. 14.3	Pretty Creek	Yes	Culvert to span bridge, enhance bed and banks	424
Celestine Lake Rd. 12.4	Unnamed Channel	Yes	Culvert to span bridge, enhance bed and banks	277.5
Snaring Road 10.6	Cobblestone Creek	Partial	Culvert to span bridge, enhance bed and banks	282.5
Maligne Range Rd. 2.7	Unnamed Channel	Partial	Culvert to span bridge, enhance bed and banks	750
Maligne Range Rd. 2.8	Unnamed Channel	Yes	Culvert to span bridge, enhance bed and banks	260
Cottonwood Creek (Jasper)	Cottonwood Creek	Yes – sluice and culvert	Enhance Fish Habitat between Canought Drive and Athabasca River, including re-establishment of connectivity.	3280
Miette River	Miette River	No	Enhance ~850m of a channelized section of the Miette River	15555
Maligne Lake Outlet	Maligne Lake Outlet	No	Restoration of riparian habitat along outlet margins	1000
Total Compensation Area				22,919m²



**AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON**

Referral File No. 05-HCAA-CA1-000-001582
Authorization No. ED-05-1582

Appendix C – Summary of Proposed British Columbia Project-Specific Compensation

Site Name and Location	Waterbody	Barrier	Crossing Compensation	Actual HADD Compensation (m ²)
Lucerne Station Road Culverts	Yellowhead Lake	Partial during Low Flow	Replace centre three of five culverts with a clear span bridge	5,750
Yellowhead Creek Highway 16 Culverts	Yellowhead Creek	Velocity and physical barrier during low flow	Construct a series of stepped K/V-weir and pools to raise water elevation at culverts	4,750
Fraser River Back Channel Standpipe and Causeway	Fraser River Backchannel	Yes	Replace culvert and barrier with single clear span bridge	6,785
Tributary to Fraser River – Fellen Bridge	Unnamed tributary to Fraser River near West Twin Creek	No	Removal of collapsed log stringer bridge and restoration of instream and riparian habitat	760
Total Compensation Area				18,045m ²

Riedler, Harold ENV:EX

From: Wakulchyk, Curtis [Curtis_Wakulchyk@kindermorgan.com]
Sent: Thursday, January 26, 2012 4:26 PM
To: 'Barghshoon@neb-one.gc.ca'; Riedler, Harold ENV:EX
Cc: Chow, Dan
Subject: Sumas TK121 Electronic Documents
Attachments: Remedial Action and Monitoring Plan Project PhaseV2 Jan 25 2012.pdf; Sumas tank farm GW wells from perimeter monitoring.pdf; Surface Water Sampling Plan V1.pdf; Sumas Air Monitoring Plan V7.pdf; Sumas Air Sampling Plan V8.pdf

Hi,
Attached are electronic versions of the items discussed between us on January 25. Please confirm receipt of these documents via email reply.

- Project Phase Remedial Action and Monitoring Plan: Please note this document will be superseded by an Initial Cleanup Plan (ICP) once available, in order to keep documents in alignment with the NEB Remediation Process Guide.
- Sumas Tank Farm Perimeter Wells Diagram: This diagram shows locations of existing monitoring wells onsite from our perimeter monitoring program.
- Surface Water Sampling Plan
- Air Monitoring Plan
- Air Sampling Plan

Please let me know if you have any questions regarding these documents.

Curtis

Curtis Wakulchyk B.Sc., P.Ag.
Environmental Specialist

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Sumas Tank Farm**TK 121 Release****Project Phase Remedial Action and Monitoring****Air Quality Monitoring**

During any remedial operation on site such as gravel removal and hydrovaccing of product, air sampling with instrumentation should continue at the seven locations specified by Golder Associates as well as at on site fenceline locations measured by KMC personnel. The sampling intervals should remain as hourly unless an elevated reading is detected, in which case a more frequent sampling program will be implemented.

Once the operations on site have ceased and all levels (H₂S, VOCs and Benzene) are registering zero (less than instrument detection limit), the sampling can conclude. If during the operations, levels above zero are detected, sampling should continue until three consecutive zero readings are registered.

Ambient sampling with canisters will be conducted on January 26 2012 in order to verify results found with instrumentation and complete post clean up sampling.

Soil Remediation**Tank 121 Tank Bay:**

All free product in the tank 121 bay will be removed via vac truck and stored in onsite baker tanks. The tank bay contains a synthetic liner. Impacted tank bay material (gravel, clay, sand) will be removed via hand excavation and/or hydrovac and disposed of offsite at an approved regulatory facility (Hazco Richmond). Any Impacted water collected during remediation will be collected via vac truck and disposed of offsite at an approved regulatory facility (Hazco Richmond). Golder Associates will be onsite during remediation or at conclusion. As per "Soil Sampling Plan V1" the consultant will visually inspect the area to confirm impacts have been removed. Swab samples of the liner underlying impacted material will be taken if possible. If appropriate, soil samples will be taken to confirm remediation. A confirmatory sampling plan is being prepared for the site and will be implemented.

Following remediation and, accumulated water in the tank 121 bay will be analyzed for hydrocarbon parameters prior to any discharge activities. Results from water sampling will be used in conjunction with visual data, soil data and swab data (as available) to confirm impacts have been removed.

Surface Water Monitoring**Tank 122 Tank Bay:**

Accumulated water in the tank 122 bay will be analyzed for hydrocarbon parameters to confirm impacts have not migrated between the bays.

Tank 101 Tank Bay:

Accumulated water in the tank 101 bay will be monitored as per "Surface Water Monitoring Plan V1". Sampling will be conducted on January 25 and 26 2012. Results will be interpreted prior to any discharge of water.

Site Discharge Wetland and Down Gradient of Site:

Surface water will be monitored as per "Surface Water Monitoring Plan". Sampling will be conducted on January 25 and 26 2012. Need for continuation of monitoring will be evaluated once results from these events have been interpreted.

Onsite Groundwater

The presence of a synthetic liner in the tank 121 bay minimizes the potential for downward migration of impacts. As an additional precaution, existing perimeter groundwater wells will be monitored for the presence of hydrocarbon product once on or before January 31 2012 and analyzed for hydrocarbon parameters (BTEX, LEPH, HEPH) to confirm onsite groundwater quality. Need for continuation of monitoring will be evaluated once results from these events have been interpreted.

Drinking Water

The presence of a synthetic liner in the tank 121 bay minimizes the potential for downward migration of impacts. As an additional precaution, risk to drinking water supply wells will be evaluated by Golder Associates. Nearby wells will be identified and risk to each well will be documented based on worst case migration scenarios. Results will be summarized and follow-up action will be taken for any wells identified to be at risk.

Visual Monitoring

Visual inspection of drain and outfall locations will be conducted on an hourly basis until remediation is complete. Following remediation visual inspection of these locations will be conducted by KMC personnel three times per week for 2 weeks or within 24 hours of a significant rainfall event for a total of six times within a two week period.

Remediation Process (NEB)

These activities will be presented in a remedial action plan as part of the Remediation Process Guide. A closure report summarizing activities will be presented.

Surface Water Monitoring PlanObjectives in order of priority:

1. Sample watercourse and wetland as soon as practicable to establish water quality baseline. In the event that impacts migrate from site the sampling plan.
 - a. Upstream Control Site (0.5 km U/S). (inside TK101 berm)
 - b. Source at discharge from tank farm South East corner
 - c. Downstream Site 1 (0.5 km D/S)
2. Samples will be collected once per day at 14:00 while impacts are contained onsite. If impacts leave the site sampling will be conducted twice daily at 09:00 and 15:00 to monitor impacts.

Safety Concerns:

See task-specific Health and Safety Plan for details and mitigation, in summary:

Aquatic Sampling:

- a. Wading; boating (if required); risk of drowning; risk of exposure (elements); risk of exposure (product); traffic; heavy equipment
- b. PPE will include hard hats, safety glasses and steel toed boots. Steel toed boots will not be worn while wading instream. When operating near water, PFDs will be worn.

Plan Details:

1) Aquatic sampling:

- A two-person crew will be collecting surface water samples. A zodiac inflatable is recommended to be available; however, it is not expected to be required.
- At each collection point, the following samples will be collected for analysis, including:
 1. TEH
 2. Daphnia
 3. LC 50 (100%)
- The water samples will be delivered to Maxxam Labs.
- The time of sample and location (including GPS coordinates) must be recorded at each sample site. Photographs should be taken at each location and geo-referenced. Appropriate duplicates and travel blanks will be collected.
- Chain of custody forms will be completed and the samples shipped to Maxxam Labs (4606 Canada Way Burnaby, British Columbia V5G 1K5).
- ALL SAMPLES MUST BE LABELLED FOR "Emergency Rush" UNTIL FURTHER NOTICE.

When collecting water samples, do the following:

- Triple rinse all plastic bottles and lids with site water prior to collecting sample water, discarding rinse water downstream of the sample site (or away from the boat for lake samples). DO NOT rinse glass bottles.
- At surface water sampling stations (stream or lake surface), collect one (1) grab sample at each site by submerging sample bottles to a depth of 30 cm (i.e., go up to your elbow, if depth permits).
- Preserve samples as required.
- Keep samples cool and in the dark (i.e., place samples in a cooler with ice packs) until delivery.

AIR SAMPLING PLAN**1.0 INTRODUCTION**

An Ambient Air Monitoring Plan (AAMP) was prepared to address and document the methods and procedures for monitoring ambient air adjacent to and in neighbouring residential areas in response to the January 24, 2012 crude oil release at the tank farm located at 4076 Sumas Mountain Road. Benzene is known to be present in the product. This Air Sampling Plan (ASP) documents the methods and procedures for sampling ambient air at key locations.

1.1 PURPOSE

The ASP describes the methods that KMC will employ to collect quantitative data for regulatory and health and safety purposes.

Safety Concerns:

See task-specific Health and Safety Plan for details and mitigation, in summary:

Ambient air Monitoring:

- a. Driving, sampling near roadway, work at night
- b. PPE will include hard hats, safety glasses and steel toed boots, half face respirator with organic cartridges available.

Plan Details:**1) Air Sampling**

- Air samples will be collected at four established air monitoring locations with one duplicate sample (suggested locations: SCH1, SO, MER1, FR1). The samples will be analysed for:
 1. Benzene
 2. H₂S
- Samples will be collected in Summa canisters set to collect a sample over a 15 minute duration.
- The time of sample, ambient field measurements and sample location (including GPS coordinates or intersection) must be recorded at each sample site.
- Record at each site: wind speed and direction

AIR SAMPLING PLAN

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1.2 PERSON IN CHARGE

KMC will exercise diligence to ensure all responders follow the provisions of the plan.

2.0 REPORTING REQUIREMENTS

Samples will be submitted to Maxxam Analytics for analysis. Data will be tabulated and compared to applicable action limits.

AIR SAMPLING PLAN**1.0 INTRODUCTION**

An Ambient Air Monitoring Plan (AAMP) was prepared to address and document the methods and procedures for monitoring ambient air adjacent to and in neighbouring residential areas in response to the January 24, 2012 crude oil release at the tank farm located at 4076 Sumas Mountain Road. Benzene is known to be present in the product. This Air Sampling Plan (ASP) documents the methods and procedures for sampling ambient air at key locations.

1.1 PURPOSE

The ASP describes the methods that KMC will employ to collect quantitative data for regulatory and health and safety purposes.

Safety Concerns:

See task-specific Health and Safety Plan for details and mitigation, in summary:

Ambient air Monitoring:

- a. Driving, sampling near roadway, work at night
- b. PPE will include hard hats, safety glasses and steel toed boots, half face respirator with organic cartridges available.

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 1. Benzene
 2. H₂S
- Samples will be collected in Summa canisters set to collect a sample over a 15 minute duration.
- The time of sample, ambient field measurements and sample location (including GPS coordinates or intersection) must be recorded at each sample site.
- Record at each site: wind speed and direction

AIR SAMPLING PLAN

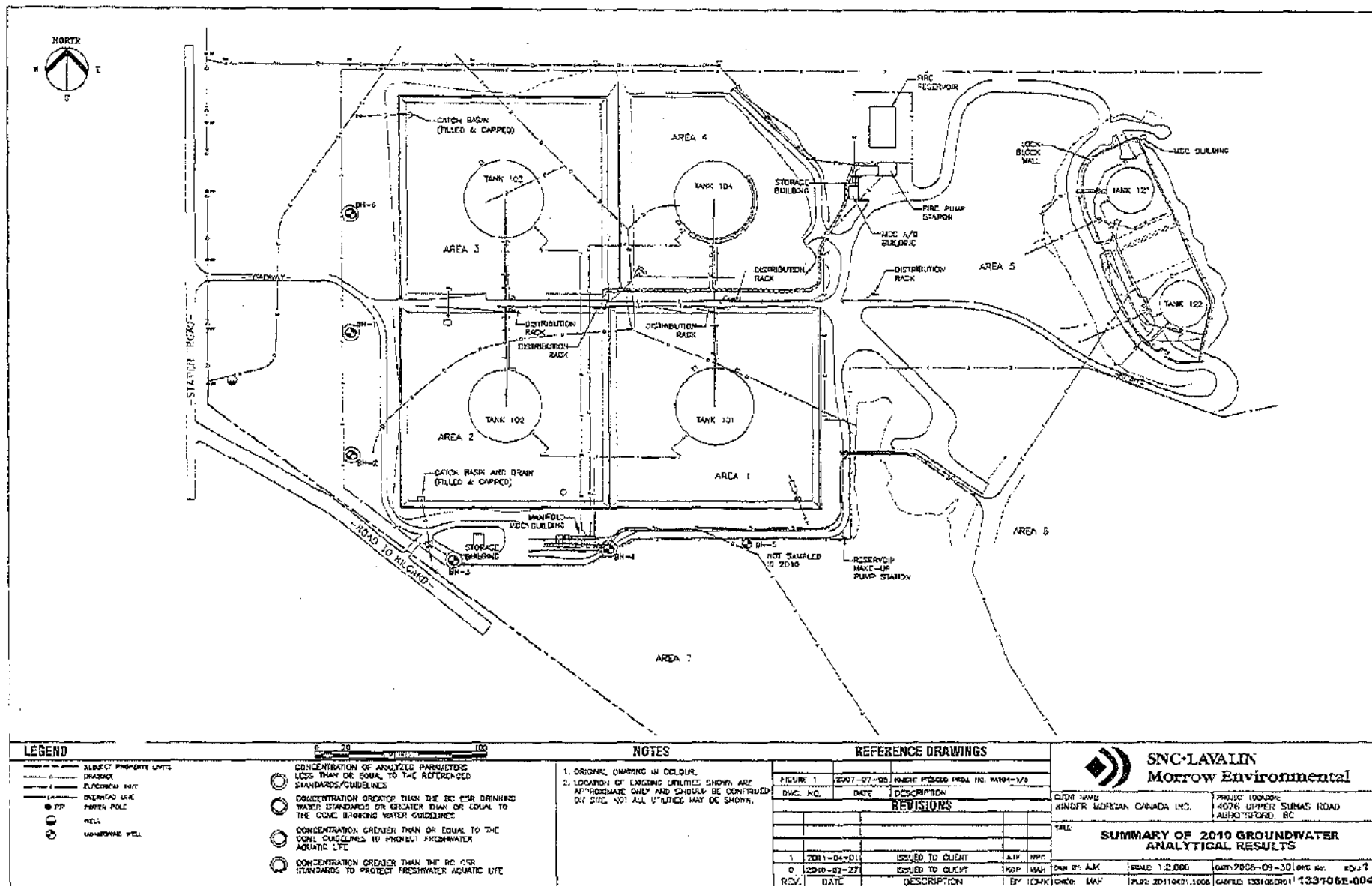
Copyright

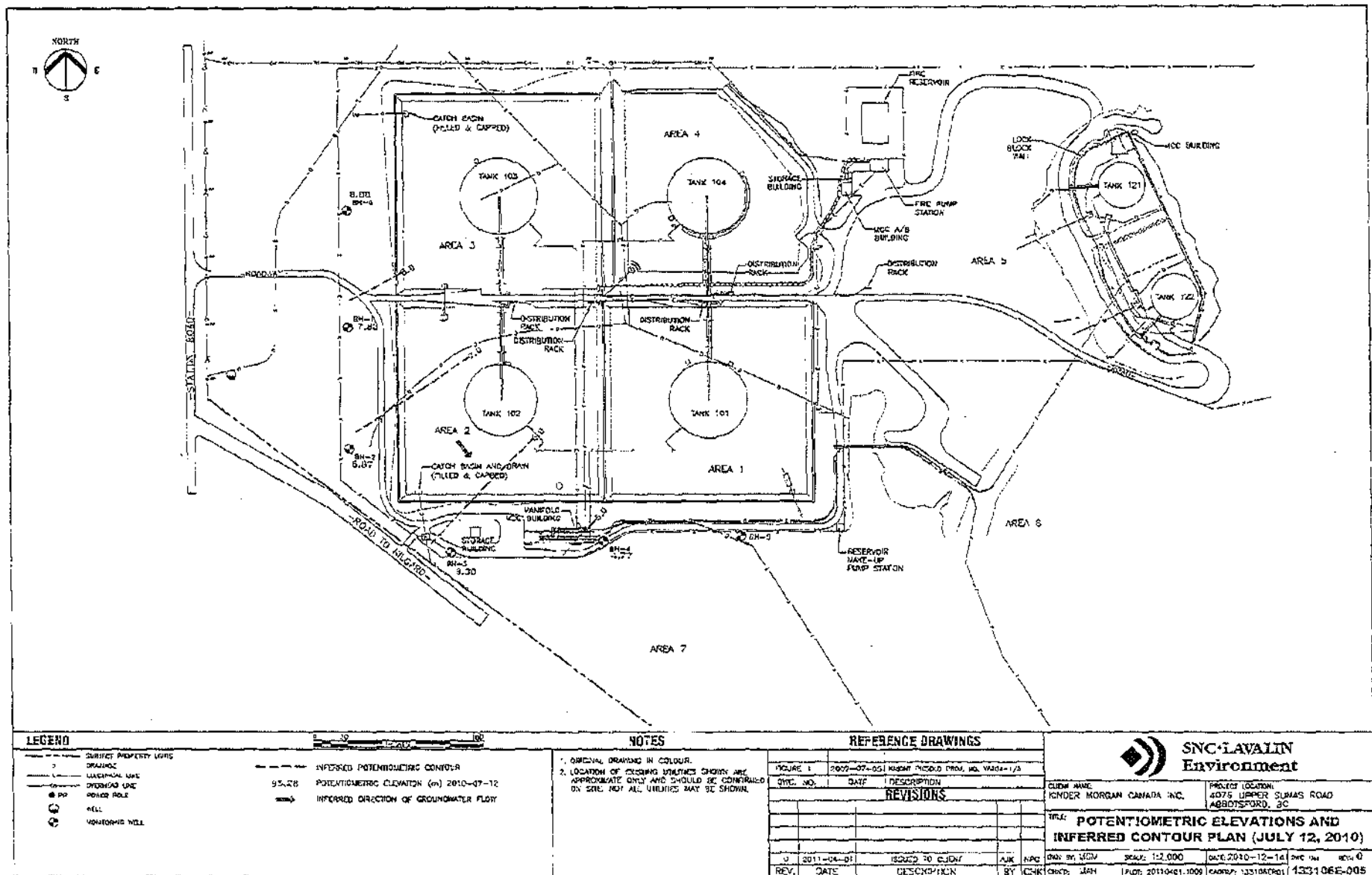
1.2 PERSON IN CHARGE

KMC will exercise diligence to ensure all responders follow the provisions of the plan.

2.0 REPORTING REQUIREMENTS

Samples will be submitted to Maxxam Analytics for analysis. Data will be tabulated and compared to applicable action limits.





AIR MONITORING PLAN**1.0 INTRODUCTION**

This Ambient Air Monitoring Plan (AAMP) has been prepared to address and document the methods and procedures for sampling ambient air adjacent to and in neighboring residential areas in response to the January 24, 2012 crude oil release at the tank farm located at 4076 Sumas Mountain Road. Kinder Morgan Canada (KMC) will follow the guidelines outlined in this plan. Tank 121 was reported to have carried BC Light Crude oil. Chemical characterization of the product indicates the following:

- Density 819 kg/m³
- Wt% S 0.8197
- Partial Pressure H₂S at 31 deg C, 0.9882 kPa
- Wt% H₂S in liquid 84.1
- Reid VP 31.5 kPa

Benzene is known to be present in the product.

1.1 PURPOSE

The AAMP describes the methods that KMC will employ to collect qualitative data for health and safety purposes. The AAMP is to be considered a living document and will be revised as required. Any changes to the AAMP will be communicated to the Unified Command in a timely manner.

Objectives in order of priority:

1. Monitor air quality for: benzene, total VOCs (LEL), H₂S in the following areas:
Note wind direction and velocity, establish wind direction and thus upwind direction at initial sampling event (SE1).
 - a. Source – sample as close to tank farm as safely possible. Establish this location as (S0)
 - b. Adjacent residences to immediate SW (it appears from Google Earth to be 2 residences), establish as (SWR1)
 - c. First Home heading SE on Keeping Road (SER1),
 - d. NE of Site where Keeping Rd turns from NW/SE to E-W (NER1)
 - e. SW at terminus of Westminster Drive (SWR1)
 - f. North at S terminus of Charlie Spruce Place (NR1)
 - g. School (SCH1)
 - h. Fence line locations (if wind changes direction)
 - i. Finucci Road at Sumas Mtn Road (FR1)

AIR MONITORING PLAN**Safety Concerns:**

See task-specific Health and Safety Plan for details and mitigation, in summary:

Ambient air Monitoring:

- a. Driving, sampling near roadway, work at night
- b. PPE will include hard hats, safety glasses and steel toed boots, half face respirator with organic cartridges available.

Plan Details:**1) Ambient Air Monitoring (Every hour):**

- At each collection point, the following samples will be collected for analysis, including:
 1. Benzene ppm
 2. Total VOCs LEI.
 3. H₂S ppm
- The time of sample and location (including GPS coordinates or intersection) must be recorded at each sample site. Photographs should be taken at each location and geo-referenced.
- Record at each site: wind speed and direction

AIR MONITORING PLAN

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1.2 PERSON IN CHARGE

KMC will exercise diligence to ensure all responders follow the provisions of the plan.

2.0 REPORTING REQUIREMENTS

- Action levels:
 - Benzene: short term exposure limit (STEL) Worksafe BC is 2.5 ppm and TWA (8-hour weighted average) is 0.5 ppm,
 - H₂S ceiling exposure is 10 ppm, (Worksafe BC).

KMC Action Levels

Based on the above provincial levels, the following action levels will be adhered to onsite:

- BENZENE (Instrumentation used initially on site was an RKL Eagle which has a detection limit of 1 ppm and replaced on January 25th with an Ultrarae 3000 with a detection limit of 50 ppb)

AIR MONITORING PLAN

- Less than 0.5 ppm - no action required.
- 0.5 ppm to less than 5 ppm – half face respirator with organic vapour cartridges required.
- 5 ppm to 25 ppm - don SCBA or full face respirator with organic vapour cartridges.
- **Hydrogen Sulphide** (Instrumentation used on site was an RKI Eagle, which has a reported detection limit of <1 ppm according to the unit provider)
 - less than 5 ppm - monitor continuously to ensure 5 minute STEL of 5 ppm not exceeded and 8 hour TWA of 1 ppm not exceeded.
 - Greater than 5 ppm depart from area and don SCBA/ SABA
- **Total Combustible Volatiles** (Instrumentation used was an RKI Eagle which has a detection limit of 1% or 5ppm according to the instrument provider).
 - LEL less than 10% - proceed with caution; monitor frequently
 - LEL 10% or greater – leave area and do not re-enter the area until LEL is less than 10%
 - LEL must be 0% for hot work to be performed
- **Volatile Organic Carbons (VOCs)** (Instrumentation used was an RKI Eagle which has a detection limit of 1ppm according to the instrument provider).
 - greater than 10 ppm - additional testing required to confirm presence or absence of benzene
- **Reporting Timeline:** the above report items will be provided on a schedule agreed to by all pertinent parties.

Riedler, Harold ENV:EX

From: Wakulchyk, Curtis [Curtis_Wakulchyk@kindermorgan.com]
Sent: Friday, January 27, 2012 7:26 AM
To: XT:HLTH Rice, George
Cc: Riedler, Harold ENV:EX; Chow, Dan; 'Barghshoon@neb-one.gc.ca'
Subject: Sumas TK121 Electronic Documents
Attachments: Remedial Action and Monitoring Plan Project PhaseV2 Jan 25 2012.pdf; Sumas tank farm GW wells from perimeter monitoring.pdf; Surface Water Sampling Plan V1.pdf; Sumas Air Monitoring Plan V7.pdf; Sumas Air Sampling Plan V8.pdf

Hi George,
Here is an electronic copy of the remediation and monitoring plans for Sumas Tank 121.
Please let me know if you have any questions or need any further info.
Thanks
Curtis

Curtis Wakulchyk B.Sc., P.Ag.
Environmental Specialist

KINDERMORGAN
CONSULTANTS

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Calgary, AB T2P 5J2
e-mail: wakulchyk@kindermorgan.com
Direct: 403.514.6509
Cellular: 403.771.1428
Fax: 403.514.6627

Curtis, can you also provide George Rice, Manager, Fraser Valley Health Authority an electronic copy of your draft plans to allow the Health Authority an opportunity to review and comment? I copied George in this email so that you would have his email address. Thank you.

Harold Riedler
Senior Emergency Response Officer
Coastal Region - Surrey Office
Environmental Emergencies Program
Ministry of Environment
Phone: 604-582-5278
harold.riedler@gov.bc.ca

From: Wakulchyk, Curtis
Sent: Thursday, January 26, 2012 5:26 PM
To: 'Barghshoon@neb-one.gc.ca'; 'harold.riedler@gov.bc.ca'
Cc: Chow, Dan
Subject: Sumas TK121 Electronic Documents

Hi,
Attached are electronic versions of the items discussed between us on January 25. Please confirm receipt of these documents via email reply.

- Project Phase Remedial Action and Monitoring Plan: Please note this document will be superseded by an Initial Cleanup Plan (ICP) once available, in order to keep documents in alignment with the NEB Remediation Process Guide.
- Sumas Tank Farm Perimeter Wells Diagram: This diagram shows locations of existing monitoring wells onsite from our perimeter monitoring program.
- Surface Water Sampling Plan
- Air Monitoring Plan

Chor, Alan ENV:EX

From: Riedler, Harold ENV:EX
Sent: Saturday, January 28, 2012 10:31 PM
To: 'dan_chow@kindermorgan.com'
Cc: XT:HLTH Rice, George; 'Nickerson, Scott [PYR]'; 'dan.barghshoon@neb-one.gc.ca'; Caunce, Cassandra ENV:EX; Hebert, David ENV:EX; Chor, Alan ENV:EX; Veale, J Graham ENV:EX; 'DBEER@CITY.ABBY.BC.CA'; 'Chris.Raymond@ec.gc.ca'; Knox, Graham ENV:EX
Subject: FW: Kinder Morgan Review
Attachments: Kinder Morgan Response JNB 26Jan2012.doc; image001.gif

Our file: 32936-20/DGIR112840

Attention: Dan Chow, Environmental Coordinator, Kinder Morgan.

Hello, Dan.

Ministry of Environment and Fraser Health Authority received the following documents for review and comment:

- “*Kinder Morgan Canada Inc. Sumas Tank Farm Incident: Tank 121 Air Monitoring Plan*”, dated January 25, 2012;
- “*Sumas Tank Farm TK121 Release, Project Phase Remedial Action and Monitoring*”, dated January 25, 2012;
- “*Kinder Morgan Canada Inc. Sumas Tank Farm Incident: Tank 121, Soil Sampling Plan*”, dated January 25, 2012; and
- “*Kinder Morgan Canada Inc. Sumas Tank Farm Incident: Tank 121, Surface Water Monitoring Plan*”, dated January 25, 2012.

Specifically, the following Ministry of Environment and Fraser Health Authority representatives have conducted a review and provided comments, detailed in this email::

- 1) Janet Barrett, Senior Contaminated Sites Officer, Ministry of Environment (attached, above),
- 2) Graham Veale, Air Quality Meteorologist, Air Quality Section, Ministry of Environment (below),
- 3) George Rice, Manager, Environmental Health, Fraser Health Authority (below), and
- 4) Dave Hebert, Environmental Protection Officer, Environmental Protection, BC Ministry of Environment (including comments, provided below, from Cassandra Caunce – Section Head, Alan Chor - Senior Environmental Protection Officer).

Please advise the undersigned and the copied stakeholders as to how Kinder Morgan will address the issues, questions and concerns provided, below, as soon as possible. It is also requested that Kinder Morgan provide a “Schedule of Activities” to show how the company will be moving forward with the remedial measures. Realizing that the Schedule of Activities will take more time to develop than replying to the comments provided below, please place priority in responding to the comments from the copied agency stakeholders. It is recommended that Kinder Morgan work on the Schedule of Activities as information becomes available. We are willing to receive a Schedule of Activities with some undefined target dates to provide agencies earlier direction as to how Kinder Morgan intends to proceed with remedial measures. Activities with no available completion date at this time should still have the pending activity acknowledged in the Schedule. The missing projected target dates can be filled-in as they become available. It is requested that placement of amendments and updates to your Schedule of Activities be posted on a web site that can be accessed by the agencies for reference. It is also requested that comments provided below and other agency correspondence associated with this incident be posted on this shared web site to allow a common and

Harold Riedler
Senior Emergency Response Officer
Coastal Region - Surrey Office
Environmental Emergencies Program
Ministry of Environment
Phone: 604-582-5278
harold.riedler@gov.bc.ca

- The monitoring plan appears to be designed for the protection of those conducting the sampling rather than nearby residents. The purpose of the Plan (Section 1.1) indicates that monitoring will be conducted at several identified off-site locations (presumably to ensure protection of residents health) but the KMC Action Levels (Section 2.0) indicate that these levels will only be adhered to “on-site” and that should these levels be exceeded the only action to be taken is by the samplers themselves. Is no action contemplated for the residents in the vicinity of the measured elevated concentrations should they occur ?? It is not clear how this is protective of ambient air quality and residents health.
- The selection of Action Levels appears based on workplace standards (with an assumed safety factor applied). Generally speaking, it is not appropriate to use workplace air standards when assessing air quality in the receiving environment (ambient air quality). Ambient air quality criteria are usually much lower, reflecting the potential for ongoing exposure to the contaminant of interest. For example:
 - H2S BC Air Quality Objective = 5ppb (although based on avoidance of nuisance odour v. health impacts)
Agency for Toxic Substance and Disease Registry (ATSDR) Minimal Risk Levels = 70ppb (acute inhalation)
 - Benzene No BC Air Quality Objective
ATSDR Minimal Risk Levels = 9ppb (acute inhalation)

contaminants may help to alleviate residents concerns that health impacts are not being adequately monitored.

- The attached “Project Phase Remedial Action and Monitoring” document indicates that on completion of on-site operations, monitoring will cease when all contaminant levels are registering “zero” (defined as the instrument detection limit). As stated previously, the instrumentation is not sensitive enough to register lower concentrations. Therefore, it should be noted that residual pockets of contaminated air may still result in odour complaints after clean up is completed.
- The “Project Phase Remedial Action and Monitoring” document also indicates that “ambient sampling with canisters will be conducted...”. The contaminants to be sampled, along with detailed sampling methodology are not provided. I would suggest that health professionals should be consulted to determine the appropriate contaminants (a comprehensive scan of all potential hydrocarbons and VOC’s or at least BTEX along with H₂S ??). The canister exposure time should be sufficient to ensure that a large enough volume of air is collected to enable analyses of detectable amounts of the contaminants of concern. Detailed contaminant information will be useful should a post-incident health/air quality assessment be required.

I have contacted George regarding his input to the Plan but have received feedback as yet. I have also left voicemail messages with the City of Abbotsford (Rod Shead) and Fraser Valley Regional District (Julian Zalaski sp? Don’t have e-mail so Stacy barker cc’d) but received no response as yet.

Graham Veale
Air Quality Meteorologist
Environmental Quality
Ministry of Environment
2nd Floor 10470-152nd Street
Surrey BC V3R 0Y3
Phone: (604) 582-5286
Fax: (604) 930-7119
Email: j.graham.veale@gov.bc.ca

Comments from George Rice, Manager, Fraser Health Authority

I have conducted a review of the proposed protocol for air quality monitoring and agree with Graham's findings. I am also concerned that the protocol does not appear to address the issue of public or at least government agency notification of the test results or if safe levels are exceeded.

While this particular incident was fairly small - it has pointed out a few shortcomings in Kinder Morgan's reaction to spill and air quality incidents at the facility.

I have referred the matter to our environmental safety consultant for any additional comment on the specific testing methods. We have considerable data related to air quality concerns for residents in the area of the Chevron refinery in Burnaby and will see if there are any practices that could be applied to the Sumas Mtn facility.

George Rice C.P.H.I.(C)

Manager, Environmental Health
Fraser East Geographic Programs
Chilliwack, Abbotsford, Mission, Hope, Agassiz



Comments from Environmental Protection, Business Standards Group (Cassandra Caunce – Section Head, Alan Chor – Senior Environmental Protection Officer and Dave Hebert – Environmental Protection Officer)

Cassandra's comments:

Air Monitoring:

Will samples for benzene, H₂S and Total VOCs be taken at ground level?

Concern over heavy vapours close to ground being missed. How will wind speed and direction be measured at each sample site?

Regarding H₂S monitoring, how many will be deployed on site? Will it capture any potential change in wind direction? During remediation (gravel removal), hourly sampling will occur. If multiple elevated air quality readings are detected, will someone be notified to investigate?

Soil:

Will all impacted water and soil meet hazardous waste criteria? Will there be a check? Will it all be manifested? (It is my understanding that the DGIR# is being used as a BCG and all gravel material is being manifested, is that correct?)

Ground Water:

Perhaps one additional test in February beyond the one planned on or before January 31, to ensure no impacts. What is the rate of groundwater movement in this area?

Dave's Comments:

Site plan and Engineered drawings for containment, drainage and oil water separation should be made available, with locations of discharge clearly marked, current map is unreadable.

Do we have access to their emergency/spill plan?

Currently using DGIR# for spill related disposal of hazardous waste materials (gravel mostly correct?). Do not have a BCG for site, suspect they have been using 3434 McDermott Road BCG#46172 in the past to dispose of hazardous waste

Surface Water:

Noted that the upstream control site is within TK101 berm, is this an issue? Do the creek headwaters begin within the facility?

Do discharges to the waterway from the storm water collection area exceed 15mg/L hydrocarbon content?

Dave Hebert

Environmental Protection Officer
Ministry of Environment South Coast Region
10470 152 Street 2nd Floor

Alan's Comments:

Kinder Morgan should:

- 1) Provide detailed site plans/drawings/information regarding/showing tanks (including tank names), location of spill, spill containment facilities, berms, liners, stormwater flows, pipes, drainage [including drainage below tanks/liners], direction of flows, shutoff valves, stormwater treatment facilities/oil separators, outlets from bermed areas, outfalls, sampling locations, creeks/watercourses, etc.;
- 2) Maintain close ongoing contact with the lab so that Kinder Morgan is immediately notified of any sampling results that indicate an environmental concern to facilitate immediate implementation of corrective action and increased monitoring. (For example, Kinder Morgan should ensure that if any mortalities occur before the 96 hour fish bioassay test is completed, the lab notifies them immediately so that corrective action can be taken immediately);
- 3) Investigate whether Kinder Morgan can safely maximize the surge capacity of their stormwater treatment/containment facilities by discharging any stormwater from the system (after testing to confirm that it is uncontaminated/non-toxic) in case a significant storm event occurs and they need to contain/treat/handle an excessive amount of stormwater to ensure that no contaminated effluent is discharged;
- 4) Investigate if a more appropriate background/control monitoring site is available than the inside of a bermed tank area (e.g. creek upstream of the tank farm site);
- 5) Take all measures to prevent pollution and comply with all requirements related to the *Environmental Management Act.*
- 6) Keep the ministry (and other relevant agencies) updated on the status of the spill incident including monitoring results and corrective/clean up measures being implemented.

If you have any questions, please let me know.

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

January 26, 2012

To: Harold Riedler
Senior Environmental Emergency Response Officer
Environmental Protection Division

From: Janet Barrett
Contaminated Sites Officer
Land Remediation Section, Surrey

Re: **Review of Kinder Morgan Canada Inc. (KMC) Sumas Tank Farm Incident: Tank 121 Documents**

The following documents were released by KMC regarding the January 24, 2012 crude oil release at the tank farm located at 4076 Sumas Mountain Road:

- “*Kinder Morgan Canada Inc. Sumas Tank Farm Incident: Tank 121 Air Monitoring Plan*”, dated January 25, 2012;
- “*Sumas Tank Farm TK121 Release, Project Phase Remedial Action and Monitoring*”, dated January 25, 2012;
- “*Kinder Morgan Canada Inc. Sumas Tank Farm Incident: Tank 121, Soil Sampling Plan*”, dated January 25, 2012; and
- “*Kinder Morgan Canada Inc. Sumas Tank Farm Incident: Tank 121, Surface Water Monitoring Plan*”, dated January 25, 2012.

As per your request, I have reviewed the above-listed documents and provide the following general comments:

- A sample of the crude oil should be collected and analyzed to determine whether all CSR-regulated potential contaminants of concern are being adequately addressed in the remedial efforts. Samples collected from soil, groundwater and surface water, as indicated in the above-listed documents, should be analyzed for CSR-regulated parameters. Parameters not included in the sampling plans that may be of concern include, but are not limited to, volatile petroleum hydrocarbons (VPH), polycyclic aromatic hydrocarbons (PAHs) and metals.
- A site diagram showing the proposed groundwater monitoring wells, nearby watercourses, and locations of underground utility lines in the vicinity of the tank should be provided.

Comments specific to each of the above-listed documents are provided below.

1. Project Phase Remedial Action and Monitoring

Soil Remediation – Tank 121 Tank Bay

See Soil Sampling Plan section, below, for details.

Surface Water Monitoring

Tank 122 Tank Bay

- Note that this tank bay is located adjacent Tank 121 tank bay.
- See above comment regarding selection of potential contaminants of concern.

Tank 101 Tank Bay

- Note that this is the proposed upstream control site listed in the Surface Water Monitoring Plan (see below).
- See above comment regarding selection of potential contaminants of concern.

Site Discharge Wetland and Down Gradient of Site

- See above comment regarding selection of potential contaminants of concern.
- Additional comments are provided in the Surface Water Monitoring Plan section, below.

Onsite Groundwater

The document notes that the presence of a synthetic liner in the Tank 121 bay minimizes the potential for downward migration of impacts, and indicates that existing perimeter groundwater wells will be monitored for the presence of hydrocarbon product once on or before January 31, 2012. BTEX, LEPH, HEPH are listed as potential contaminants of concern.

- Due to the possibility of an absence of confirmatory soil data for the tank bay area, collection of groundwater samples from nearby downgradient wells is desirable to confirm that groundwater has not been impacted by the spilled crude oil. If nearby downgradient wells currently do not exist in the area, new installations may be necessary.
- Additional potential contaminants of concern should be included, as determined by the crude oil sample analysis (see previous comments).
- In the case that groundwater impacts are not observed downgradient of the tank nest during the first sampling event, an additional groundwater sampling event in the future is suggested to confirm that groundwater has not been impacted.
- In the case that groundwater impacts are observed downgradient of the tank nest during the first sampling event, further investigation will be required.

Drinking Water

The document indicates that risks to drinking water supply wells will be evaluated by Golder Associates. Nearby wells will be identified and risk to each well will be evaluated. Follow-up action will be taken for any wells identified to be at risk.

- Further information regarding the drinking water assessment is anticipated.

Visual Monitoring

Visual monitoring of drain and outfall locations will be conducted until remediation is complete, and will continue over a period of two weeks.

Remedial Action Plan

A remedial action plan and a closure report will be prepared.

2. Air Monitoring Plan

KMC prepared the Ambient Air Monitoring Plan (AAMP) to address and document methods and procedures for sampling ambient air adjacent to and in neighbouring residential areas in response to the crude oil release. Air quality will be monitored at a number of locations for benzene, total VOCs (LEL), and H₂S. KMC indicates that the data will be collected for health and safety purposes.

- Note that the CSR provides generic numerical vapour standards (see Schedule 11 of the CSR). With respect to the CSR, vapour contamination exists if the concentration of any vapour PCOC that is associated with a soil, sediment or water source exceeds its Schedule 11 standard in the breathing zone. Assessment of vapour concentrations in the vicinity of the spill is recommended. Further investigation and remediation may be required should vapour contamination be identified. Vapour contamination originating onsite and migrating offsite must be fully delineated.

3. Soil Sampling Plan

KMC indicates that soil sampling may not be possible as the spill was contained within the tank berm; therefore, KMC proposes to collect swab samples of the liner along the base and sidewalls of the tank berm. Samples will be analyzed for EPH and BTEX. Should affected areas of soil be observed, representative soil samples will be collected and submitted for analysis of EPH and BTEX. Although soil confirmatory samples are preferable to swab samples from the liner, groundwater and surface water monitoring can provide confirmation that unacceptable impacts did not occur.

4. Surface Water Monitoring Plan

Three sample locations are proposed:

1. Upstream Control Site (0.5 km upstream, located inside TK101 berm);
2. Source at discharge from tank farm South East corner;
3. Downstream of site (0.5 km downstream).

KMS proposes to analyze samples for TEH, Daphnia and LC50 (100%).

- Note that TEH is not a CSR-regulated parameter. Please determine appropriate potential contaminants of concern based on the crude oil analysis.

It is preferable that a statement be provided, along with supporting documentation, by an approved or qualified professional that the crude oil spill has not caused impacts to site soil, surface water, groundwater, sediment or vapour at concentrations in excess of CSR standards.

DATE January 31, 2012**PROJECT No.** 12-1493-0017**TO** Curtis Wakulchyk
Kinder Morgan Canada Inc.**CC** Dan Bargshoon – National Energy Board
Harold Reidler, BC Ministry of Environment
Dan Chow – Kinder Morgan Canada Inc.
Mike Droppo – Kinder Morgan Canada Inc.**FROM** Nicky Jennings**EMAIL** njennings@golder.com**SUMAS TANK FARM TANK 121 RELEASE – INITIAL CLEAN UP PLAN****NEB INCIDENT NUMBER: 2012-016****NEB FILE NUMBER: OF-SURV-INC-2012-016**

This memorandum outlines the Initial Clean Up Plan (ICP) as required through the National Energy Board's (NEB) Remediation Process Guide (2011). The ICP has been prepared in response to a petroleum hydrocarbon product release on January 24, 2012 from Tank 121 at Trans Mountain Pipeline ULC's (Trans Mountain) Sumas Tank Farm. Kinder Morgan Canada (KMC), a subsidiary of Kinder Morgan Energy Partners, L.P. operates the system on behalf of Trans Mountain. The release was contained within the tank bay of Tank 121 at the Sumas Tank Farm. The Emergency Phase of the response was conducted on January 24 and 25, 2012.

1.0 REMEDIATION PROCESS (NATIONAL ENERGY BOARD)

The NEB Remediation Process Guide provides details of the documentation and planning that is required in response to an unplanned release. In the case of the Sumas Tank Farm Tank 121 release, immediate remedial measures were required to manage the free product, and therefore the first step in the NEB guidance is the development of an Initial Clean Up Plan which is presented in this document.

Following a release, an Environmental Site Assessment (ESA) may be required, but as noted below in Section 5.0, an ESA is not considered warranted at this time based on site specific conditions pertaining to the release and the information available regarding site conditions. Following evaluation of the requirements for an ESA, available information was then used to conduct an assessment of whether a Remedial Action Plan (RAP) is warranted using the 'self assessment' form in the NEB guidance document. Completion of the self assessment document indicates that a RAP is not required for this site (completed form provided in Attachment 1 for reference). A Remediation Closure Report will be prepared on completion of the remedial activities at the site.

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2.0 REMEDIATION OBJECTIVES

The release of petroleum hydrocarbon product was fully contained within the Tank 121 bay, which contains a synthetic liner, overlain by a protective layer of gravel. The release was contained within the lowest point of the tank bay, resulting in a limited volume of gravel becoming contaminated with product and small area of the liner coming into contact with free product. The free product was removed via vacuum trucks and stored separately in containment tanks, and the contaminated gravel will be excavated and disposed of off-site at Hazco Environmental Services (Hazco) facility in Richmond, BC. The liner will be then be cleaned to remove residual contamination. Release of product to the underlying soil, surface water or groundwater in the vicinity of the tank is considered unlikely based on visual observations of the local drainage discharges by KMC and inferred liner integrity.

3.0 REMEDIATION CRITERIA AND STANDARDS

The site is regulated by the National Energy Board, a federal agency, and as the surface impacts of the release were contained to the facility the Canadian Council of Ministers for the Environment (CCME) guidelines are applicable to the site. The CCME has defined Environmental Quality Guidelines (EQGs) for soil, sediment and surface water to assess potential chemical impacts for defined land uses. The site is considered an industrial land use.

4.0 CONTAINMENT

The free product in the Tank 121 bay will be removed via vacuum truck and stored in onsite baker tanks. The tank bay contains a synthetic liner. Impacted tank bay material (gravel), which overlies and protects the liner, will be removed using hand excavation and/or hydrovac and disposed of offsite at an appropriately licensed facility (Hazco Environmental Services in Richmond, BC) in accordance with the Waste Management Plan. Impacted water collected during remediation will be collected via vac truck, temporarily stored on sites in tanks and disposed of offsite at an appropriately licensed facility (Hazco Environmental Services in Richmond). Golder Associates Ltd. (Golder) will conduct periodic inspection of the remediation during the work. On completion of the remediation, Golder will visually inspect the area to confirm contamination has been removed. As there is a synthetic liner beneath Tank 121, confirmatory soil sampling may not be possible; therefore, swab samples of the liner underlying contaminated material will be collected. A Confirmatory Sampling Plan has been prepared for the site and will be implemented (provided in Attachment 2).

Following remediation, accumulated water in the Tank 121 bay will be analyzed for hydrocarbon parameters prior to discharge activities. Results from water sampling will be used in conjunction with visual data and swab data (as available) to confirm the removal of contaminated gravel about the liner and cleaning of the surface of the liner were successful.

5.0 CONTAMINANT DELINEATION

As noted above, the product was contained within the lined Tank 121 bay. There was no evidence indicating that released product migrated outside of the tank bay. It is assessed that contaminant delineation or an environmental site assessment is not warranted at this time, as contamination of soil or groundwater from the release was not observed and is not anticipated. The presence of perimeter groundwater monitoring wells that are regularly monitored will provide an indication of possible long term groundwater quality issues.

6.0 SENSITIVE RECEPTORS

The release was contained within the Tank 121 bay. Possible receptors include local creeks receiving discharge from the site and human receptors via drinking water from wells and ambient air. These receptors have been addressed with the following monitoring program:

6.1 Air Quality Monitoring – During Remediation

During the remedial operation on site such as gravel removal and hydrovaccing of product, air quality monitoring with instrumentation will continue at off-site locations identified by Golder in the Air Monitoring Plan (provided in Attachment 3) and at the on-site perimeter locations. The measurements will be collected by KMC or Golder personnel. Hourly monitoring intervals of the off-site and on site locations should be maintained during the site remedial activities unless an elevated reading is detected, in which case more frequent monitoring will be implemented. Action levels for both occupational exposure and ambient air quality are provided in the Air Monitoring Plan (provided in Attachment 3). The air monitoring will be conducted during the remediation activities and will cease at the end of each working day.

Once the remedial activities on site have been completed and measurements of monitored air quality parameters (hydrogen sulphide, volatile organic compounds and benzene) are registering less than the method detection limit of the instrument, the monitoring can conclude. If during the operations, levels above zero are detected, sampling should continue until three consecutive zero readings are registered. Action levels have been established in the Air Monitoring Plan.

6.2 Ambient Air Sampling

Ambient air sampling at four locations was conducted on January 27, 2012 during remediation activities to obtain quantitative air quality data. The samples will be collected using Summa canisters and analyzed for benzene, toluene, ethylbenzene, xylenes, hydrogen sulphide, hexane, naphthalene, trimethylbenzenes and total reduced sulphur. The data will be used to evaluate whether the ambient air quality in the vicinity of the site meets applicable federal and provincial guidelines and standards. The air sampling program is detailed in the Air Sampling Plan (provided in Attachment 4).

6.3 Surface Water Monitoring

6.3.1 Tank 101 Tank Bay

Accumulated water in the Tank 101 bay will be monitored as per "Surface Water Monitoring Plan" (provided in Attachment 5). Sampling was conducted on January 25 and 26, 2012. Results will be interpreted prior to any discharge of water. The need for continuation of monitoring will be evaluated once results from these events have been interpreted.

6.3.2 Site Discharge Wetland and Down Gradient of Site:

Surface water will be monitored as per "Surface Water Monitoring Plan" (provided in Attachment 5). Sampling was conducted on January 25 and 26, 2012. The need for continuation of monitoring will be evaluated once results from these events have been interpreted.

6.3.3 Tank 122 Tank Bay

Accumulated water in the Tank 122 bay, immediately adjacent to Tank 121, was sampled on January 26, 2012 and analyzed for hydrocarbon parameters to confirm impacts have not migrated between the tank bays.

6.3.4 Visual Monitoring

Visual inspection of drain and outfall locations will be conducted on an hourly basis by KMC or Golder personnel until remediation is complete. Following remediation visual inspection of these locations will be conducted by KMC personnel three times per week for 2 weeks or within 24 hours of a significant rainfall event for a total of six times within a two week period. Based on recent observations, spill pads and booms have been deployed at these locations by KMC, and evidence of hydrocarbon product has not been observed. If this situation changes, the pads and/or booms will be replaced as required and the Surface Water Monitoring Plan would be revised accordingly.

6.4 Onsite Groundwater

The presence of a synthetic liner in the Tank 121 bay minimizes the potential for downward migration of impacts. As an additional precaution, six existing perimeter groundwater wells will be monitored for the presence of hydrocarbon product in accordance with the Groundwater Monitoring Plan (provided in Attachment 6). The existing wells will be sampled once on, or before January 31, 2012 and analyzed for hydrocarbon parameters (LEPH, HEPH, BTEX) to confirm current onsite groundwater quality. Subsequent groundwater monitoring events will be conducted in accordance with the regular monitoring program in place for the site by another consultant to the site. Changes in groundwater quality, if any, will be identified during any continued monitoring program.

6.4.1 Drinking Water

The presence of a synthetic liner in the Tank 121 bay minimizes the potential for downward migration of released hydrocarbons. As an additional precaution, risk to drinking water supply wells was evaluated by Golder. Nearby wells were identified and risk to each well has been documented based on worst case migration scenarios. Evaluating potential groundwater flow velocities in both overburden deposits and bedrock, a conservative estimate of the time for groundwater beneath the Site to flow to the nearest registered downgradient drinking water well is 625 days. Should inspection of the liner post-remediation indicate the possibility that the liner has been breached, a plan will be enacted to assess groundwater quality at the Site boundary between Tank 121 and local drinking water wells.

7.0 CONCLUSION

An environmental site assessment and remedial action plan is not considered necessary for the site, based on the self assessment checklist, attached for reference. A Remediation Closure Report will be prepared in accordance with the NEB Remediation Process Guide on completion of remedial activities at the site.

If you have any questions, please contact the undersigned,

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Nicky Jennings, MSc., P.Geo.
Project Manager, Senior Environmental Scientist

NS/NJ/rja

ORIGINAL SIGNED

Nick Sargent, M.Sc., P.Geo.
Principal

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ATTACHMENT 1
SELF ASSESSMENT DOCUMENT

January 31, 2012



National Energy Board
Office national de l'énergie

SELF ASSESSMENT - NEED FOR A REMEDIAL ACTION PLAN		
Screening Question	Assessment	Comment
Prescreening		
1. Is the spill less than 1.5 cubic metres or if it is North of the 60th parallel, less than 100 litres in volume?	Yes___ No <input checked="" type="checkbox"/>	If Yes, normal cleanup is expected with documentation of location.
2. Has a detailed Incident Report or NT-NU Spill Report been submitted?	Yes <input checked="" type="checkbox"/> No___	If No, company should supply it.
3. If the spill is greater than 1.5 cubic metres or greater than 100 litres in the North, has it already been appropriately cleaned up or remediated? <i>Note: clean-up means removing all free product and/ or material from surface of soil, water, snow, ice or impermeable site.</i>	Yes___ No <input checked="" type="checkbox"/>	If Yes, company should submit a report certified by a company official that the site has been remediated to applicable standards, with a survey of the spill site, or that contaminated materials have been removed and appropriately disposed.
4. Have environmental site assessment(s) been done?	Yes___ No <input checked="" type="checkbox"/>	If No, the company should explain why not. (See ICP)
5. Is there sufficient information to not do environmental site assessment(s)	Yes <input checked="" type="checkbox"/> No___	If No, the company should conduct environmental site assessment(s).

Need for a Remedial Action Plan		
Screening Question	Assessment	Comment
<p>6. Are there contamination exceedances based on:</p> <p>a) CCME environmental quality guidelines,</p> <p>b) equivalent provincial/territorial guidelines/standards in lieu of (a) for a specific chemical, or</p> <p>c) toxicity benchmarks for chemicals not covered in (b)?</p> <p>This does not apply to contamination contained within a NEB-regulated facility but does apply to a Right of Way</p>	<p>Yes___ No <input checked="" type="checkbox"/></p>	
<p>7. Is there evidence of impact to humans at the site or off-site due to spill migration?</p>	<p>Yes___ No <input checked="" type="checkbox"/></p>	
<p>8. Is there evidence of significant impacts to ecological receptors (vegetation, wildlife)?</p>	<p>Yes___ No <input checked="" type="checkbox"/></p>	
<p>9. Is the size of the affected area greater than 2 hectares or 1000 square metres if it is in the North or does it extend beyond the property boundary?</p>	<p>Yes___ No <input checked="" type="checkbox"/></p>	
<p>10. Are there indicators of adverse environmental effects at the spill site (hydrocarbon sheen, stressed biota or presence of contaminants in soil) following initial cleanup?</p> <p>This does not apply to contamination contained within a NEB-regulated facility but does apply to a Right of Way</p>	<p>Yes___ No <input checked="" type="checkbox"/></p>	

11.	Is there a potential for contamination to reach groundwater based on depth to groundwater, depth to confining layer, soil permeability etc.?	Yes___ No <input checked="" type="checkbox"/>	
12.	Is there a potential for contamination to reach surface water based on distance to a waterbody, ditches, soil permeability, conduits etc.?	Yes___ No <input checked="" type="checkbox"/>	
13.	Does the top 1.5 metres of soil contain contaminants that cannot easily be removed?	Yes___ No <input checked="" type="checkbox"/>	
14.	Is there a potable surface water or groundwater source within 300 metres? <u>This does not apply to contamination contained within a NEB-regulated facility but does apply to a Right of Way</u>	Yes___ No___ N/A	
15.	Are there any utility conduits through or under the spill site that will remain in contact with any contaminant?	Yes___ No <input checked="" type="checkbox"/>	
Screening Assessment			
	Screening Question	Assessment	Comment
16.	Were any of the Screening answers (Q6-15) Yes?	Yes___ No <input checked="" type="checkbox"/>	If Yes, company prepares a Remedial Action Plan.
17.	Were any of the Screening answers (Q6-15) not able to be answered?	Yes___ No <input checked="" type="checkbox"/>	If Yes, the company needs to acquire and provide appropriate information.
18.	Were all of the Screening answers No?	Yes <input checked="" type="checkbox"/> No___	If Yes, company must submit a company certified report that either, the site has been remediated to standards with a survey of the spill site, or remediation is not necessary as contaminated materials have been removed and appropriately disposed.

ATTACHMENT 2

SOIL SAMPLING PLAN

SOIL SAMPLING PLAN (Draft)Background

Soil sampling and/or swab sampling will be undertaken within the containment berm of Tank 121 at the completion of the hydrocarbon product removal. The purpose of the sampling is to confirm that the hydrocarbon contamination has been removed. The results will be included in the remediation closure report. The sampling plan presents the field procedures used during the collection of soil quality/swab data. The following points summarize the objectives in order of priority:

Safety Concerns

Task-specific Health and Safety Plan provides details and mitigation. The primary safety concerns include: contact with product and vapors, traffic and construction equipment, and slips/trips/falls.

Plan Details:

Visual Assessment – Following the remedial efforts, Golder and KMC representatives will inspect the surface of the liner to confirm that no visible oil droplets remained on the liner surfaces.

The spill was contained within the tank berm, therefore soil sampling is not possible, therefore swab sampling of the liner will be conducted by Golder Associates Ltd. personnel. The swab sampling methodology is as follows:

- A number of 10 cm x 10 cm sampling areas will be identified on the base and sidewalls of the tank berm. The area will be swabbed by a sterile cotton swab wetted by a 0.9 % NaCl solution in sterile water. The swab was placed in a sterile glass jar and forwarded to an analytical laboratory for analysis of extractable petroleum hydrocarbons, benzene, toluene, ethylbenzene and xylenes. Standard chain of custody and sample handling protocols will be followed.
- Background Samples – Because all hard surfaces in the area are likely affected by the general nature of the site activities, two background samples will be collected for comparison from other areas of the site.

Soil Sampling

Soil sampling will not likely be possible as the spill was contained within the tank berm. However, should affected areas of soil be observed during the inspection noted above, representative soil samples will be collected. Soil samples will be collected either using hand tools if safe to do so or by mechanical means (excavator).

- Samples will be collected on a 5 m x 5 m grid of the affected area. Soil samples collected will be split. First subsample will be field screened for soil combustible

SOIL SAMPLING PLAN (Draft)

headspace vapours. Second subsample will be placed in a glass laboratory supplied jar for possible chemical analysis. Several samples for laboratory analysis will be selected based on review of field screening results by Environmental Unit. Select samples will be submitted to Maxxam Analytics for analysis of EPH and BTEX on a regular turnaround schedule (5 days). Duplicate 1 in 10 samples.

- Locations of samples will be recorded on a grid basis corresponding to set sampling reference point marked in the field with a stake. Location of the stake will be recorded by recreation grade GPS.

ATTACHMENT 3
SUMAS AIR MONITORING PLAN

AIR MONITORING PLAN**1.0 INTRODUCTION**

This Ambient Air Monitoring Plan (AAMP) has been prepared to address and document the methods and procedures for sampling ambient air adjacent to and in neighbouring residential areas in response to the January 24, 2012 crude oil release at the tank farm located at 4076 Sumas Mountain Road. Kinder Morgan Canada (KMC) will follow the guidelines outlined in this plan. Tank 121 was reported to have carried BC Light Crude oil. Chemical characterization of the product indicates the following:

- Density 819 kg/m³
- Wt% S 0.8197
- Partial Pressure H₂S at 31 deg C, 0.9882 kPa
- Wt% H₂S in liquid 84.1
- Reid VP 31.5 kPa

Benzene is known to be present in the product.

1.1 PURPOSE

The AAMP describes the methods that KMC will employ to collect qualitative data for health and safety purposes. The AAMP is to be considered a living document and will be revised as required. Any changes to the AAMP will be communicated to the Unified Command in a timely manner.

1. Scope of Monitoring Program: Monitor air quality off-site for: benzene, total VOCs (LEL), H₂S in the following areas:
Note wind direction and velocity, establish wind direction and thus upwind direction at initial sampling event (SE1).
 - a. Source – sample as close to tank farm as safely possible. Establish this location as (S0)
 - b. Adjacent residences to immediate SW (it appears from Google Earth to be 2 residences), establish as (SWR1)
 - c. First Home heading SE on Keeping Road (SER1),
 - d. NE of Site where Keeping Rd turns from NW/SE to E-W (NER1)
 - e. SW at terminus of Westminster Drive (SWR1)
 - f. North at S terminus of Charlie Spruce Place (NR1)
 - g. School (SCH1)
 - h. Fence line locations (if wind changes direction)
 - i. Finucci Road at Sumas Mtn Road (FR1)

AIR MONITORING PLAN

2. Monitor air quality on site at Tank 121 during remedial activities for benzene, total VOCs (LEL), H₂S.

Note wind direction and velocity.

Safety Concerns:

See task-specific Health and Safety Plan for details and mitigation, in summary:

Ambient air Monitoring:

- a. Driving, sampling near roadway, work at night
- b. On-site orientation and H₂S Alive training required for work on the tank farm
- c. PPE will include hard hats, Nomex fire retardant suit (when on the tank farm site), safety glasses and steel toed boots, half face respirator with organic cartridges available.

Air Monitoring Methods:

- 1) Ambient Air Monitoring to be conducted every hour during remediation activities, on site and off-site or as otherwise requested by KMC personnel:
 - At each collection point, the following parameters will be monitored including:
 1. Benzene (ppb)
 2. Total VOCs/LEL
 3. H₂S (ppm)
 - The time of sample and location (including GPS coordinates or intersection) must be recorded at each sample site. Photographs should be taken at each location and geo-referenced.
 - Record at each site: wind speed and direction

AIR MONITORING PLAN

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1.2 PERSON IN CHARGE

KMC will exercise diligence to ensure all responders follow the provisions of the plan.

2.0 ACTION LEVELS**Occupational Exposure Action Levels**

- Benzene: short term exposure limit (STEL) Worksafe BC is 2.5 ppm and TWA (8- hour weighted average) is 0.5 ppm,
- H₂S ceiling exposure is 10 ppm, (Worksafe BC).

KMC Action Levels

AIR MONITORING PLAN

Based on the above provincial levels, the following action levels will be adhered to onsite:

- **BENZENE** (Instrumentation used initially on site was an RKI Eagle which has a detection limit of 1 ppm and replaced on January 25th with ppbRae 3000 with a detection limit of 1 ppb)
 - Less than 0.5 ppm - no action required.
 - 0.5 ppm to less than 5 ppm – half face respirator with organic vapour cartridges required.
 - 5 ppm to 25 ppm - don SCBA or full face respirator with organic vapour cartridges.
- **Hydrogen Sulphide** (Instrumentation used on site was an RKI Eagle, which has a reported detection limit of <1 ppm according to the unit provider)
 - **less than 5 ppm** - monitor continuously to ensure 5 minute STEL of 5 ppm not exceeded and 8 hour TWA of 1 ppm not exceeded.
 - Greater than 5 ppm depart from area and don SCBA/ SABA
- **Total Combustible Volatiles** (Instrumentation used was an RKI Eagle which has a detection limit of 1% or 5ppm according to the instrument provider).
 - LEL less than 10% - proceed with caution; monitor frequently
 - LEL 10% or greater – leave area and do not re-enter the area until LEL is less than 10%
 - LEL must be 0% for hot work to be performed
- **Volatile Organic Carbons (VOCs)** (Instrumentation used was an RKI Eagle which has a detection limit of 1ppm according to the instrument provider).
 - greater than 10 ppm - additional testing required to confirm presence or absence of benzene

Ambient Air Quality Action Levels**3.0 REPORTING REQUIREMENTS**

Golder will compile the on-site and off-site air monitoring data collected by both KMC personnel and Golderr and will be provided on a schedule agreed to by all pertinent parties.

ATTACHMENT 4
SUMAS AIR SAMPLING PLAN

AIR SAMPLING PLAN**1.0 INTRODUCTION**

An Ambient Air Monitoring Plan (AAMP) was prepared to address and document the methods and procedures for monitoring ambient air adjacent to and in neighbouring residential areas in response to the January 24, 2012 crude oil release at the tank farm located at 4076 Sumas Mountain Road. Benzene is known to be present in the product. This Air Sampling Plan (ASP) documents the methods and procedures for sampling ambient air at key locations.

1.1 PURPOSE

The ASP describes the methods that KMC will employ to collect quantitative data for regulatory and health and safety purposes.

Safety Concerns:

See task-specific Health and Safety Plan for details and mitigation, in summary:

Ambient air Monitoring:

- a. Driving, sampling near roadway, work at night
- b. PPE will include hard hats, safety glasses and steel toed boots, half face respirator with organic cartridges available.

Plan Details:**1) Air Sampling**

- Air samples will be collected at four established air monitoring locations with one duplicate sample (suggested locations: SCH1, SO, MER1, FR1). The samples will be analysed for:
 1. Benzene, toluene, ethylbenzene, xylenes
 2. H₂S
 3. Hexane
 4. Naphthalene
 5. Trimethylbenzenes
 6. Total reduced Sulphur
- Samples will be collected in Summa canisters set to collect a sample over a 15 minute duration.
- The time of sample, ambient field measurements and sample location (including GPS coordinates or intersection) must be recorded at each sample site.
- Record at each site: wind speed and direction

AIR SAMPLING PLAN

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1.2 PERSON IN CHARGE

KMC will exercise diligence to ensure all responders follow the provisions of the plan.

2.0 REPORTING REQUIREMENTS

Samples will be submitted to Maxxam Analytics for analysis. Data will be tabulated and compared to applicable action limits.

ATTACHMENT 5
SURFACE WATER SAMPLING PLAN

Surface Water Monitoring PlanObjectives in order of priority:

1. Sample watercourse and wetland as soon as practicable to establish water quality baseline. In the event that impacts migrate from site the sampling plan .
 - a. Upstream Control Site (0.5 km U/S). (inside TK101 berm)
 - b. Source at discharge from tank farm South East corner
 - c. Downstream Site 1 (0.5 km D/S)
2. Samples will be collected once per day at 14:00 while impacts are contained onsite. If impacts leave the site sampling will be conducted twice daily at 09:00 and 15:00 to monitor impacts.

Safety Concerns:

See task-specific Health and Safety Plan for details and mitigation, in summary:

Aquatic Sampling:

- a. Wading; boating (if required); risk of drowning; risk of exposure (elements); risk of exposure (product); traffic; heavy equipment
- b. PPE will include hard hats, safety glasses and steel toed boots. Steel toed boots will not be worn while wading instream. When operating near water, PFDs will be worn.

Plan Details:

1) Aquatic sampling:

- A two-person crew will be collecting surface water samples. A zodiac inflatable is recommended to be available; however, it is not expected to be required.
- At each collection point, the following samples will be collected for analysis, including:
 1. TEH
 2. Daphnia
 3. LC 50 (100%)
- The water samples will be delivered to Maxxam Labs.
- The time of sample and location (including GPS coordinates) must be recorded at each sample site. Photographs should be taken at each location and geo-referenced. Appropriate duplicates and travel blanks will be collected.
- Chain of custody forms will be completed and the samples shipped to Maxxam Labs (4606 Canada Way Burnaby, British Columbia V5G 1K5).
- ALL SAMPLES MUST BE LABELLED FOR "Emergency Rush" UNTIL FURTHER NOTICE.

When collecting water samples, do the following:

- Triple rinse all plastic bottles and lids with site water prior to collecting sample water, discarding rinse water downstream of the sample site (or away from the boat for lake samples). **DO NOT** rinse glass bottles.
- At surface water sampling stations (stream or lake surface), collect one (1) grab sample at each site by submerging sample bottles to a depth of 30 cm (i.e., go up to your elbow, if depth permits).
- Preserve samples as required.
- Keep samples cool and in the dark (i.e., place samples in a cooler with ice packs) until delivery.

ATTACHMENT 6

GROUNDWATER SAMPLING PLAN

Groundwater Sampling Plan (Draft)Introduction

The release into the Tank 121 bay was contained. To confirm that groundwater is not affected by the release, groundwater sampling of up to six existing groundwater wells around the western and southern perimeters of the site (i.e. down gradient) is planned. A plan of the locations is attached. Previous reports indicate that BH5 could not be located. An attempt will be made to find this well, but it may be removed from the sampling program if the search is unsuccessful.

Sampling Program:Safety Concerns:

See Health and Safety Plan for details and mitigation, in summary:

- 1) H2S Alive training required for site access
- 2) Site orientation required
- 3) PPE will include hard hats, safety glasses, Nomex fire retardant overalls, steel toed boots, half face respirator with organic cartridges available.

Method

Depth to water will be measured and recorded using a product/water interface tape. If hydrocarbon product is noted in the well, the apparent thickness will be recorded.

Record instruments used to collect measurements. Six wells (if located) will be sampled. One sample will be collected in duplicate.

Where hydrocarbon product is noted, a groundwater sample will not be collected.

The sampling will be conducted using a peristaltic pump and a flow through cell.

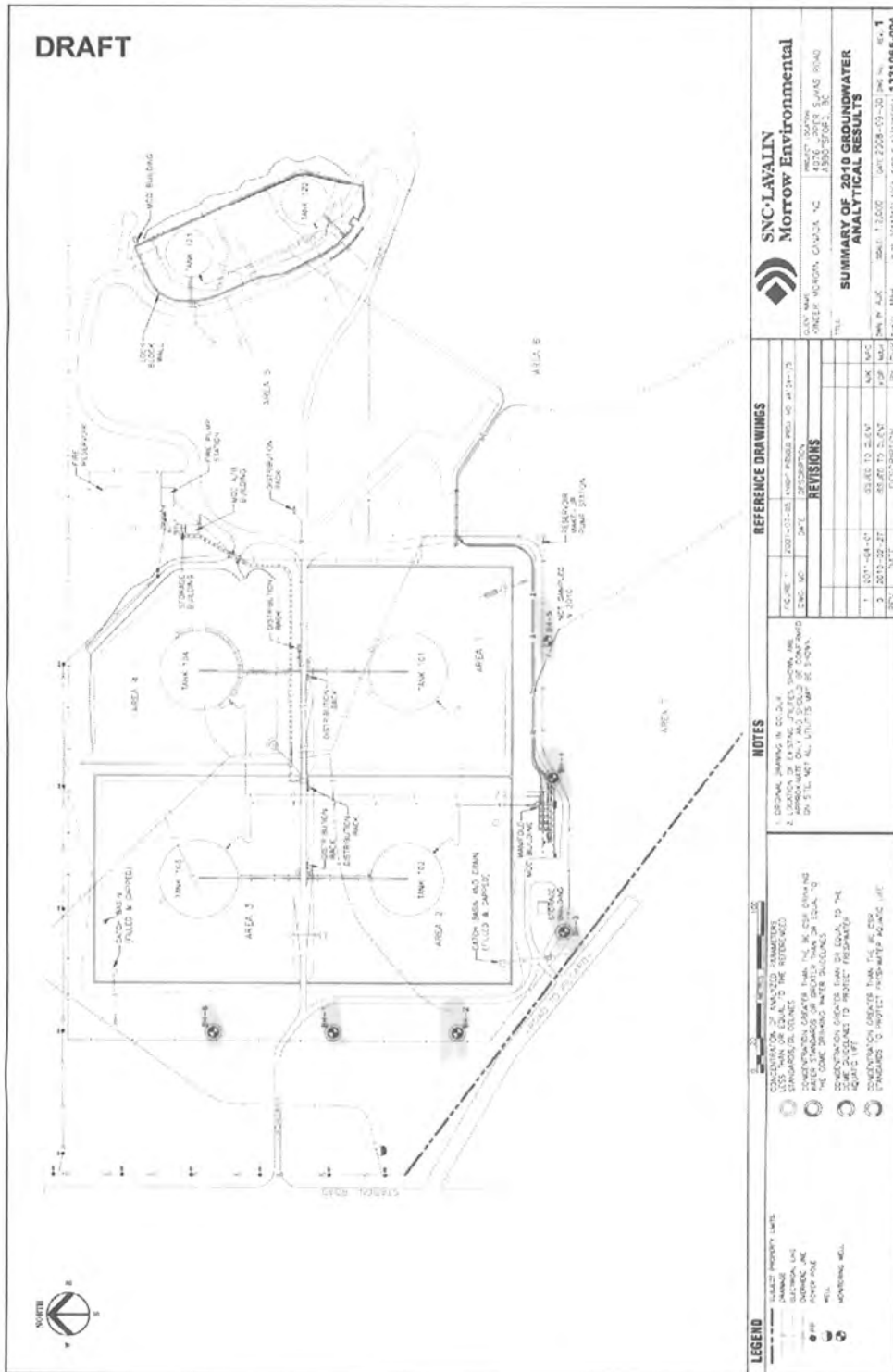
Sampling suite to include the following:

- BTEX
- LEPH/HEPH, PAHs

The samples will be submitted to Maxxam Analytics in Burnaby on a regular turnaround time.

Results provided to: Nicky Jennings (njennings@golder.com), Dan Chow
(Dan_Chow@kindermorgan.com) and Curtis Wakulchyk
(Curtis_wakulchyk@kindermorgan.com).

Groundwater Sampling Plan (Draft)



Chor, Alan ENV:EX

From: Dan Barghshoon [Dan.Barghshoon@neb-one.gc.ca]
Sent: Wednesday, February 1, 2012 3:48 PM
To: Veale, J Graham ENV:EX; XT:HLTH Rice, George; Riedler, Harold ENV:EX
Cc: Nickerson, Scott [PYR]; corine.mcgill@ec.gc.ca; Chris.Raymond@ec.gc.ca; tanya.tulk@ec.gc.ca; Barrett, Janet ENV:EX; Caunce, Cassandra ENV:EX; Chor, Alan ENV:EX; Hebert, David ENV:EX; Knox, Graham ENV:EX; DBEER@CITY.ABBY.BC.CA; Julian Zelazny; Bal, Harsimran [PYR]
Subject: FW: Sumas Tank 121 Incident: Responses to BC MOE Comments
Attachments: image001.jpg; Memo to NEB RE Response to BC MOE Comments 01Feb2012.pdf; Sumas Tank Farm Site Drawing.pdf; Response to Comments Feb 1 2012 Final.pdf

Hi Graham/George and Harold,

Please find attached, responses to questions related to the Tank 121 release that you forwarded to Trans Mountain on 28 January 2012.

Thanks very much.

Dan

From: Chow, Dan [mailto:Dan_Chow@kindermorgan.com]
Sent: Wednesday, February 01, 2012 3:51 PM
To: Dan Barghshoon
Cc:
Subject: Sumas Tank 121 Incident: Responses to BC MOE Comments

Dan,

Please see the attached (one cover memo, site drawing and response table) as follow up to the BC MOE comments received previously.

Dan Chow, BSc, MBA, ASCT
Senior EHS Coordinator
Trans Mountain Pipelines



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MEMO

To:	Dan Barghshoon, National Energy Board	Date:	February 1, 2012
Cc:	Harold Reidler, BC Ministry of Environment Mike Droppo, Kinder Morgan Canada Curtis Wakulchyk, Kinder Morgan Canada	From:	Dan Chow
Re:	Sumas Tank 121 Release Incident – Response to BC MOE and FHA Comments	Pages:	1

Please see the attached for tabulated comments and responses received on January 28, 2012 on the various monitoring and sampling plans submitted by Kinder Morgan Canada (KMC) to the BC Ministry of Environment and Fraser Health Authority. KMC, in conjunction with its Consultant, Golder Associates Ltd. have catalogued the various comments and has provided responses.

Kinder Morgan Canada

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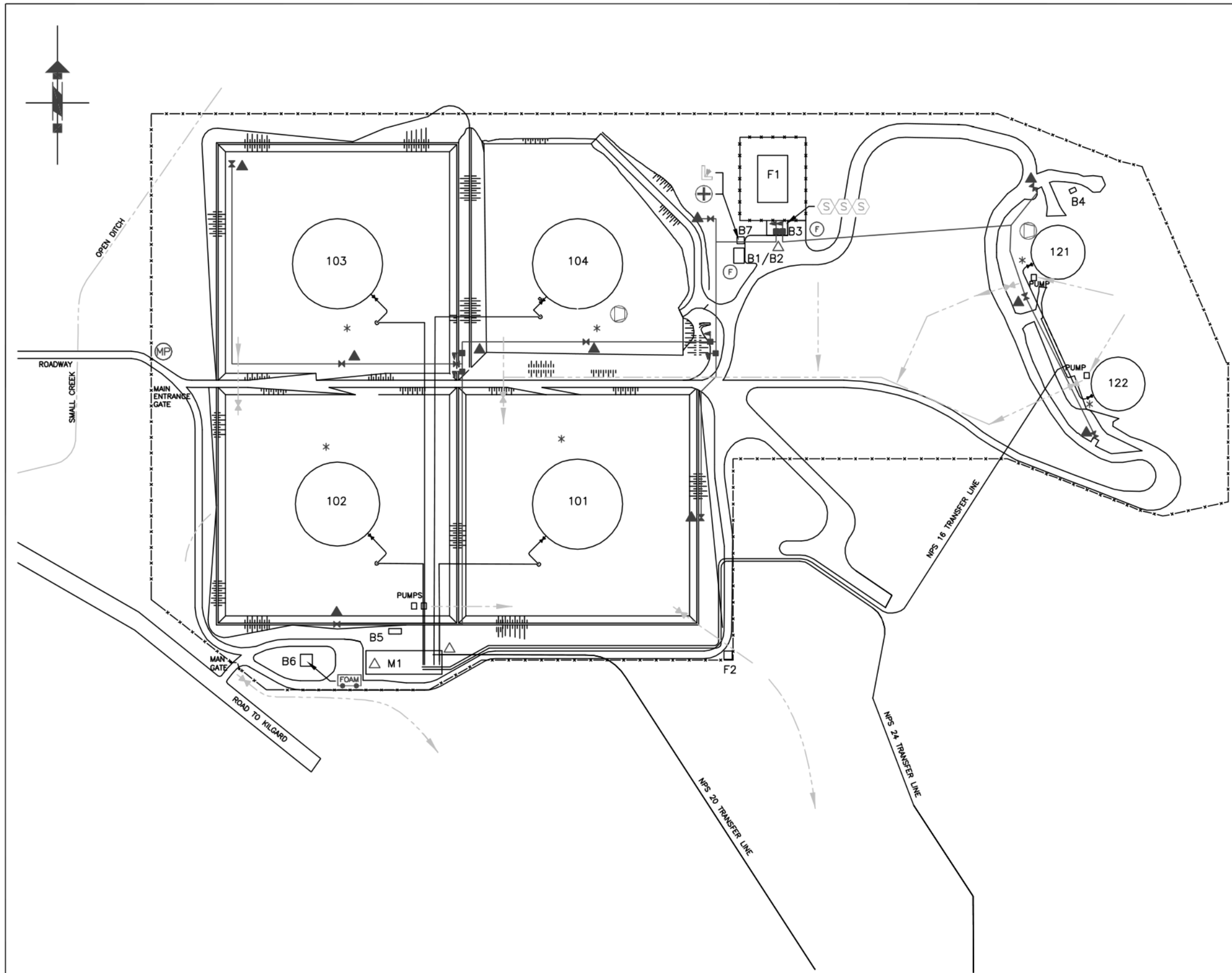
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Page 130 of 228

#	Date of Comment	Role		Comment	Reply
1	January 28, 2012	Harold Riedler	Senior Emergency Response Officer, MOE	It is [also] requested that Kinder Morgan provide a “Schedule of Activities” to show how the company will be moving forward with the remedial measures.	In accordance with the National Energy Board <i>Remediation Process Guide</i> , an Initial Clean Up Plan was submitted on January 31, 2012 which details the remedial measures that will be put in place.
2	January 28, 2012			It is requested that placement of amendments and updates to your Schedule of Activities be posted on a web site that can be accessed by the agencies for reference. It is also requested that comments provided below and other agency correspondence associated with this incident be posted on this shared web site to allow a common and complete source for reference.	The National Energy Board (NEB) is the lead Regulatory Body in regard to the January 24 incident, and as such, questions from other regulatory agencies should be coordinated through the NEB. For transparency, accessibility, and document control issues, it is generally the responsibility of the lead regulator to compile and disseminate information pertaining to the spill response.
3	January 28, 2012	Graham Veale	Air Quality Meteorologist, MOE	The monitoring plan appears to be designed for the protection of those conducting the sampling rather than nearby residents. The purpose of the Plan (Section 1.1) indicates that monitoring will be conducted at several identified off-site locations (presumably to ensure protection of residents health) but the KMC Action Levels (Section 2.0) indicate that these levels will only be adhered to “on-site” and that should these levels be exceeded the only action to be taken is by the samplers themselves. Is no action contemplated for the residents in the vicinity of the measured elevated concentrations should they occur ?? It is not clear how this is protective of ambient air quality and residents health.	Ambient air measurements collected at the perimeter of the site during the emergency response period indicated that ambient concentrations were at the instrument detection limit, therefore offsite measurements were not anticipated to be above detection limits. Ambient air monitoring off site using a ppbRae 3000 portable handheld VOC monitor with a detection limit of 1ppb for total VOCs was deployed on January 25, 2012 and indicated that the measurements were also at the instrument detection limit for the parameters of concern. If the concentrations measured at the perimeter of the site or off-site were above the instrument detection limit, controls for local residents would have been developed by KMC, as necessary.
4	January 28, 2012			The selection of Action Levels appears based on workplace standards (with an assumed safety factor applied). Generally speaking, it is not appropriate to use workplace air standards when assessing air quality in the receiving environment (ambient air quality). Ambient air quality criteria are usually much lower, reflecting the potential for ongoing exposure to the contaminant of interest. For example: H2S: BC Air Quality Objective = 5ppb (although based on avoidance of nuisance odour v. health impacts) Agency for Toxic Substance and Disease Registry (ATSDR) Minimal Risk Levels = 70ppb (acute inhalation) Benzene: No BC Air Quality Objective ATSDR Minimal Risk Levels = 9ppb (acute inhalation) However, the Action Levels represent an instantaneous reading rather than the slightly longer-term (1 hour to 14 day) averaging period of the BCAQO and ATSDR values. Also, based on the stated the detection limits of the current monitoring equipment, it would be unable to achieve such low level measurements and it is my understanding that health professionals have been consulted and approved the use of the concentration criteria listed in the monitoring plan.	On-site air quality action levels were in line with Worksafe BC and the Canada Labour Code for protection of on-site workers. For ambient air quality guidelines off site, the guidelines noted in comment #4 are applicable. Product characterization is referenced in sampling plan and indicates low levels of H2S.
5	January 28, 2012			In Section 2.0, the bulleted text for VOC seems to imply that testing for Benzene will not occur unless the VOC Action Level is exceeded. Given the health concerns associated with Benzene and assuming that detectors are readily available, it is not clear why sampling for Benzene would not be done at all sampling sites and sampling events... a more conservative approach.	Both combined VOC and benzene were measured at each monitoring location. Initially, two RKI Eagles were used: one calibrated just for benzene, and subsequently using an RKI Eagle II for VOCs and a ppbRae to measure benzene.
6	January 28, 2012			It should be noted that while the Action Levels may be protective of health, they are still much higher than the odour thresholds and therefore odour complaints may still occur.	Review of documented odour thresholds indicated they could range from 2.7-69ppm for benzene. The detection limit of the ppbRae is sufficient to detect this range. There is however a large variability in the ability of individuals within a population to detect benzene odours, up to 50% is not uncommon.
7				The selection of contaminants to be measured is limited, although perhaps understandable given the current scenario and need for expediency. Benzene and H2S are likely the main contaminants of concern, however, it would be desirable to see sampling for other contaminants (e.g. Xylene, Ethylbenzene and Toluene) if this could be accomplished in a timely manner (i.e. available monitoring equipment). Sampling for additional contaminants may help to alleviate residents concerns that health impacts are not being adequately monitored.	Summa canisters were used to collect the ambient air samples. Potential contaminants of concern specific to the release were selected for analysis and were BTEX, naphthalene, trimethylbenzenes, hexane, hydrogen sulphide and total reduced sulphur.
8	January 28, 2012			The attached Project Phase Remedial Action and Monitoring" document indicates that on completion of on-site operations, monitoring will cease when all contaminant levels are registering "zero" (defined as the instrument detection limit). As stated previously, the instrumentation is not sensitive enough to register lower concentrations. Therefore, it should be noted that residual pockets of contaminated air may still result in odour complaints after clean up is completed.	The ppbRae can report total VOCs to 1ppb, which would meet the reporting criteria noted in Comment #4, above, therefore air monitoring termination in accordance with the Project Phase Remedial Action Plan is recommended. Once the remedial activities on site have been completed and measurements of monitored air quality parameters (hydrogen sulphide, volatile organic compounds and benzene) are registering less than the method detection limit of the instrument, the monitoring can conclude.

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9	January 28, 2012			The Project Phase Remedial Action and Monitoring" document also indicates that "ambient sampling with canisters will be conducted...". The contaminants to be sampled, along with detailed sampling methodology are not provided. I would suggest that health professionals should be consulted to determine the appropriate contaminants (a comprehensive scan of all potential hydrocarbons and VOC's or at least BTEX along with H2S ??). The canister exposure time should be sufficient to ensure that a large enough volume of air is collected to enable analyses of detectable amounts of the contaminants of concern. Detailed contaminant information will be useful should a post-incident health/air quality assessment be required.	Summa canisters were used to collect the ambient air samples. Potential contaminants of concern specific to the release were selected for analysis and were BTEX, naphthalene, trimethylbenzenes, hexane, hydrogen sulphide and total reduced sulphur. A review of the analysis results will determine if additional assessment is necessary.
10	January 28, 2012	George Rice	Manager, Environmental Health Services, Fraser Health	I have conducted a review of the proposed protocol for air quality monitoring and agree with Graham's findings. I am also concerned that the protocol does not appear to address the issue of public or at least government agency notification of the test results or if safe levels are exceeded.	Verbal reports were made to Harold Riedler on January 24 and January 25 regarding the ambient air quality monitoring data. During the off site ambient air monitoring, concentrations of parameters of concern were not measured above the instrument detection limits.
11	January 28, 2012			While this particular incident was fairly small - it has pointed out a few shortcomings in Kinder Morgan's reaction to spill and air quality incidents at the facility.	Noted
12	January 28, 2012	Cassandra Caunce	Section Head, MOE	Air Monitoring: Will samples for benzene, H2S and Total VOCs be taken at ground level?	Ambient air monitoring with canisters was conducted at breathing height. Air samples using portable monitors were collected at both breathing height and close to ground level.
13	January 28, 2012			Air Monitoring: Concern over heavy vapours close to ground being missed. How will wind speed and direction be measured at each sample site?	An anemometer was deployed during the air monitoring events, and a compass used to record the wind direction. Observations of the wind sock at the Sumas Tank Farm was also used to confirm the wind direction.
14	January 28, 2012			Air Monitoring: Regarding H2S monitoring, how many will be deployed on site? Will it capture any potential change in wind direction?	During clean up and remediation activities, a vRae personal gas monitor was used during the ambient air monitoring off-site (detection limit of 1ppm) and iTX four gas monitors were used on site in addition to the UltraRae. The H2S detection limit on the iTX is 1ppm. The air monitoring locations are amended to account for any changes in wind direction.
15	January 28, 2012			Air Monitoring: During remediation (gravel removal), hourly sampling will occur. If multiple elevated air quality readings are detected, will someone be notified to investigate?	Where elevated measurements are reported, action will be taken to mitigate the possible risks to on-site workers. Off-site ambient air quality measurements will be reviewed to confirm no changes in status off-site. Off-site measures will be taken where warranted. If multiple elevated readings are detected, KMC Safety Manager would be notified and develop plan which may include notification of NEB and Fraser Health Authority .
16	January 28, 2012			Soil: Will all impacted water and soil meet hazardous waste criteria? Will there be a check? Will it all be manifested? (It is my understanding that the DGIR# is being used as a BCG and all gravel material is being manifested, is that correct?)	The DGIR reference number is being used in place of the BCG number. Gravels contaminated with oil has been subject to waste characterization testing. The oily gravel and oily water recovered from the tank bay are being removed from site under manifest and are documented.
17	January 28, 2012			Groundwater: Perhaps one additional test in February beyond the one planned on or before January 31, to ensure no impacts. What is the rate of groundwater movement in this area?	The groundwater velocity reported as 0.719 m/day. The perimeter monitoring wells are monitored on a routine basis and a regular round of sampling is planned later in 2012.
18	January 28, 2012	Dave Hebert	Environmental Protection Officer, MOE	Site plan and Engineered drawings for containment, drainage and oil water separation should be made available, with locations of discharge clearly marked, current map is unreadable.	A drainage plan has been included
19	January 28, 2012			Do we have access to their emergency/spill plan?	Emergency Response spill plans have been provided to BC MOE in the past and will be provided to BC MOE as the plans are updated.
20	January 28, 2012			Currently using DGIR# for spill related disposal of hazardous waste materials (gravel mostly correct?). Do not have a BCG for site, suspect they have been using 3434 McDermott Road BCG#46172 in the past to dispose of hazardous waste	Noted
21	January 28, 2012			Surface Water: Noted that the upstream control site is within TK101 berm, is this an issue? Do the creek headwaters begin within the facility?	The Creek headwaters do not begin within the facility. Surface water on site is directed to the Tank 101 bay for storage pending discharge and therefore represents a background for the tank farm itself. According to previous reports, an unnamed creek located immediately south of the Site flows towards the Sumas River 2.2 km southeast, and an unnamed tributary to Clayburn Creek emerges to the west-northwest of the Site and flows westwards into the Clayburn watershed.
22	January 28, 2012			Surface Water: Do discharges to the waterway from the storm water collection area exceed 15mg/L hydrocarbon content?	TEH is the parameter associated with the discharge permit for the site. Concentrations analyzed in two samples were less than the method detection limit of 0.2 mg/L.
23	January 28, 2012	Alan Chor	Senior Environmental Protection Officer, MOE	Provide detailed site plans/drawings/information regarding/showing tanks (including tank names), location of spill, spill containment facilities, berms, liners, stormwater flows, pipes, drainage [including drainage below tanks/liners], direction of flows, shutoff valves, stormwater treatment facilities/oil separators, outlets from bermed areas, outfalls, sampling locations, creeks/watercourses, etc.;	Key features identified on Drainage Plan. Sampling locations are described in each plan and those as well as the release location will be identified on subsequent reporting drawings.
24	January 28, 2012			Maintain close ongoing contact with the lab so that Kinder Morgan is immediately notified of any sampling results that indicate an environmental concern to facilitate immediate implementation of corrective action and increased monitoring. (For example, Kinder Morgan should ensure that if any mortalities occur before the 96 hour fish bioassay test is completed, the lab notifies them immediately so that corrective action can be taken immediately);	Noted

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25	January 28, 2012			Investigate whether Kinder Morgan can safely maximize the surge capacity of their stormwater treatment/containment facilities by discharging any stormwater from the system (after testing to confirm that it is uncontaminated/non-toxic) in case a significant storm event occurs and they need to contain/treat/handle an excessive amount of stormwater to ensure that no contaminated effluent is discharged;	Testing of waters contained within the facility was and will continue to be conducted in accordance with the surface water discharge permit in place for the site.
26	January 28, 2012			Investigate if a more appropriate background/control monitoring site is available than the inside of a bermed tank area (e.g. creek upstream of the tank farm site);	None available
27	January 28, 2012			Take all measures to prevent pollution and comply with all requirements related to the Environmental Management Act.	Noted
28	January 28, 2012			Keep the ministry (and other relevant agencies) updated on the status of the spill incident including monitoring results and corrective/clean up measures being implemented.	The incident clean up plan was submitted on January 31, 2012 and Kinder Morgan will provide updates based on significant milestones as they are achieved.
29	January 26, 2012	Jane Barrett	Contaminated Sites Officer, MOE	A sample of the crude oil should be collected and analyzed to determine whether all CSR-regulated potential contaminants of concern are being adequately addressed in the remedial efforts. Samples collected from soil, groundwater and surface water, as indicated in the above-listed documents, should be analyzed for CSR-regulated parameters. Parameters not included in the sampling plans that may be of concern include, but are not limited to, volatile petroleum hydrocarbons (VPH), polycyclic aromatic hydrocarbons (PAHs) and metals.	A sample of the oil has been collected for characterization of its chemical components. Surface water samples were analyzed for parameters in accordance with the discharge permit for the site. No soil contamination has been reported and groundwater samples have been collected and analyzed for LEPH/HEPH, PAHs, BTEX/VPH.
30	January 26, 2012			A site diagram showing the proposed groundwater monitoring wells, nearby watercourses, and locations of underground utility lines in the vicinity of the tank should be provided.	Refer to Drainage Plan
31	January 26, 2012			<p>Onsite Groundwater: The document notes that the presence of a synthetic liner in the Tank 121 bay minimizes the potential for downward migration of impacts, and indicates that existing perimeter groundwater wells will be monitored for the presence of hydrocarbon product once on or before January 31, 2012. BTEX, LEPH, HEPH are listed as potential contaminants of concern. Due to the possibility of an absence of confirmatory soil data for the tank bay area, collection of groundwater samples from nearby downgradient wells is desirable to confirm that groundwater has not been impacted by the spilled crude oil. If nearby downgradient wells currently do not exist in the area, new installations may be necessary. Additional potential contaminants of concern should be included, as determined by the crude oil sample analysis (see previous comments).</p> <p>In the case that groundwater impacts are not observed downgradient of the tank nest during the first sampling event, an additional groundwater sampling event in the future is suggested to confirm that groundwater has not been impacted.</p> <p>In the case that groundwater impacts are observed downgradient of the tank nest during the first sampling event, further investigation will be required.</p>	See response to Comment #17, above. Visual inspection of liner after contaminant removal by an Approved Professional Expert will determine any future activities that may be required.
32	January 26, 2012			Drinking Water: The document indicates that risks to drinking water supply wells will be evaluated by Golder Associates. Nearby wells will be identified and risk to each well will be evaluated. Follow-up action will be taken for any wells identified to be at risk. Further information regarding the drinking water assessment is anticipated.	Noted
33	January 26, 2012			<p>Air Monitoring Plan: KMC prepared the Ambient Air Monitoring Plan (AAMP) to address and document methods and procedures for sampling ambient air adjacent to and in neighbouring residential areas in response to the crude oil release. Air quality will be monitored at a number of locations for benzene, total VOCs (LEL), and H2S. KMC indicates that the data will be collected for health and safety purposes.</p> <p>Note that the CSR provides generic numerical vapour standards (see Schedule 11 of the CSR). With respect to the CSR, vapour contamination exists if the concentration of any vapour PCOC that is associated with a soil, sediment or water source exceeds its Schedule 11 standard in the breathing zone. Assessment of vapour concentrations in the vicinity of the spill is recommended. Further investigation and remediation may be required should vapour contamination be identified. Vapour contamination originating onsite and migrating offsite must be fully delineated.</p>	The release was contained within the Tank 121 bay. If impacts are noted outside the synthetic liner, a review of the requirement for additional site assessment will be conducted.
34	January 26, 2012			Soil Sampling Plan: KMC indicates that soil sampling may not be possible as the spill was contained within the tank berm; therefore, KMC proposes to collect swab samples of the liner along the base and sidewalls of the tank berm. Samples will be analyzed for EPH and BTEX. Should affected areas of soil be observed, representative soil samples will be collected and submitted for analysis of EPH and BTEX. Although soil confirmatory samples are preferable to swab samples from the liner, groundwater and surface water monitoring can provide confirmation that unacceptable impacts did not occur.	Noted

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35	January 26, 2012			Surface Water Monitoring Plan: Upstream Control Site (0.5 km upstream, located inside TK101 berm); Source at discharge from tank farm South East corner; Downstream of site (0.5 km downstream). KMC proposes to analyze samples for TEH, Daphnia and LC50 (100%). Note that TEH is not a CSR-regulated parameter. Please determine appropriate potential contaminants of concern based on the crude oil analysis.	See response to Comment #22, above.
36	January 26, 2012			It is preferable that a statement be provided, along with supporting documentation, by an approved or qualified professional that the crude oil spill has not caused impacts to site soil, surface water, groundwater, sediment or vapour at concentrations in excess of CSR standards.	On completion of the remedial program, a remediation completion report will be prepared, which will include review by an approved professional.



- LEGEND**
- HAZARDOUS MATERIALS**
- (C) - CRUDE OIL
 - (CS) - CAUSTIC SODA
 - (F) - FUEL
 - (G) - COMPRESSED GAS
 - (J) - AVIATION TURBINE JET FUEL - JET A OR JET A1
 - (L) - LUBRICANTS
 - (M) - METHANOL
 - (P) - PAINTS AND PRIMERS
 - (S) - SOLVENTS AND CLEANERS
 - (W) - WELDING SUPPLIES
 - (V) - VARSOL
- FIRE PROTECTION**
- △ - WHEELED FIRE EXTINGUISHER
 - ▲ - MONITOR/HYDRANT
 - - HYDRANT
 - - PORTABLE WHEELED MONITOR
 - ✂ - VALVE
 - - POST INDICATOR VALVE
 - * - FOAM DAM HOOK-UP
 - - STANDPIPE/MONITOR
- SITE DRAINAGE**
- - SURFACE DRAINAGE
 - - DRAIN WITH BLOCK VALVE
- MAJOR FACILITIES**
- ⊞ - WIND SOCK
 - (MP) - MUSTER POINT
 - ⊕ - FIRST AID KIT
 - (F) - FOAM CART
 - FOAM - FOAM TRAILER / TRUCK
 - - EVACUATION ROUTE
 - ▨ - FLAMMABLE STORAGE BLDG.
 - 🚿 - EYE WASH STATION
 - 🚿 - EMERGENCY SHOWER
 - (S) - SPILL KIT
 - SPILL - OSCAR / SPILL TRAILER
 - (ESD) - EMERGENCY SHUT DOWN
- B1 - MCC A/B CONTR. ROOM BLDG.
B2 - GENERATOR BLDG.
B3 - FIRE WATER PUMP BLDG.
B4 - TANK 121/122 MCC BLDG.
B5 - MANIFOLD MCC BLDG.
B6 - COLD STORAGE BLDG. (FIRE EQUIPMENT)
B7 - WASHROOM
F1 - FIRE WATER RESERVOIR
F2 - FIRE WATER MAKE-UP PUMP
M1 - TANK MANIFOLD

KINDER MORGAN				TRANS MOUNTAIN	
DRAWN YL		EMERGENCY RESPONSE SITE PLAN		SHEET SIZE A1	
CHECKED MDH				SCALE NTS	
APPROVED				DATE 07-05-18	
SUMAS TANK FARM					
DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
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Chor, Alan ENV:EX

From: Riedler, Harold ENV:EX
Sent: Friday, February 10, 2012 5:06 PM
To: 'dan_chow@kindermorgan.com'
Cc: 'dan.barghshoon@neb-one.gc.ca'; Caunce, Cassandra ENV:EX; Hebert, David ENV:EX; Veale, J Graham ENV:EX; Chor, Alan ENV:EX; Knox, Graham ENV:EX
Subject: FW: Kinder Morgan Sumas Tank 121 Initial Clean Up Plan; Incident 2012-016; Incident #DGIR112840; Effluent Permit PE-13418,

Attention: Dan Chow, Kinder Morgan and Dan Barghshoon, National Energy Board.

Please find the following comments provided by Graham Veale and Alan Chor of our Environmental Protection Division, as well as a comment from me for your consideration in the development of the Initial Clean-up Plan (ICP). Please feel free to call Graham, Alan, Cassandra (604-582-5299) or I should you have any questions in regard to these comments.

Comments from Harold Riedler, Senior Emergency Response Officer, Environmental Emergencies Program, BC MOE. Phone: 604-582-5278.

The ICP should include air quality thresholds for worker safety, public health and nuisance odour and include Kinder Morgan's required response for each of the threshold levels. This would include messaging that is required from the agency stakeholder for each of these threshold levels. The ICP should ensure timely messaging to the community and to the emergency response, environment and health agencies. Kinder Morgan must ensure that the ICP includes the required content and immediate timing of the mentioned report to agencies of jurisdiction to ensure compliance with respective agency regulations. Note that a community representative has informed me that Kinder Morgan needs to understand that common risk evaluation and messaging used within the industry may be completely misunderstood and raise anxiety within the community. For example, Kinder Morgan's message to the community that an incident is considered to be minor may mean within the industry that the liquid product is contained and monitoring results are found not to exceed human health criteria. The community that smells a strong hydrocarbon odour with no information concerning whether the material is contained, whether hydrocarbon air emissions are expected to increase, whether specific actions are being taken to control the hydrocarbon air emission, etc., will not understand how something, this unpleasant, can be considered to be minor from their perspective. Therefore community members would question whether Kinder Morgan actually has the incident under control. Kinder Morgan should consider the communities need for information when conducting an advisory.

I realize that National Energy Board and Kinder Morgan wish to separate out issues pertaining to routine and future Kinder Morgan operations from addressing this ICP. In regard to Graham Veale's comments, below, I would still like Kinder Morgan to consider Graham's comments that pertain to routine operations for the following reasons. The Sumas Tank Farm is continuing to operate near normal conditions during the course of this ICP period. Any scheduled activities that are not related to this emergency event, but add to expected releases of vapour during this clean-up, can significantly increase airborne hydrocarbon exposure to the community. The ICP should allow adjusting any of these routine scheduled activities (e.g. maintenance) and/or take additional pollution abatement measures to prevent any further fugitive air emissions during clean-up activities. In addition, we request Kinder Morgan provide the complaint history information that the company has recorded, so that we can evaluate whether there could be a potential frequency of hydrocarbon emissions under normal operations that may likely occur during clean-up and recovery from this recent incident and thus compound hydrocarbon air emissions.

Comments from Graham Veale, Air Quality Meteorologist, Environmental Protection, BC MOE. Phone: 604-582-5286.

Comments on ICP

6.1 Air Quality Monitoring – During Remediation

The text indicates that “action levels for both occupational exposure and ambient air quality are provided in the Air Monitoring Plan (provided in Attachment 3)”. However in the attached document the section titled Ambient Air Quality Action Levels (Section 2.0) is blank. What levels, if any, are currently being used to assess air quality impacts off-site ?? If levels have been selected, are they protective of human health and nuisance odour ??

The use of hand held detectors and hourly ‘grab’ sampling is acceptable as a short term method for air quality monitoring during the initial response but as the project moves to the on-going remediation and clean up phase where further emissions of vapours are anticipated, KMC should be investigating the use of more sophisticated real time continuous monitoring to provide air quality information to the public in a more timely and transparent manner.

The Air Monitoring Plan (Section 3.0) indicates that monitoring data “...will be provided on a schedule agreed to by all pertinent parties.” Has such a schedule been determined ? To date BC Ministry of Environment has not received any data.

6.2 Ambient Air Sampling

The text indicates that sampling using Summa canisters has occurred (January 24, 2012). The stated purpose is to “...evaluate whether the ambient air quality in the vicinity of the site meets applicable federal and provincial standards and guidelines.” It is not clear how one round of 15-minute ‘grab’ samples will achieve this goal, especially since the ‘standards and guidelines’ for the proposed assessment are not provided and most air quality criteria are based on a minimum of 1-hour. However, the samples may be useful in characterizing the VOC’s present in the air at the time of sampling. It would be more useful if such sampling were to occur on a regular schedule.

The Air Sampling Plan (Section 2.0) indicates that samples have been submitted for laboratory analyses but gives no indication as to when results are expected (days/weeks/months ??). It is proposed that the results will be compared to “applicable action limits” but it is not clear what these “action limits” are. Is KMC referring to the on-site limits established in their Air Monitoring Plan ?? If so, then this is not appropriate as off-site contaminant concentrations should be compared to ambient air criteria and as stated earlier such ambient criteria have not been identified in either document.

In summary, the ICP relies heavily on the Air Monitoring Plan and Air Sampling Plan. These documents have changed little from the earlier versions I reviewed and found inadequate in terms of providing data and information to the public and agencies in a timely and transparent manner. The text in the ICP document adds nothing to the air monitoring discussion. This is a concern given my understanding that KMC’s remediation and clean up is planned to take longer than originally anticipated and therefore local residents will potentially be exposed to fugitive vapour emissions over a much longer period.

I also have concerns regarding the ongoing operations at the facility and the number of odour complaints generated from the nearby residents related to current operating practices at the facility. It is my understanding that the majority of complainants direct their concerns to KMC using the contact information provided by the company on their billboard at the facility. Consequently, the BC Ministry of Environment has no knowledge of the air quality issues associated with the KMC operation which hinders our ability to quantify the seriousness of the issue and gauge the possible mitigation and monitoring actions that might be required under our mandate for protection of air quality (Note that under the BC *Environmental Management Act*, ‘nuisance’ odour may also be determined to be pollution and require management/mitigation action). Initial discussions with NEB staff indicate that they too have no

knowledge of the number of complaints received by KMC. It appears that all complaints are handled 'in-house' by KMC. This situation leaves the regulatory agencies with no idea whether the responses to concerns were appropriate or satisfactory nor gives any indication of the level of public concern which might indicate the need for further action.

It is also my understanding that KMC plans to increase the volume of product handled at the facility. If there are existing problems with emissions, this proposed increase will likely exacerbate the situation.

To address the above concerns, KMC should:

Immediately

- Investigate the availability of continuous VOC and H2S monitoring to provide real time data concentrations to the public, agencies and stakeholders. The monitoring should also include continuous real time meteorological monitoring (wind speed/direction, temperature and relative humidity). There are several consulting companies able to provide such services including equipment, logistical support, data acquisition systems and website capability. It is suggested that a continuous monitoring station be located in the nearby residential community.
- Coupled with the monitoring, retain the services of a qualified professional (QP) to determine appropriate criteria or thresholds for nuisance odour and protection of public health. BC has existing Ambient Air Quality Objectives (AAQO) for H2S but no AAQO for VOC's or the associated speciated compounds (BTEX etc). The QP should investigate the use of air quality criteria/thresholds for VOC's and associated speciated compounds in other jurisdictions and/or use professional knowledge and judgement to determine appropriate contaminant concentrations and averaging periods. The QP should also determine if monitoring of VOC's alone is sufficient or whether more targeted compounds (e.g. BTEX) would provide improved protection from nuisance odour and better public health protection
- Provide a detailed summary of complaints received for the last 5 years, including type, location, KMC response and any other pertinent information.
- A copy of the facility Environmental Protection Program as required under the NEB Onshore Pipeline Regulations (1999), Part 6, Section 48.

In addition to the above to address potential issues related to ongoing operations and proposed expansion

- Retain the services of a QP to conduct an air quality impact assessment for the facility. The assessment should include, but not be limited to:
 - An emission inventory to identify and quantify all emission sources, including fugitive emissions.
 - A review and documentation of plant operational practices, equipment and works, along with an assessment as to whether the current operation is using 'best environmental practices' and 'best available technology' to mitigate and minimize emissions and their impacts on the receiving environment.
 - Air dispersion modelling of the plant emissions to quantify potential impacts of emissions on the receiving environment and identify locations of maximum impact.

Graham Veale
Air Quality Meteorologist
Environmental Protection
Ministry of Environment
2nd Floor, 10470 - 152nd Street
Surrey BC V2R 0Y3
Phone: (604) 582-5286
Fax: (604) 930-7119
Email: j.graham.veale@gov.bc.ca

Comments from Alan Chor, Senior Environmental Protection Officer, BC MOE. Phone: 604-582-5271.

Kinder Morgan should:

- 1) Advise/confirm whether the storage tank facility meets CCME guidelines [e.g. CCME ENVIRONMENTAL GUIDELINES FOR CONTROLLING EMISSIONS OF VOLATILE ORGANIC COMPOUNDS FROM ABOVE GROUND STORAGE TANKS (www.ccme.ca/assets/pdf/pn_1180_e.pdf)];
- 2) Provide agencies with details/status of the incident including monitoring results, activities completed/planned (with time lines) such as removal of contaminated gravel from within the spill containment berm (which has apparently been completed), completion of measures that may cause high risk of air emissions/odours/pollution, inspection/repair of tank/flexible stormwater hose for the floating roof that apparently leaked and caused the oil spill, results of investigation (e.g. cause of spill, measures that will be implemented to prevent future spills, improvements in communications/notification of agencies), Ambient Air Quality Action Levels [which appear to be missing from the Air Monitoring Plan (Version 8)], etc.
- 3) Take all measures to prevent pollution and comply with all requirements related to the *Environmental Management Act* including complying with Effluent Permit PE-13418.

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

Chor, Alan ENV:EX

From: Chor, Alan ENV:EX
Sent: Tuesday, February 14, 2012 9:22 AM
To: 'Wakulchyk, Curtis'
Cc: 'dan.bargshoon@neb-one.gc.ca'; 'Tim Sullivan'; Veale, J Graham ENV:EX; Riedler, Harold ENV:EX; Caunce, Cassandra ENV:EX; Hebert, David ENV:EX; Barrett, Janet ENV:EX
Subject: RE: TK 121 Sampling Data, RESULTS OF AMBIENT AIR MONITORING AT THE SUMAS TANK FARM, Effluent Permit PE-13418
Attachments: image001.jpg

Dear Curtis Wakulchyk, Kinder Morgan Canada Inc.

Thank you for submitting your consultant's draft report: "RESULTS OF AMBIENT AIR MONITORING AT THE SUMAS TANK FARM 4076 SUMAS MOUNTAIN ROAD, ABBOTSFORD, BC", dated February 13, 2012, and forwarding a copy of it to the National Energy Board so they can provide it to stakeholders/agencies, such as the Fraser Health Authority, for review.

I'm forwarding the report within our office for review and will advise you of any comments that we have (e.g. via the NEB stakeholder process).

If you have any questions, please contact us.

Sincerely,

Alan Chor
Senior Environmental Protection Officer
BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3
Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env
24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)
24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Wakulchyk, Curtis [mailto:Curtis_Wakulchyk@kindermorgan.com]
Sent: Monday, February 13, 2012 4:50 PM
To: 'dan.bargshoon@neb-one.gc.ca'; 'Tim Sullivan'; Chor, Alan ENV:EX
Subject: TK 121 Sampling Data
Attach: [\\Complex\S40073\EP\Share1\Other\Kinder Morgan Sumas Tank Farm\TM 0213_12 Air Screening - DRAFT.pdf](#)

Hi,
Mike Droppo is away this afternoon and has asked me to forward this memo regarding air sample data at Sumas Tank 121.
Please let Mike or myself know if there are any questions regarding this memo.

Thanks,
Curtis

Curtis Wakulchyk B.Sc., P.Ag.
Environmental Specialist



2700, 300 - 5 Avenue SW
Calgary, AB T2P 5J2
curtis_wakulchyk@kindermorgan.com
Direct: 403.514.6509
Cellular: 403.771.1426
Fax: 403.514.6627

Chor, Alan ENV:EX

From: Chor, Alan ENV:EX
Sent: Tuesday, February 14, 2012 10:09 AM
To: 'Dan Barghshoon'
Cc: 'Wakulchyk, Curtis'
Subject: FW: TK 121 Sampling Data
Attachments: image001.jpg; TM 0213_12 Air Screening - DRAFT.pdf

Hi Dan,

As requested, I'm forwarding this email from Kinder Morgan to you because they had sent it to an incorrect email address.

Alan Chor
Senior Environmental Protection Officer
BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3
Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env
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From: Wakulchyk, Curtis [mailto:Curtis_Wakulchyk@kindermorgan.com]
Sent: Monday, February 13, 2012 4:50 PM
To: 'dan.barghshoon@neb-one.gc.ca'; 'Tim Sullivan'; Chor, Alan ENV:EX
Subject: TK 121 Sampling Data

Hi,
Mike Droppo is away this afternoon and has asked me to forward this memo regarding air sample data at Sumas Tank 121.
Please let Mike or myself know if there are any questions regarding this memo.

Thanks,
Curtis

Curtis Wakulchyk B.Sc., P.Ag.
Environmental Specialist



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DATE February 13, 2012**PROJECT No.** 12-1493-0017/4000**TO** Mike Droppo
Kinder Morgan Canada Inc.**FROM** Audrey Wagenaar**EMAIL** awagenaar@golder.com**RESULTS OF AMBIENT AIR MONITORING AT THE SUMAS TANK FARM
4076 SUMAS MOUNTAIN ROAD, ABBOTSFORD, BC****1.0 INTRODUCTION**

Golder Associates Ltd. (Golder) was retained by Kinder Morgan Canada Inc. (KMC) to conduct ambient air monitoring in the vicinity of the Sumas Tank Farm located on 4076 Sumas Mountain Road, Abbotsford, BC. As part of the ambient air monitoring program, Golder collected ambient air samples that were submitted to a laboratory for chemical analysis. The purpose of the assessment was to review the potential for adverse health effects associated with a recent release of crude oil at the facility, which occurred on January 24, 2012. The scope of this technical memorandum was to report the results of the air quality sampling and compare the results to air quality screening criteria.

Other aspects of program, including additional details about the sampling program will be reported separately.

2.0 SAMPLE COLLECTION

Ambient air quality samples were collected at four locations around the Sumas Tank Farm as shown on Figure 1. The sample locations were off-site and described as follows:

- 1) SCH1, located to the north west of the site at Auguston Traditional Elementary School;
- 2) SO, located outside the gates of the Sumas Tank Farm;
- 3) MER1 (and a field duplicate sample), located to the north east of Tank 121; and
- 4) FR1, located to the south east of Tank 121.

The sample locations were selected to review the ambient air quality in the vicinity of local residential developments and an elementary school.



Ambient air quality samples were collected on January 27, 2012 with a Summa canister over a 15-minute period. The air samples were sent to Maxxam Laboratories in Burnaby and analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), hydrogen sulphide (H₂S), hexane, naphthalene, trimethylbenzenes and total reduced sulphur. Ambient field measurements including wind speed and direction and sample location information (GPS coordinates) were collected at each sample site. Ambient air sampling locations are provided on Figure 1.

3.0 AMBIENT AIR SCREENING CRITERIA

Ambient air quality criteria were compiled from several jurisdictions and the focus was on acute air quality criteria which were based on health or odour endpoints. Acute air quality criteria were selected due to the nature of the spill and associated clean-up process which would result in potential short-term exposures. Although 1-hour ambient air quality criteria are available for some of the substances assessed, the more conservative 24-hour health based criteria were used for screening purposes as they are the most representative of the type of exposure potentially received by an off-site resident. Odour-based endpoints were also included for sulphide based compounds and these are usually based on a shorter duration exposure (*i.e.*, often 10 or 15 minutes).

The following agencies provide health-based air thresholds for acute (24-hour) which were considered when selecting the air thresholds for the assessment of potential health effects associated with the Sumas Tank Farm release and associated clean-up process:

- Agency of Toxic Substances and Disease Registry (ATSDR 2012, internet site);
- British Columbia Ministry of the Environment (BC MOE 2009);
- Canadian Council of Ministers of the Environment (CCME) National Ambient Air Quality Objectives (NAAQO) (CCME 1999);
- Ontario Ministry of the Environment (OMOE 2005; OMOE 2008); and
- World Health Organization (WHO 2000; WHO 2005).

In general, the most protective (*i.e.*, lowest) of the health-based thresholds provided by these agencies were adopted as the screening guideline for substances in air; however, priority was given to BC MOE guidelines when available. If no health-based thresholds were available, then a threshold based upon another endpoint, such as odour, was used. The screening criteria are compiled in Table 1 with the results of the ambient air quality monitoring and laboratory certificates of analysis provided in Attachment 1.

4.0 RESULTS OF THE AMBIENT AIR SAMPLING

The results of the ambient air quality sampling are provided in Table 1 and indicate that while none of the detected concentrations exceeded acute screening criteria, detection limits were elevated for several substances (hydrogen sulphide, dimethyl disulphide, dimethyl sulphide, total reduced sulphur and mercaptan) with respect to the air quality guidelines for odour and/or health effects. The lowest thresholds in Table 1 for which detection limits exceed are odour based.

5.0 CLOSURE

We trust the information contained in this technical memorandum is sufficient for your present needs. Should you have any additional questions regarding the project, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Audrey Wagenaar, M.Sc., PChem
Associate, Senior Environmental Scientist

Ian Hers, Ph.D., P.Eng.
Principal, Senior Specialist Engineer

AKW/IH/asd

Attachments: Table 1 – Screening of Maximum Air Concentrations Measured at Sumas Tank Farm
Figure 1 – Air Sampling Locations
Attachment 1 – Maxxam Analytics Laboratory Report

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6.0 REFERENCES

- Agency of Toxic Substances and Disease Registry. (ATSDR 2011). Toxicological Profiles – Minimum Risk Levels (MRL) for Acute and Chronic Inhalation Exposure. Available on-line at:
<http://www.atsdr.cdc.gov/toxprofiles/index.asp>
- B.C MoE. 2009. Air Quality Objectives and Standards. Available on-line at:
<http://www.bcairquality.ca/reports/pdfs/aqotable.pdf>
- Canadian Council of Ministers of the Environment ((CCME 1999, including updates to 2011)) – Canadian Environmental Quality Guidelines.
- Ontario Ministry of the Environment (OMOE). 2008. Jurisdictional Screening Level (JSL) List. A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality. Standards Development Branch, Ontario Ministry of the Environment. PIBS #: 6547e, Version 1, February 2008. Available at:
<http://www.ene.gov.on.ca/publications/6547e.pdf>. Accessed August.
- OMOE. 2005. Summary of O. Reg. 419/05 Standards and Point of Impingement Guidelines and Ambient Air Quality Criteria (AAQCs). Standards Development Branch, Ontario Ministry of the Environment. December 2005. Available at: <http://www.ene.gov.on.ca/envision/gp/2424e04.pdf>. Accessed August 2011.
- WHO (World Health Organization). 2005. WHO Air Quality Guidelines Global Update 2005 Report on a Working Group meeting, Bonn, Germany 18-20 October 2005.
- WHO. 2000. *Air Quality Guidelines for Europe, Second Edition*. WHO Regional Publications, European Series. No. 91. Copenhagen, DK.

Parameter	Air Screening Levels and Guidelines (µg/m³)										
	BC MoE			CCME NAAQO			OMOE	ATSDR	WHO	Maximum Measured Concentrations	Location of Maximum Measured Concentration ²
	Level A	Level B	Level C	Desirable	Acceptable	Tolerable					
Benzene	-	-	-	-	-	-	-	28.75	-	1.46	MER1
Ethylbenzene	-	-	-	-	-	-	1,000	21,710	-	<0.868	-
Hexane	-	-	-	-	-	-	2,500	-	-	5.76	MER1
1,2,3-Trimethylbenzene	-	-	-	-	-	-	220	-	-	<2.46	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	220	-	-	<2.46	-
1,3,5-Trimethylbenzene	-	-	-	-	-	-	220	-	-	<2.46	-
Toluene	-	-	-	-	-	-	2000 (odour)	3770	332,000 (health); 1000 (odour)	2.58	MER1
p+m-xylene	-	-	-	-	-	-	-	-	-	3.27	S0
o-xylene	-	-	-	-	-	-	-	-	-	<0.868	-
xylenes	-	-	-	-	-	-	730	8680	-	3.27	S0
Naphthalene	-	-	-	-	-	-	22.5	-	-	<2.62	-
Hydrogen sulphide	4	6-7.5	7.5-8	-	-	-	7	97.57	150	<980	-
Dimethyl disulfide	-	-	-	-	-	-	56 (10 min - odour)	-	-	<1430	-
Dimethyl sulfide	-	-	-	-	-	-	30 (10 min - odour)	-	-	<1020	-
Total reduced sulphur*	3	6	-	-	-	-	7	-	-	<3430	-
Methyl mercaptan	-	-	-	-	-	-	13 (10 min -odour)	-	-	<790	-

Notes:

Ambient air quality samples were collected over a 15-minute averaging period. Air quality screening criteria are 24-hour health based criteria unless otherwise indicated.

All values are in $\mu\text{g}/\text{m}^3$, unless otherwise noted.

Blue shading indicates screening criteria selected; grey shading indicates that ambient air quality measurement exceeds selected screening criteria.

BC MOE: British Columbia Ministry of Environment, CCME: Canadian Council for Ministers of the Environment, NAAQO: National Ambient Air Quality Objectives, OMOE: Ontario Ministry of Environment, ATSDR: Agency of Toxic Substances and Disease Registry, WHO: World Health Organization

ATSDR screening levels are based on acute inhalation MRLs

Sulfur compounds were converted from reported values of ppmv to $\mu\text{g}/\text{m}^3$ assuming 25°C and 1 atmosphere

*Calculated as sum of hydrogen sulphide, dimethyl disulfide and dimethyl sulfide

^{*2} Where no location indicated, maximum concentration was the reportable detection limit and was the same for the four sample locations



LEGEND

- AIR SAMPLING LOCATION
- TANK FARM



REFERENCE

ORTHOPHOTO OBTAINED FROM THE PROVINCE OF BRITISH COLUMBIA
TRANSPORTATION DATA OBTAINED FROM DMTI SPATIAL INC.
DATUM: NAD83 PROJECTION: UTM ZONE 10

DRAFT

PROJECT

KINDER MORGAN CANADA INC.
SUMAS TANK FARM - TANK 121 RELEASE
ABBOTSFORD, B.C.

TITLE

AIR SAMPLING LOCATIONS



Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 12-1493-0017			PHASE No.	
DESIGN	NJ	13 Feb. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	13 Feb. 2012	FIGURE: 1	
CHECK				
REVIEW				

ATTACHMENT 1

MAXXAM ANALYTICS LABORATORY REPORT

Your Project #: B206044
Your C.O.C. #: na

Attention: Kelly Janda
Maxxam Analytics
4606 Canada Way
Burnaby, BC
V5G 1K5

Report Date: 2012/02/02

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B213486
Received: 2012/01/30, 10:23


Sample Matrix: AIR
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Canister Pressure (TO-15)	3	N/A	2012/01/30	BRL SOP-00304	EPA TO-15
Canister Pressure (TO-15)	2	N/A	2012/01/31	BRL SOP-00304	EPA TO-15
Total Reduced Sulfurs	5	N/A	2012/02/01	CAM SOP-00220	GC/FPD
Volatile Compounds in Air (SUMMA) (1)	3	N/A	2012/01/30	BRL SOP-00304	EPA TO-15
Volatile Compounds in Air (SUMMA) (1)	2	N/A	2012/01/31	BRL SOP-00304	EPA TO-15

(1) Air sampling canisters have been cleaned in accordance with U.S. EPA Method TO14A. At the end of the cleaning, evacuation, and pressurization cycles, one canister was selected and was pressurized with Zero Air. This canister was then analyzed via TO14A on a GC/MS. The canister must have been found to contain <0.2 ppbv concentration of all target analytes in order for the batch to have been considered clean. Each canister also underwent a leak check prior to shipment.

Please Note: SUMMA® canister samples will be retained by Maxxam for a period of 5 calendar days from the date of this report, after which time they will be cleaned for reuse. If you require a longer sample storage period, please contact your service representative.

Encryption Key

 Cristina Bacchus
02 Feb 2012 08:46:39 -05:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

THERESA STEPHENSON, Project Manager
Email: TStephenson@maxxam.ca
Phone# (905) 817-5763

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics Inc. is a NELAC accredited laboratory. Certificate # CANA001. Use of the NELAC logo however does not insure that Maxxam is accredited for all of the methods indicated. This certificate shall not be reproduced except in full, without the written approval of Maxxam Analytics Inc. Maxxam has procedures in place to guard against improper use of the electronic signature and have the required



Your Project #: B206044
Your C.O.C. #: na

Attention: Kelly Janda

Maxxam Analytics
4606 Canada Way
Burnaby, BC
V5G 1K5

Report Date: 2012/02/02

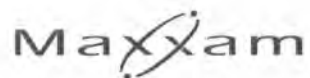
CERTIFICATE OF ANALYSIS

-2-

"signatories", as per section.

Total cover pages: 2

Page 2 of 10

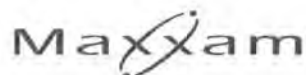


Maxxam Job #: B213486
Report Date: 2012/02/02

Maxxam Analytics
Client Project #: B206044

RESULTS OF ANALYSES OF AIR

Maxxam ID		MJ5319		MJ5320	MJ5321	MJ5322		MJ5323	
Sampling Date		2012/01/27		2012/01/27	2012/01/27	2012/01/27		2012/01/27	
COC Number		na		na	na	na		na	
	Units	CO4908-01R \ FR1	QC Batch	CO4910-01R \ SO	CO4911-01R \ MER1	CO4912-01R \ DUPAIR	QC Batch	CO4913-01R \ SCH1	QC Batch
Pressure on Receipt	psig	(-1.3)	2752787	(-0.4)	0	(-0.5)	2750335	(-0.5)	2752787
QC Batch = Quality Control Batch									



Maxxam Job #: B213486
Report Date: 2012/02/02

Maxxam Analytics
Client Project #: B206044

COMPRESSED GAS PARAMETERS (AIR)

Maxxam ID		MJ5319			MJ5320		MJ5321		MJ5322		
Sampling Date		2012/01/27			2012/01/27		2012/01/27		2012/01/27		
COC Number		na			na		na		na		
	Units	CO4908-01R \\ FR1	RDL	QC Batch	CO4910-01R \\ SO	RDL	CO4911-01R \\ MER1	RDL	CO4912-01R \\ DUPAIR	RDL	QC Batch

Dimethyl disulfide	ppmv	<0.36	0.36	2752963	<0.37	0.37	<0.34	0.34	<0.37	0.37	2752259
Dimethyl Sulfide	ppmv	<0.3	0.3	2752963	<0.4	0.4	<0.3	0.3	<0.4	0.4	2752259
Hydrogen sulfide	ppmv	<0.6	0.6	2752963	<0.7	0.7	<0.6	0.6	<0.7	0.7	2752259
Methyl mercaptan	ppmv	<0.4	0.4	2752963	<0.4	0.4	<0.3	0.3	<0.4	0.4	2752259

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		MJ5322			MJ5323	MJ5323		
Sampling Date		2012/01/27			2012/01/27	2012/01/27		
COC Number		na			na	na		
	Units	CO4912-01R \\ DUPAIR Lab-Dup	RDL	QC Batch	CO4913-01R \\ SCH1	CO4913-01R \\ SCH1 Lab-Dup	RDL	QC Batch

Dimethyl disulfide	ppmv	<0.37	0.37	2752259	<0.35	<0.35	0.35	2752963
Dimethyl Sulfide	ppmv	<4	4	2752259	<0.3	<0.3	0.3	2752963
Hydrogen sulfide	ppmv	<0.7	0.7	2752259	<0.6	<0.6	0.6	2752963
Methyl mercaptan	ppmv	<0.4	0.4	2752259	<0.3	<0.3	0.3	2752963

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		MJ5319				MJ5320				
Sampling Date		2012/01/27				2012/01/27				
COC Number		na				na				
	Units	CO4908-01R \\ FR1	ug/m3	DL (ug/m3)	QC Batch	CO4910-01R \\ SO	RDL	ug/m3	DL (ug/m3)	QC Batch
Hexane	ppbv	<0.30	<1.06	1.06	2751934	0.37	0.30	1.29	1.06	2750811
Benzene	ppbv	0.20	0.638	0.575	2751934	0.19	0.18	0.621	0.575	2750811
Toluene	ppbv	0.24	0.885	0.753	2751934	0.27	0.20	1.02	0.753	2750811
Ethylbenzene	ppbv	<0.20	<0.868	0.868	2751934	<0.20	0.20	<0.868	0.868	2750811
p+m-Xylene	ppbv	<0.37	<1.61	1.61	2751934	0.75	0.37	3.27	1.61	2750811
o-Xylene	ppbv	<0.20	<0.868	0.868	2751934	<0.20	0.20	<0.868	0.868	2750811
1,3,5-Trimethylbenzene	ppbv	<0.50	<2.46	2.46	2751934	<0.50	0.50	<2.46	2.46	2750811
1,2,4-Trimethylbenzene	ppbv	<0.50	<2.46	2.46	2751934	<0.50	0.50	<2.46	2.46	2750811
1,2,3-Trimethylbenzene	ppbv	<0.50	<2.46	2.46	2751934	<0.50	0.50	<2.46	2.46	2750811
Naphthalene	ppbv	<0.50	<2.62	2.62	2751934	<0.50	0.50	<2.62	2.62	2750811
Xylene (Total)	ppbv	<0.60	<2.61	2.61	2751934	0.75	0.60	3.27	2.61	2750811
Surrogate Recovery (%)										
Bromochloromethane	%	88	N/A	N/A	2751934	77		N/A	N/A	2750811
D5-Chlorobenzene	%	80	N/A	N/A	2751934	71		N/A	N/A	2750811
Difluorobenzene	%	86	N/A	N/A	2751934	76		N/A	N/A	2750811
N/A = Not Applicable RDL = Reportable Detection Limit QC Batch = Quality Control Batch										

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		MJ5321			MJ5322				
Sampling Date		2012/01/27			2012/01/27				
COC Number		na			na				
	Units	CO4911-01R MER1	ug/m3	DL (ug/m3)	CO4912-01R DUPAIR	RDL	ug/m3	DL (ug/m3)	QC Batch
Hexane	ppbv	1.60	5.63	1.06	1.63	0.30	5.76	1.06	2750811
Benzene	ppbv	0.46	1.46	0.575	0.44	0.18	1.42	0.575	2750811
Toluene	ppbv	0.68	2.58	0.753	0.69	0.20	2.58	0.753	2750811
Ethylbenzene	ppbv	<0.20	<0.868	0.868	<0.20	0.20	<0.868	0.868	2750811
p+m-Xylene	ppbv	<0.37	<1.61	1.61	<0.37	0.37	<1.61	1.61	2750811
o-Xylene	ppbv	<0.20	<0.868	0.868	<0.20	0.20	<0.868	0.868	2750811
1,3,5-Trimethylbenzene	ppbv	<0.50	<2.46	2.46	<0.50	0.50	<2.46	2.46	2750811
1,2,4-Trimethylbenzene	ppbv	<0.50	<2.46	2.46	<0.50	0.50	<2.46	2.46	2750811
1,2,3-Trimethylbenzene	ppbv	<0.50	<2.46	2.46	<0.50	0.50	<2.46	2.46	2750811
Naphthalene	ppbv	<0.50	<2.62	2.62	<0.50	0.50	<2.62	2.62	2750811
Xylene (Total)	ppbv	<0.60	<2.61	2.61	<0.60	0.60	<2.61	2.61	2750811
Surrogate Recovery (%)									
Bromochloromethane	%	75	N/A	N/A	73		N/A	N/A	2750811
D5-Chlorobenzene	%	71	N/A	N/A	72		N/A	N/A	2750811
Difluorobenzene	%	71	N/A	N/A	71		N/A	N/A	2750811
N/A = Not Applicable RDL = Reportable Detection Limit QC Batch = Quality Control Batch									

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		MJ5323				
Sampling Date		2012/01/27				
COC Number		na				
	Units	CO4913-01R SCH1	RDL	ug/m3	DL (ug/m3)	QC Batch
Hexane	ppbv	0.40	0.30	1.40	1.06	2751934
Benzene	ppbv	0.19	0.18	0.594	0.575	2751934
Toluene	ppbv	0.23	0.20	0.847	0.753	2751934
Ethylbenzene	ppbv	<0.20	0.20	<0.868	0.868	2751934
p+m-Xylene	ppbv	<0.37	0.37	<1.61	1.61	2751934
o-Xylene	ppbv	<0.20	0.20	<0.868	0.868	2751934
1,3,5-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2751934
1,2,4-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2751934
1,2,3-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2751934
Naphthalene	ppbv	<0.50	0.50	<2.62	2.62	2751934
Xylene (Total)	ppbv	<0.60	0.60	<2.61	2.61	2751934
Surrogate Recovery (%)						
Bromochloromethane	%	91		N/A	N/A	2751934
D5-Chlorobenzene	%	77		N/A	N/A	2751934
Difluorobenzene	%	87		N/A	N/A	2751934
N/A = Not Applicable RDL = Reportable Detection Limit QC Batch = Quality Control Batch						



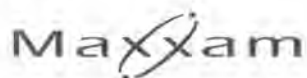
Maxxam Job #: B213486
Report Date: 2012/02/02

Maxxam Analytics
Client Project #: B206044

GENERAL COMMENTS

Sulfur Analysis: Canister were pressurized with Nitrogen to enable sampling. Results and DLs adjusted accordingly.

Results relate only to the items tested.

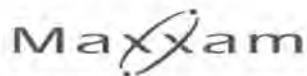


Maxxam Analytics
Attention: Kelly Janda
Client Project #: B206044
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: GB213486

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2750811 DVO	Spiked Blank	Bromochloromethane	2012/01/30		97	%	60 - 140
		D5-Chlorobenzene	2012/01/30		99	%	60 - 140
		Difluorobenzene	2012/01/30		99	%	60 - 140
		Hexane	2012/01/30		104	%	70 - 130
		Benzene	2012/01/30		109	%	70 - 130
		Toluene	2012/01/30		108	%	70 - 130
		Ethylbenzene	2012/01/30		109	%	70 - 130
		p+m-Xylene	2012/01/30		106	%	70 - 130
		o-Xylene	2012/01/30		107	%	70 - 130
		1,3,5-Trimethylbenzene	2012/01/30		97	%	70 - 130
		1,2,4-Trimethylbenzene	2012/01/30		95	%	70 - 130
		Xylene (Total)	2012/01/30		106	%	70 - 130
	Method Blank	Bromochloromethane	2012/01/30		87	%	60 - 140
		D5-Chlorobenzene	2012/01/30		87	%	60 - 140
		Difluorobenzene	2012/01/30		89	%	60 - 140
		Hexane	2012/01/30	<0.30		ppbv	
		Benzene	2012/01/30	<0.18		ppbv	
		Toluene	2012/01/30	<0.20		ppbv	
		Ethylbenzene	2012/01/30	<0.20		ppbv	
		p+m-Xylene	2012/01/30	<0.37		ppbv	
		o-Xylene	2012/01/30	<0.20		ppbv	
		1,3,5-Trimethylbenzene	2012/01/30	<0.50		ppbv	
		1,2,4-Trimethylbenzene	2012/01/30	<0.50		ppbv	
		1,2,3-Trimethylbenzene	2012/01/30	<0.50		ppbv	
		Naphthalene	2012/01/30	<0.50		ppbv	
		Xylene (Total)	2012/01/30	<0.60		ppbv	
2751934 DVO	Spiked Blank	Bromochloromethane	2012/01/31		103	%	60 - 140
		D5-Chlorobenzene	2012/01/31		103	%	60 - 140
		Difluorobenzene	2012/01/31		105	%	60 - 140
		Hexane	2012/01/31		103	%	70 - 130
		Benzene	2012/01/31		107	%	70 - 130
		Toluene	2012/01/31		107	%	70 - 130
		Ethylbenzene	2012/01/31		111	%	70 - 130
		p+m-Xylene	2012/01/31		108	%	70 - 130
		o-Xylene	2012/01/31		110	%	70 - 130
		1,3,5-Trimethylbenzene	2012/01/31		117	%	70 - 130
		1,2,4-Trimethylbenzene	2012/01/31		123	%	70 - 130
		Xylene (Total)	2012/01/31		108	%	70 - 130
	Method Blank	Bromochloromethane	2012/01/31		98	%	60 - 140
		D5-Chlorobenzene	2012/01/31		97	%	60 - 140
		Difluorobenzene	2012/01/31		100	%	60 - 140
		Hexane	2012/01/31	<0.30		ppbv	
		Benzene	2012/01/31	<0.18		ppbv	
		Toluene	2012/01/31	<0.20		ppbv	
		Ethylbenzene	2012/01/31	<0.20		ppbv	
		p+m-Xylene	2012/01/31	<0.37		ppbv	
		o-Xylene	2012/01/31	<0.20		ppbv	
		1,3,5-Trimethylbenzene	2012/01/31	<0.50		ppbv	
		1,2,4-Trimethylbenzene	2012/01/31	<0.50		ppbv	
		1,2,3-Trimethylbenzene	2012/01/31	<0.50		ppbv	
		Naphthalene	2012/01/31	<0.50		ppbv	
		Xylene (Total)	2012/01/31	<0.60		ppbv	
RPD		Hexane	2012/01/31	NC		%	25
		Benzene	2012/01/31	NC		%	25
		Toluene	2012/01/31	5.6		%	25



Maxxam Analytics
Attention: Kelly Janda
Client Project #: B206044
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: GB213486

QA/QC Batch			Date Analyzed					
Num Init	QC Type	Parameter	yyyy/mm/dd	Value	Recovery	Units	QC Limits	
2751934 DVO	RPD	Ethylbenzene	2012/01/31	NC		%	25	
		p+m-Xylene	2012/01/31	7.5		%	25	
		o-Xylene	2012/01/31	5.1		%	25	
		1,3,5-Trimethylbenzene	2012/01/31	NC		%	25	
		1,2,4-Trimethylbenzene	2012/01/31	NC		%	25	
		Naphthalene	2012/01/31	2.3		%	25	
		Xylene (Total)	2012/01/31	NC		%	25	
2752259 VLA	Method Blank	Dimethyl disulfide	2012/02/01	<0.1		ppmv		
		Dimethyl Sulfide	2012/02/01	<0.1		ppmv		
		Hydrogen sulfide	2012/02/01	<0.1		ppmv		
		Methyl mercaptan	2012/02/01	<0.1		ppmv		
	RPD [MJ5322-01]	Dimethyl disulfide	2012/02/01	NC		%	N/A	
		Dimethyl Sulfide	2012/02/01	NC		%	N/A	
		Hydrogen sulfide	2012/02/01	NC		%	N/A	
		Methyl mercaptan	2012/02/01	NC		%	N/A	
2752963 VLA	Method Blank	Dimethyl disulfide	2012/02/01	<0.1		ppmv		
		Dimethyl Sulfide	2012/02/01	<0.1		ppmv		
		Hydrogen sulfide	2012/02/01	<0.1		ppmv		
		Methyl mercaptan	2012/02/01	<0.1		ppmv		
	RPD [MJ5323-01]	Dimethyl disulfide	2012/02/01	NC		%	N/A	
		Dimethyl Sulfide	2012/02/01	NC		%	N/A	
		Hydrogen sulfide	2012/02/01	NC		%	N/A	
		Methyl mercaptan	2012/02/01	NC		%	N/A	

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Chor, Alan ENV:EX

From: Chor, Alan ENV:EX
Sent: Tuesday, February 14, 2012 3:51 PM
To: 'Curtis_Wakulchyk@KinderMorgan.com'
Cc: 'Dan_Chow@KinderMorgan.com'; Caunce, Cassandra ENV:EX; Riedler, Harold ENV:EX; Hebert, David ENV:EX; Veale, J Graham ENV:EX; 'Dan Barghshoon'; Black, Brenda ENV:EX
Subject: FW: Kinder Morgan Sumas Tank Farm - 2011 Annual Report for Permit PE-13418 and Inspection on February 16, 2012 at 9:30 am
Attachments: PE 13418 STF 2011 Annual Rpt.pdf

Dear Curtis Wakulchyk, Kinder Morgan Canada Inc.,

This is further to our discussion today. Three of us from the ministry will be participating in the inspection (Dave Hebert, Felix Mensah-Yeboah & myself). You advised that:

- 1) We need to bring the following safety equipment: hard hat, steel toe footwear and eye protection. Kinder Morgan will provide the fire retardant coveralls (Following our discussion, we were thinking that we should have larger coveralls to accommodate our coats/jackets. Could you please provide the following sizes: one medium, one large and one extra large) and
- 2) Golder Associates will take the samples for analyses at Maxxam lab.

If you have any questions, please contact us.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 | www.gov.bc.ca/env

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Chor, Alan ENV:EX
Sent: Friday, February 10, 2012 3:55 PM
To: 'Droppo, Mike'
Cc: 'Dan_Chow@KinderMorgan.com'; 'Curtis_Wakulchyk@KinderMorgan.com'; 'Dan Barghshoon'; Caunce, Cassandra ENV:EX; Riedler, Harold ENV:EX; Hebert, David ENV:EX; Veale, J Graham ENV:EX
Subject: Kinder Morgan Sumas Tank Farm - 2011 Annual Report for Permit PE-13418 and Inspection on February 16, 2012

Dear Mike Droppo (403 514-6537), Kinder Morgan Canada Inc.,

Thank you for:

- 1) Submitting monitoring data for 2011 and reporting that all stormwater effluent discharges were in compliance with *Environmental Management Act* Effluent Permit PE-13418. In future reports, please include the % mortality of test fish in 100% effluent sample at the end of the 96 hour fish bioassay;
- 2) Making arrangements for us to conduct a site inspection on February 16, 2012. As discussed, we also plan to conduct audit sampling of the stormwater effluent for TEH (Total Extractable Hydrocarbons) and fish toxicity (Rainbow Trout LT50). The estimated cost of the audit sampling is approximately \$400.00. After the Lab Services Officer completes the audit report, an invoice for the final cost will be sent to Kinder Morgan.

During our telephone conversations yesterday and today, you advised that:

- 1) Dan Chow (604-268-3008), the normal site contact person, is currently away and will be returning on February 20, 2012. In the meantime, you are the contact person until February 10th and, after that, Curtis Wakulchyk (403 514-6509/ cel: 403 771-1426) will be the contact person until Dan Chow returns;
- 2) Kinder Morgan's consultant will be taking samples for the above parameters at the same time as the ministry;
- 3) Kinder Morgan will submit a report shortly to the National Energy Board so that it can be forwarded to the agencies. The report will include the results of monitoring related to the crude oil spill incident, etc.;
- 4) The following Kinder Morgan representatives will be attending the meeting on February 13th/Monday evening: Hugh Harden, Vice President Operations; Bruce Jamer, BC Regional Director and Lexa Hobershield, media/public relations.

We plan to arrive on site at approximately 9:30 am on February 16, 2012. Please advise us of the safety requirements (e.g. hard hat, steel toe footwear, safety vest, etc.).

If you have any questions, please contact us.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

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24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Droppo, Mike [mailto:Mike_Droppo@kindermorgan.com]

Sent: Friday, February 10, 2012 1:23 PM

To: Chor, Alan ENV:EX

Subject: 2011 Annual Report for PE-13418 Sumas Tank Farm

Attach: <PE 13418 STF 2011 Annual Rpt.pdf>

Alan,

As per your request, please find attached a copy of the 2011 annual report for PE 13418 Sumas Tank Farm.

If you require any other information please let me know.

Mike

Michael Droppo, P.Ag.

Manager, Environment

Kinder/Morgan Canada Inc.

Suite 2700, 300 - 5th Ave SW

Calgary, AB T2P 5J2

Direct: 403-514-6537

Cell: 403 630-0161

Kinder Morgan Canada Inc.
7815 Shellmont Street
Burnaby, BC V5A 4S9
Tel: (604) 268-3000
Fax: (604) 268-3001
Toll Free: 1 (800) 535-7219
www.kindermorgan.com

January 20, 2012

Ministry of Environment
Environmental Protection Branch
10470 – 152nd Street
Surrey, BC
V3R 0Y3

Attn: Avtar Sundher
Toxic Management/Emergency Response Officer

**RE: 2011 ANNUAL COMPLIANCE ASSESSMENT REPORT
FOR PERMIT PE-13418 - SUMAS TANK FARM**

Enclosed are the 2011 monitoring results required by Permit PE-13418 for the Terasen Pipelines Trans Mountain) Sumas Tank Farm facility. The name of our operating company has changed to Kinder Morgan Canada Inc. However, this does not affect a name change to the entity holding the permit.

All water quality values are within the permitted limits. Polycyclic Aromatic Hydrocarbons (PAH) in the sediment are below the action limit indicated in the permit.

We were unable to obtain the monthly water samples from January, July, August and September as there was limited rainfall and no discharge from the site.

If you have any questions regarding this report, please do not hesitate to call the undersigned at (604) 268-3008.

Sincerely,



Dan Chow, BSc., MBA, AScT
Environmental Coordinator

Enclosure
/DC

MONITORING RESULTS

Permit No. PE-13418 (Sumas Tank Farm)

Date: Year 2011

Tank 101 Containment Bay Discharge

Sampling Date Yr. Mo. Day	TEH mg/L	96 Hr LC ₅₀ %
2011 January	No Sample	
2011 February 17	<0.08	
2011 March 15	<0.08	
2011 April 26	<0.10	
2011 May 19	<0.12	
2011 June 15	<0.12	>100 %
2011 July	No Sample	
2011 August	No Sample	
2011 September	No Sample	
2011 October 26	<0.20	
2011 November 7	<0.20	
2011 December 30	<0.20	>100 %
Permit Limit	5.0	> 100

Sediment of Receiving Waters

Sampling Date Yr. Mo. Day	PAH µg/g
2011 December 30	0.13
Permit Limit	4.0

Chor, Alan ENV:EX

From: Dan Barghshoon [Dan.Barghshoon@neb-one.gc.ca]
Sent: Tuesday, March 27, 2012 7:25 AM
To: Chor, Alan ENV:EX
Subject: RE: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418
Attachments: BCMOE Comments on Effluent Permit PE-13418 Audit .pdf

Thanks, Alan.

I will continue to keep you in the loop on this and other items.

Dan

From: Chor, Alan ENV:EX [<mailto:Alan.Chor@gov.bc.ca>]
Sent: Monday, March 26, 2012 3:41 PM
To: Dan Barghshoon
Cc: Caunce, Cassandra ENV:EX; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX; Hebert, David ENV:EX; Barrett, Janet ENV:EX; 'Dan_Chow@KinderMorgan.com'; 'Curtis_Wakulchyk@KinderMorgan.com'
Subject: RE: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Hi Dan,

Thank you for continuing to keep us updated on the Kinder Morgan's responses to our questions/concerns. Kinder Morgan indicates that they have prepared reports or are conducting investigations/reviews including:

- 1) An incident investigation including:
 - a) Examination of the initial detection & response,
 - b) Identification of the cause of the spill & appropriate preventative measures that will be implemented,
 - c) Development of a standard for managing roof drains and associated water;
- 2) A review of site drainage and drainage infrastructure identifying opportunities for water management and ensuring appropriate isolation in the event of a leak;
- 3) A report summarizing remediation and monitoring activities (including confirmatory sampling and groundwater monitoring program/installation of additional groundwater wells);
- 4) An investigation into the installation of a real-time ambient air monitoring system based on factors such as:
 - a) Air dispersion modeling of the Sumas Tank Farm under routine and an anticipated worst-case scenario,
 - b) A review of operational practices and potential emission sources;

We look forward to receiving the above and any other relevant information related to preventing pollution and future spills.

If you have any questions, please contact us.

Sincerely,

Alan Chor
Senior Environmental Protection Officer
BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3
Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env
24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)
24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Dan Barghshoon [<mailto:Dan.Barghshoon@neb-one.gc.ca>]
Sent: Friday, March 16, 2012 8:53 AM
To: Chor, Alan ENV:EX
Subject: RE: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418
Attach: \\Complex\S40073\EP\Share1\Other\Kinder Morgan Sumas Tank Farm\BCMOE Comments on Effluent Permit PE-13418 Audit .pdf

Hi Alan,

Please find attached, responses from Kinder Morgan (Trans Mountain) to the questions you provided below.

Thanks very much and have a good day.

Dan

From: Chor, Alan ENV:EX [<mailto:Alan.Chor@gov.bc.ca>]
Sent: Monday, March 05, 2012 11:18 AM
To: 'Curtis_Wakulchyk@KinderMorgan.com'
Cc: 'Dan_Chow@KinderMorgan.com'; Dan Barghshoon
Subject: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Dear Curtis Wakulchyk, Kinder Morgan Canada Inc. (403 514-6509/ cel:403 771-1426),

Thank you for meeting with us during the site inspection and audit sampling conducted on February 16, 2012. Please forward the final sample results/lab sheets for TEH (Total Extractable Hydrocarbons) and fish toxicity (Rainbow Trout) so that our lab specialist may review them.

As indicated in the two emails below, we have forwarded questions/issues that were discussed with Kinder Morgan during the inspection to the National Energy Board so that Kinder Morgan can address them during the investigation and follow up of the spill incident.

If you have any questions, please contact us.

Sincerely,

Alan Chor
Senior Environmental Protection Officer
BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3
Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env
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From: Chor, Alan ENV:EX

Sent: Thursday, March 1, 2012 2:26 PM

To: 'Dan Barghshoon'

Cc: Caunce, Cassandra ENV:EX; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX; Hebert, David ENV:EX; Barrett, Janet ENV:EX; Mensah-Yeboah, Felix ENV:EX

Subject: Kinder Morgan Sumas Tank Farm Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Hi Dan,

This is further to our discussion yesterday.

During a site inspection of the Sumas Tank Farm on February 16, 2012, the BC Ministry of Environment (Alan Chor, Dave Hebert and Felix Mensah-Yeboah) met with Kinder Morgan Canada Inc. (Curtis Wakulchyk and others) and their consultant, Golder Associates (Shaun Lamoureux), at the Sumas Tank Farm to conduct an inspection and audit sampling of stormwater effluent discharge authorized by Permit PE-13418.

It is our understanding that the National Energy Board (NEB) has requested Kinder Morgan to conduct a full investigation into the cause of the oil spill incident and the corrective measures that are necessary to prevent future spill incidents. It is requested that the NEB ask Kinder Morgan, and their qualified professionals, to include in their incident investigation report the results of investigation/review of the issues listed below to determine the corrective actions/improvements that are required to prevent spills/pollution and minimize the risk to the environment. Some of the following issues were raised during the inspection while other issues were determined after discussions with the Environmental Emergency Response Officer in the ministry office.

- 1) The tank/facility inspection program should be reviewed to determine what improvements need to be implemented to prevent future spills (including how often the tanks should be drained to conduct a full inspection of the tanks);
- 2) What measures/improvements need to be implemented to facilitate immediate detection of and response to any spill or leak?
- 3) Kinder Morgan advised that stormwater (that accumulates on top of the tank's floating roof) drains through a piping system located inside the tank, passes through the tank's crude oil product and drains to the diked tank containment area via a valve/outlet near the bottom of the tank. The drainage piping system consists of rigid pipe segments connected by sealed elbow joints in a scissor-like fashion that allow the piping system to "extend and retract" with the "rise and fall" of the floating roof.

Kinder Morgan advised that one possible cause of the spill was leakage of crude oil into the drainage piping system through one of the elbow joint seals and out of the drain valve outlet near the bottom of the tank. The incident investigation report should include a review of the design of the roof drainage system and the inspection/preventative maintenance program;

- 4) Kinder Morgan advised that valves on the stormwater drainage pipes between the diked tank containment areas (e.g. Tank 104 area and Tank 101 area) are typically left in the open position as the default. Should the valves for the stormwater drains between the diked tank containment areas, instead, be left in the closed position as the default to:
 - a) Isolate/confine any potential oil spill to the diked area of the leaking tank and prevent spreading of the oil spill to adjacent diked containment areas via open drains and
 - b) Prevent any potential oil spill from entering the diked containment area for Tank 101 (where all storm runoff from the entire site is collected and treated by the oil separator) and compromising the ability of the site to treat and discharge stormwater should a rainfall event occur (e.g. by overwhelming the treatment capability of the oil separator)?
- 5) Kinder Morgan advised that after opening the valve to release stormwater that has accumulated on the floating tank roof, the operator would observe the drainage flow for approximately 10 minutes to determine if any leaked oil is present. If no leaked oil is observed, the drain is then left open until later in the day to allow the remaining

accumulated stormwater to drain while the operator carries out other duties. Since oil is lighter than water, there is the concern that any oil that may leak onto the roof (e.g. through roof seals) may not be observed by the operator because the oil would be floating on top of the stormwater. During the first 10 minutes, the operator may only observe the relatively clean stormwater which would tend to drain out first instead of the floating oil which would tend to drain out later. The incident investigation report should include a review of this procedure;

- 6) What measures/monitoring have been conducted to ensure that the oil spill did not leak through the liner or otherwise escape from the tank's diked containment area? Does the existing groundwater monitoring program need to be improved to ensure that the operation is not causing groundwater/site contamination?
- 7) Kinder Morgan advised that there are currently no air quality monitors located on site to detect spills/release of air emissions. The incident investigation report should include a review of the need for installation of on-site monitors and other devices to detect oil spills/leaks (including release of emissions into the air and spillage of contaminants to the ground/ stormwater/surface water);
- 8) Are there operational activities which may cause high risk of air emissions such as draining of the tank after the spill incident and subsequent refilling of the tank to resume normal operations?
 - a) Kinder Morgan advised that when the tank is emptied, the floating roof is supported by "legs" which extend through the roof. At this time, is there an increased risk of leakage of air contaminants through the rim seals around the perimeter of the floating roof (or other roof seals such as the seals for the support legs) because the seals are in contact with the vapour headspace instead of liquid product/crude oil?
 - b) When the tank is refilled, does the liquid oil product entering the tank displace the vapour headspace and cause contaminants to be emitted into the air?
 - c) Kinder Morgan advised that some tanks on site have only a floating roof while other tanks have a floating roof and a fixed dome roof overtop. Which type of roof system is better for preventing air emissions? Also, is collection and treatment of air emissions necessary to prevent air pollution during emptying and refilling of tanks after a spill incident (and during normal operations)?
- 9) Would installation of fixed dome roofs over existing floating tank roofs eliminate the need for floating roof drainage piping systems and the associated risk of oil spills/leaks inherent with the drainage piping systems? Would this also protect the roof seals from adverse weather impacts, reduce the maintenance required on the seals and allow the seals to perform better with respect to preventing the escape of air emissions?

The above concerns/questions are by no means a complete list of issues that should be reviewed during the investigation of the incident. The incident investigation report should include, but not be limited to, the cause/details of the oil spill incident, the corrective measures that are necessary to prevent future spill incidents and all other relevant information.

The following websites are included for Kinder Morgan's reference:

- 1) *Environmental Management Act Spill Reporting Regulation* (www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/46_263_90);
- 2) B.C. Guidelines for Industry Emergency Response Plans (www.env.gov.bc.ca/eemp);
- 3) *Environmental Management Act Hazardous Waste Regulation* (www.env.gov.bc.ca/epd/hazwaste/index.htm);
- 4) *Environmental Management Act Contaminated Sites Regulation* (www.env.gov.bc.ca/epd/remediation/index.htm);
- 5) BC Ministry of Environment (www.gov.bc.ca/env).

If there are any questions, please contact us.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

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24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Chor, Alan ENV:EX

Sent: Tuesday, February 28, 2012 3:14 PM

To: 'Dan Barghshoon'

Cc: Veale, J Graham ENV:EX; Riedler, Harold ENV:EX; Hebert, David ENV:EX; Caunce, Cassandra ENV:EX; Barrett, Janet ENV:EX

Subject: RE: Data Memos for Sumas Tank 121 NEB Incident 2012-016, Effluent Permit PE-13418

Hi Dan,

As requested, here are my comments regarding Memo 1 - Sumas Tank 121 Surface Water Memo. (As you are aware, Graham Veale of our office has provided comments on Memo 3 - Sumas Tank 121 Offsite Air Quality Monitoring Memo.)

The comments on Memo 1 are as follows:

- 1) It is noted that Kinder Morgan/Golder Associates have reported that all effluent sample results are in compliance with the discharge limits specified in Effluent Permit PE-13418;
- 2) Measures should be taken to ensure that the effluent sample site (identified as "SW12-02" in the Golder memo) facilitates representative sampling of the effluent discharge as specified in Effluent Permit PE13418. During the ministry inspection conducted on February 16, 2012, we mentioned that the effluent sample should not contain any water from the receiving water (e.g. marsh/headwaters of Kilgaard Creek). It appeared that it could potentially be more difficult to obtain a representative effluent sample from the end of the outfall (especially if the level of the receiving water/marsh were to rise to or above the outfall level and was mixing with the effluent). Therefore, during the inspection, the ministry and Golder Associates (Shaun Lamoureux) took effluent samples from a sampling site located at a valve on a pipe on the outlet side of the oil separator. The sampling site is located at a small concrete sump between the oil separator and the outfall. It is partway down the stairway on the outside of the dike/berm of Tank 101 and is accessed by lifting a steel grating panel. Kinder Morgan (Curtis Wakulchuk) advised that they would investigate using this sample site for future effluent sampling and implementing improvements to make the taking of effluent samples easier, including the taking of toxicity/bioassay samples. Kinder Morgan should advise us of the results of this investigation and any improvements that have been made to the sampling facility;
- 3) A site plan/map should be provided showing the exact sampling locations;
- 4) In future reports, the table summarizing the sampling results should include, in the table headings, a brief description of the sample sites in addition to the sample site nos. for ease of reference (e.g. SW12-01 Prior to Separator, SW12-02 Effluent, SW12-03 Downstream). Also, the % Mortality at the end of the toxicity bioassays should also be included in the table, in addition to the LC50 value; and
- 5) Although a roof drain water TEH (Total Extractable Hydrocarbon) sample result was included for Tank 122, there was no sample result reported for Tank 121 (the tank that had the oil spill). Sampling should be conducted of the stormwater/effluent from the diked spill containment area of Tank 121 to determine if the effluent quality is acceptable prior to releasing any effluent from the diked containment area of Tank 121 (after operations are completed to flush/clean/rinse any spill residue/contaminants from the liner/diked containment

area). In addition, further ongoing sampling should be conducted and reported on a regular basis during and after the release of stormwater/effluent from the Tank 121 diked containment area to ensure that no pollution is being caused and that all final effluent discharges to the environment are consistently in compliance with Permit PE-13418.

If you have any questions, please contact us.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast)| #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk)| Fax: 604 584-9751 www.gov.bc.ca/env

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24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

- 1) *The tank/facility inspection program should be reviewed to determine what improvements need to be implemented to prevent future spills (including how often the tanks should be drained to conduct a full inspection of the tanks);*

Response:

The incident investigation identifies the cause of the spill at Tank 121 and appropriate preventative measures will be implemented based on identified causes. This report has been provided to the NEB on March 14 2012.

- 2) *What measures/improvements need to be implemented to facilitate immediate detection of and response to any spill or leak?*

Response:

The incident investigation examines the initial detection and response and appropriate measures will be implemented based on those findings. This report has been provided to the NEB on March 14 2012.

- 3) *Kinder Morgan advised that stormwater (that accumulates on top of the tank's floating roof) drains through a piping system located inside the tank, passes through the tank's crude oil product and drains to the diked tank containment area via a valve/outlet near the bottom of the tank. The drainage piping system consists of rigid pipe segments connected by sealed elbow joints in a scissor-like fashion that allow the piping system to "extend and retract" with the "rise and fall" of the floating roof.*

Kinder Morgan advised that one possible cause of the spill was leakage of crude oil into the drainage piping system through one of the elbow joint seals and out of the drain valve outlet near the bottom of the tank. The incident investigation report should include a review of the design of the roof drainage system and the inspection/preventative maintenance program;

Response:

Please refer to response #1.

- 4) *Kinder Morgan advised that valves on the stormwater drainage pipes between the diked tank containment areas (e.g. Tank 104 area and Tank 101 area) are typically left in the open position as the default. Should the valves for the stormwater drains between the diked tank containment areas, instead, be left in the closed position as the default to:*

- a) *Isolate/confine any potential oil spill to the diked area of the leaking tank and prevent spreading of the oil spill to adjacent diked containment areas via open drains and*
- b) *Prevent any potential oil spill from entering the diked containment area for Tank 101 (where all storm runoff from the entire site is collected and treated by the oil separator) and compromising the ability of the site to treat and discharge stormwater should a rainfall event occur (e.g. by overwhelming the treatment capability of the oil separator)?*

Response:

The high level of rainfall in the region necessitates an elevated degree of water management onsite. Surface water accumulates rapidly within bermed areas and TMPL strives to minimize accumulated surface water thereby reducing the exposure of water to potential sources of impacts.

Prior to the release at Tank 121, a review of site drainage and drainage infrastructure was initiated. This review is expected to identify opportunities for water management and insure appropriate isolation in the event of a leak.

Additionally, oil sensing equipment is in place to cease the flow of discharge water should oil be detected.

- 5) *Kinder Morgan advised that after opening the valve to release stormwater that has accumulated on the floating tank roof, the operator would observe the drainage flow for approximately 10 minutes to determine if any leaked oil is present. If no leaked oil is observed, the drain is then left open until later in the day to allow the remaining accumulated stormwater to drain while the operator carries out other duties. Since oil is lighter than water, there is the concern that any oil that may leak onto the roof (e.g. through roof seals) may not be observed by the operator because the oil would be floating on top of the stormwater. During the first 10 minutes, the operator may only observe the relatively clean stormwater which would tend to drain out first instead of the floating oil which would tend to drain out later. The incident investigation report should include a review of this procedure;*

Response:

The incident investigation includes a standard for managing roof drains and associated water. This report has been provided to the NEB on March 14 2012.

- 6) *What measures/monitoring have been conducted to ensure that the oil spill did not leak through the liner or otherwise escape from the tank's diked containment area? Does the existing groundwater monitoring program need to be improved to ensure that the operation is not causing groundwater/site contamination?*

Response:

A report summarising remediation and monitoring activities will be prepared. This report will summarise remediation, confirmatory sampling, and will include discussion on the groundwater monitoring program. This report will be submitted to the NEB for their review and approval in the spring of 2012.

The existing groundwater wells provide full coverage of down gradient perimeter of the site. These wells have been monitored twice since the release at Tank 121. Hydrocarbons have not been detected during these monitoring events. Additional groundwater wells will be installed within the site to confirm groundwater quality.

- 7) *Kinder Morgan advised that there are currently no air quality monitors located on site to detect spills/release of air emissions. The incident investigation report should include a review of the need for installation of on-site monitors and other devices to detect oil spills/leaks (including release of emissions into the air and spillage of contaminants to the ground/ stormwater/surface water);*

Response:

TMPL is investigating the installation of a real-time ambient air monitoring system in the community adjacent to the Sumas Tank Farm. Air dispersion modeling of the Sumas Tank Farm under routine and an anticipated worst-case scenario and a review of operational practices and potential emission sources, are among the potential factors that would be used in the development of recommendations for scope and positioning of the ambient air monitoring system.

- 8) *Are there operational activities which may cause high risk of air emissions such as draining of the tank after the spill incident and subsequent refilling of the tank to resume normal operations?*
- a) *Kinder Morgan advised that when the tank is emptied, the floating roof is supported by "legs" which extend through the roof. At this time, is there an increased risk of leakage of air contaminants through the rim seals around the perimeter of the floating roof (or other roof seals such as the seals for the support legs) because the seals are in contact with the vapour headspace instead of liquid product/crude oil?*
 - b) *When the tank is refilled, does the liquid oil product entering the tank displace the vapour headspace and cause contaminants to be emitted into the air?*
 - c) *Kinder Morgan advised that some tanks on site have only a floating roof while other tanks have a floating roof and a fixed dome roof overtop. Which type of roof system is better for preventing air emissions? Also, is collection and treatment of air emissions necessary to prevent air pollution during emptying and refilling of tanks after a spill incident (and during normal operations)?*

Response:

Please refer to response #7.

When atmospheric pressure and internal pressure are at equilibrium, there is low potential for vapour emission. Changes to the balance of pressure due to roof movement may result in vapour emission until an equilibrium state is reached.

A fixed dome roof system provides an additional method for a particular piece of infrastructure to meet emissions standards; however, TMLP facilities and operational procedures meet all applicable emission standards.

- 9) *Would installation of fixed dome roofs over existing floating tank roofs eliminate the need for floating roof drainage piping systems and the associated risk of oil spills/leaks inherent with the drainage piping systems? Would this also protect the roof seals from adverse weather impacts, reduce the maintenance required on the seals and allow the seals to perform better with respect to preventing the escape of air emissions?*

Response:

A roof drain system is still required in tanks with fixed domes. TMPL facilities have an inspection and maintenance procedure that meets all applicable standards. Weather and climate are accounted for in the maintenance program.

The following websites are included for Kinder Morgan's reference:

- 1) *Environmental Management Act Spill Reporting Regulation*
(www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/46_263_90);
- 2) B.C. Guidelines for Industry Emergency Response Plans (www.env.gov.bc.ca/eemp);
- 3) *Environmental Management Act Hazardous Waste Regulation*
(www.env.gov.bc.ca/epd/hazwaste/index.htm);
- 4) *Environmental Management Act Contaminated Sites Regulation*
(www.env.gov.bc.ca/epd/remediation/index.htm);
- 5) BC Ministry of Environment (www.gov.bc.ca/env).

As requested, here are my comments regarding Memo 1 - Sumas Tank 121 Surface Water Memo. (As you are aware, Graham Veale of our office has provided comments on Memo 3 - Sumas Tank 121 Offsite Air Quality Monitoring Memo.)

The comments on Memo 1 are as follows:

- 1) *It is noted that Kinder Morgan/Golder Associates have reported that all effluent sample results are in compliance with the discharge limits specified in Effluent Permit PE-13418;*
See Memo #1 responses
- 2) *Measures should be taken to ensure that the effluent sample site (identified as "SW12-02" in the Golder memo) facilitates representative sampling of the effluent discharge as specified in Effluent Permit PE13418. During the ministry inspection conducted on February 16, 2012, we mentioned that the effluent sample should not contain any water from the receiving water (e.g. marsh/headwaters of Kilgaard Creek). It appeared that it could potentially be more difficult to obtain a representative effluent sample from the end of the outfall (especially if the level of the receiving water/marsh were to rise to or above the outfall level and was mixing with the effluent). Therefore, during the inspection, the ministry and Golder Associates (Shaun Lamoureux) took effluent samples from a sampling site located at a valve on a pipe on the outlet side of the oil separator. The sampling site is located at a small concrete sump between the oil separator and the outfall. It is partway down the stairway on the outside of the dike/berm of Tank 101 and is accessed by lifting a steel grating panel. Kinder Morgan (Curtis Wakulchuk) advised that they would investigate using this sample site for future effluent sampling and implementing improvements to make the taking of effluent samples easier, including the taking of toxicity/bioassay samples. Kinder Morgan should advise us of the results of this investigation and any improvements that have been made to the sampling facility;*
See Memo #1 responses
- 3) *A site plan/map should be provided showing the exact sampling locations;*
See Memo #1 responses
- 4) *In future reports, the table summarizing the sampling results should include, in the table headings, a brief description of the sample sites in addition to the sample site nos. for ease of reference (e.g. SW12-01 Prior to Separator, SW12-02 Effluent, SW12-03 Downstream). Also, the % Mortality at the end of the toxicity bioassays should also be included in the table, in addition to the LC50 value; and*
See Memo #1 responses
- 5) *Although a roof drain water TEH (Total Extractable Hydrocarbon) sample result was included for Tank 122, there was no sample result reported for Tank 121 (the tank that had the oil spill). Sampling should be conducted of the stormwater/effluent from the diked spill containment area of Tank 121 to determine if the effluent quality is acceptable prior to releasing any effluent from the diked containment area of Tank 121 (after operations are completed to flush/clean/rinse any spill residue/contaminants from the liner/diked containment area). In addition, further ongoing sampling should be conducted and reported on a regular basis during and after the release of stormwater/effluent from the Tank 121 diked containment area to ensure that no pollution is being caused and that all final effluent discharges to the environment are consistently in compliance with Permit PE-13418.*
See Memo #1 responses

Chor, Alan ENV:EX

From: Wakulchyk, Curtis [Curtis_Wakulchyk@kindermorgan.com]
Sent: Tuesday, March 27, 2012 11:57 AM
To: Chor, Alan ENV:EX; XT:HLTH Rice, George; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX
Cc: Droppo, Mike
Subject: Community Letter
Attachments: image001.jpg; letter to the community.pdf

Greetings,

Attached please find a copy of the incident follow-up letter Kinder Morgan is sending out to community homeowners surrounding our Sumas facility. The letter identifies the incident cause and outlines our commitment on key action items that we will be taking to prevent incidents and improve communications in the future. We will be mailing the attached letter today to almost 800 homes in the Straiton and Auguston areas and wanted you to have advanced notification of it's release and content.

On a separate note, as part of our ongoing effort to build relationships with our regulatory stakeholders, we would like to provide you with an opportunity to become more familiar with the oil pipeline industry and it's facilities, by offering a tour for you and your colleges around a couple of our larger terminal facilities in the lower mainland. Our Director of Engineering has agreed to be tour guide, and along with other Kinder Morgan staff, provide background on tank construction and operation. Set up as an informal afternoon, it would allow you to ask about standard practices and equipment in the industry and also get to become more familiar with Kinder Morgan's local facilities.

This offer has been extended to our regulatory partners at BCMOE, Frasier Health, and the National Energy Board.

If this would be of interest to you, please let us know and we can schedule a convenient date in the near future.

Regards,
Mike Droppo
Curtis Wakulchyk

Michael Droppo, P.Ag.
Manager, Environment
Kinder Morgan Canada Inc.
Suite 2700, 300 - 5th Ave SW
Calgary, AB T2P 5J2
Direct: 403-514-6537
Cell: 403 630-0161

Curtis Wakulchyk B.Sc., P.Ag.

Environmental Specialist

The Stock Exchange Tower

2700, 300 - 5 Avenue SW

Calgary, AB T2P 5J2

curtis_wakulchyk@kindermorgan.com

Direct: 403.514.6509

Cellular: 403.771.1426

Fax: 403.514.6627





March 27, 2012

Dear Neighbour,

As promised, this letter provides you with follow up information related to the incident that occurred at our Sumas Mountain Terminal in Abbotsford on January 24, 2012.

- As you are aware, the release of oil from a storage tank at the terminal was fully contained on our property within an area that was lined with an impermeable membrane. The containment worked exactly as designed, and all of the oil was recovered on the same day as the release.
- Company personnel responded to the site immediately and a comprehensive response occurred under regulatory oversight to make sure the product was contained and cleaned up. There were no injuries and no threat to the public. However, there were significant odours due to the release and for this we sincerely apologize.

We share a mutual objective to ensure that such incidents do not occur in the future. What follows are actions being taken to address the key investigation findings.

1. Enhance Early Notification

To ensure that nearby neighbours are notified as quickly as possible in the event of an incident, we are currently investigating communication technology options with the goal to make automated calls should the need arise. This is similar to the technology being used by some schools to provide parents with important information.

We anticipate making a decision about what type of system is appropriate and providing an update by summer 2012. Neighbours will be advised as this process proceeds, will be provided with information about how the system works and how they may participate.

In addition, we are in the process of implementing a notification procedure with the Abbotsford Fire Department, School District 34 and Fortis BC. We anticipate this will be complete by June 2012.

2. Odour and Air Quality Procedures

Taking steps to minimize odours and investigate their cause is a top priority. Odours can be reported to 1.888.876.6711 24 hours per day / seven days per week. We encourage our neighbours to report odours to our call centre. All odour reports will be thoroughly investigated and addressed.

We will ensure information relating to odour complaints will be distributed to neighbours as part of our ongoing communications. These changes will be in place by fall 2012.

Kinder Morgan Canada

Suite 2700, 300 – 5th Avenue SW, Calgary, AB T2P 5J2

Phone: (800) 535-7219 Fax: (403) 514-6401 www.kindermorgan.com



Air Quality Measurement Activities

During the incident, we implemented a regulatory agency reviewed air monitoring program. It included regular air monitoring at eight locations within the neighborhood and at Auguston School. A total of 545 measurements were collected over twelve days between January 24 and February 16, 2012.

Results indicated that all concentrations of parameters of concern were below instrument detection limits or well below occupational health and safety limit measures.

As an additional measure, air samples were lab tested for potential contaminants associated with the release of crude oil. Results indicated that none of the detected concentrations exceeded acute screening criteria.

The results of the air monitoring and sampling activities have been submitted to regulatory agencies.

Air Quality Measurement Next Steps

We are working with the Fraser Health Authority and other agency stakeholders to enhance our air monitoring and sampling procedures by using pre-identified workplace and community health criteria that would trigger immediate notification to our staff in the event of a potential issue. This will be in place by summer 2012.

In addition to this improved process, we have engaged an independent rapid response service provider to conduct air monitoring and sampling if needed. This will be in place by summer 2012.

The two actions above, combined with an enhanced notification process will improve the timeliness of notifying the community in the event of a potential emergency.

Finally, to support the installation of a real-time air monitoring system near the terminal, we have commissioned a study to assess the impact of our facility on the air quality of the surrounding area. The study is anticipated to be complete and a decision will be made about an air monitoring system by summer 2012.

Odour Control Activities

As part of ongoing operations and maintenance work, the following steps are routinely used to mitigate odours:

- use of a floating roof to minimize potential odours by reducing vapour space;
- use of seals that scrape the inside of the tank to eliminate evaporation loss on the tank walls;
- use of mobile vapour scrubbers where possible; and
- minimizing oil flow rates when transferring products in and out of tanks.

Odour Control Next Steps

While we currently use industry standard external floating roofs with double seals to mitigate odours, we will review and assess currently available technology to determine whether additional improvements can be implemented to further reduce odours. We anticipate completing our assessment by the end of 2012.

Kinder Morgan Canada

Suite 2700, 300 – 5th Avenue SW, Calgary, AB T2P 5J2

Phone: (800) 535-7219 Fax: (403) 514-6401 www.kindermorgan.com



3. Enhance Early Detection

To provide operators with more redundancy in detecting potential odours, a gas detection sensor will be installed and tested at the terminal. While not commonly used in this application it will be an additional measure to provide earlier notification to our operations team. This measure will supplement hand held gas detection units currently used by employees when onsite. Planning for installation is underway and this system will be operational by fall 2012.

Summary of Key Findings

Final estimates determined that the incident released approximately 500 barrels (90m³) of crude oil through a roof water drain system into an engineered containment area surrounding the tank.

Due to unseasonably low temperatures, low volume of oil and the duration of inactivity in the tank, the roof drain system experienced freezing conditions. Given the extent and duration of freezing temperatures inside and outside the tank, water in the roof drain system froze, damaging the roof drain piping, allowing oil to enter into and escape through the drain system into the containment area.

We are revising our operating procedures to add winterization measures to prevent roof water drain parts from freezing. This will be completed by June 30, 2012. The Canadian engineering code governing pipelines and storage tanks mandates that tanks such as those located at this terminal be maintained according to American Petroleum Institute Standard 653. These inspections include a combination of inspections by employees and independent inspectors, with the tank in use and out of service, and at different timeframes. All required inspections were up to date at the time of the incident.

More Information

If you would like to discuss these findings and recommendations from our investigation, please contact Lexa Hobenshield, Kinder Morgan Canada's External Relations manager at lexa_hobenshield@kindermorgan.com or 604.268.3013.

Again on behalf of Kinder Morgan Canada, I wish to apologize for the disruption and concerns this incident caused. We will work hard to ensure that we avoid incidents in the future. Our foremost priority is the safety of our neighbours and employees. Our employees live and work in Abbotsford and are part of your community. Pipelines are and remain the safest means of transporting petroleum products. We have safely operated the Sumas Mountain Terminal for more than 40 years and as your neighbour, appreciate your feedback and look forward to maintaining a positive relationship with you.

Sincerely,

A handwritten signature in black ink, appearing to read 'Hugh Harden'.

Hugh Harden
Vice President, Operations

Kinder Morgan Canada

Suite 2700, 300 – 5th Avenue SW, Calgary, AB T2P 5J2

Phone: (800) 535-7219 Fax: (403) 514-6401 www.kindermorgan.com

Chor, Alan ENV:EX

From: Dan Barghshoon [Dan.Barghshoon@neb-one.gc.ca]
Sent: Monday, April 2, 2012 8:04 AM
To: Chor, Alan ENV:EX
Subject: FW: Kinder Morgan Sumas Tank Farm, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418
Attachments: image001.jpg

Sorry, Alan – I forgot to include you in the email this morning.

Dan

From: Dan Barghshoon
Sent: Monday, April 02, 2012 8:43 AM
To: 'Wakulchyk, Curtis'
Subject: RE: Kinder Morgan Sumas Tank Farm, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Hi Curtis,

Ken Fortin and I will be attending the meeting as well. Thanks again for the invite.

All dates are suitable except April 30th.

Thanks.

Dan

From: Chor, Alan ENV:EX [mailto:Alan.Chor@gov.bc.ca]
Sent: Friday, March 30, 2012 3:36 PM
To: 'Wakulchyk, Curtis'
Cc: 'Droppo, Mike'; Dan Barghshoon; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX; Caunce, Cassandra ENV:EX; Hebert, David ENV:EX; Barrett, Janet ENV:EX
Subject: Kinder Morgan Sumas Tank Farm, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Dear Curtis Wakulchyk, Kinder Morgan Canada Inc.,

Further to our discussion today, thank you for:

- 1) Providing Kinder Morgan's letter to the community in the Sumas Tank Farm area. We appreciate the efforts of Kinder Morgan to maintain open communications with the community by providing an update on the incident including measures being taken to prevent future spills and improve communications;
- 2) Offering to provide a tour/meeting of Kinder Morgan facilities, which is appreciated. We would like to suggest that:
 - a) The tour/meeting be held at the Sumas Tank Farm since, in addition to general information on all Kinder Morgan operations/facilities, we are interested in specific information relating to the Sumas Tank Farm incident such as:
 - i. The cause and corrective measures being implemented,
 - ii. Specific details expanding upon the information provided in the community letter,

- iii. Any additional information available since Kinder Morgan provided comments on concerns/questions expressed during the inspection and in correspondence,
- b) The start time of the tour/meeting be in the morning (e.g. 9:30 am) [Tentatively, we are available on April 5, 16, 19 & 30].

If you have any questions, please contact us.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Wakulchyk, Curtis [mailto:Curtis_Wakulchyk@kindermorgan.com]

Sent: Tuesday, March 27, 2012 11:57 AM

To: Chor, Alan ENV:EX; XT:HLTH Rice, George; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX

Cc: Droppo, Mike

Subject: Community Letter

Attach: <letter to the community.pdf>

Greetings,

Attached please find a copy of the incident follow-up letter Kinder Morgan is sending out to community homeowners surrounding our Sumas facility. The letter identifies the incident cause and outlines our commitment on key action items that we will be taking to prevent incidents and improve communications in the future. We will be mailing the attached letter today to almost 800 homes in the Straiton and Auguston areas and wanted you to have advanced notification of it's release and content.

On a separate note, as part of our ongoing effort to build relationships with our regulatory stakeholders, we would like to provide you with an opportunity to become more familiar with the oil pipeline industry and it's facilities, by offering a tour for you and your colleagues around a couple of our larger terminal facilities in the lower mainland. Our Director of Engineering has agreed to be tour guide, and along with other Kinder Morgan staff, provide background on tank construction and operation. Set up as an informal afternoon, it would allow you to ask about standard practices and equipment in the industry and also get to become more familiar with Kinder Morgan's local facilities.

This offer has been extended to our regulatory partners at BCMOE, Fraser Health, and the National Energy Board.

If this would be of interest to you, please let us know and we can schedule a convenient date in the near future.

Regards,

Mike Droppo

Curtis Wakulchyk

Michael Droppo, P.Ag.

Manager, Environment

Kinder/Morgan Canada Inc.

Suite 2700, 300 - 5th Ave SW

Calgary, AB T2P 5J2

Direct: 403-514-6537
Cell: 403 630-0161

Curtis Wakulchyk B.Sc., P.Ag.

Environmental Specialist

The Stock Exchange Tower

2700, 300 - 5 Avenue SW

Calgary, AB T2P 5J2

curtis_wakulchyk@kindermorgan.com

Direct: 403.514.6509

Cellular: 403.771.1426

Fax: 403.514.6627

KINDER MORGAN
CANADA

From: Chor, Alan ENV:EX [mailto:Alan.Chor@gov.bc.ca]

Sent: Monday, March 26, 2012 3:41 PM

To: Dan Barghshoon

Cc: Caunce, Cassandra ENV:EX; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX; Hebert, David ENV:EX; Barrett, Janet ENV:EX; 'Dan_Chow@KinderMorgan.com'; 'Curtis_Wakulchyk@KinderMorgan.com'

Subject: RE: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Hi Dan,

Thank you for continuing to keep us updated on the Kinder Morgan's responses to our questions/concerns. Kinder Morgan indicates that they have prepared reports or are conducting investigations/reviews including:

- 1) An incident investigation including:
 - a) Examination of the initial detection & response,
 - b) Identification of the cause of the spill & appropriate preventative measures that will be implemented,
 - c) Development of a standard for managing roof drains and associated water;
- 2) A review of site drainage and drainage infrastructure identifying opportunities for water management and ensuring appropriate isolation in the event of a leak;
- 3) A report summarizing remediation and monitoring activities (including confirmatory sampling and groundwater monitoring program/installation of additional groundwater wells);
- 4) An investigation into the installation of a real-time ambient air monitoring system based on factors such as:
 - a) Air dispersion modeling of the Sumas Tank Farm under routine and an anticipated worst-case scenario,
 - b) A review of operational practices and potential emission sources;

We look forward to receiving the above and any other relevant information related to preventing pollution and future spills.

If you have any questions, please contact us.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 | www.gov.bc.ca/env

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Dan Barghshoon [<mailto:Dan.Barghshoon@neb-one.gc.ca>]
Sent: Friday, March 16, 2012 8:53 AM
To: Chor, Alan ENV:EX
Subject: RE: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418
Attach: [\\Complex\S40073\EP\Share1\Other\Kinder Morgan Sumas Tank Farm\BCMOE Comments on Effluent Permit PE-13418 Audit .pdf](#)

Hi Alan,

Please find attached, responses from Kinder Morgan (Trans Mountain) to the questions you provided below.

Thanks very much and have a good day.

Dan

From: Chor, Alan ENV:EX [<mailto:Alan.Chor@gov.bc.ca>]
Sent: Monday, March 05, 2012 11:18 AM
To: 'Curtis_Wakulchyk@KinderMorgan.com'
Cc: 'Dan_Chow@KinderMorgan.com'; Dan Barghshoon
Subject: Kinder Morgan Sumas Tank Farm - Inspection on February 16, 2012, Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Dear Curtis Wakulchyk, Kinder Morgan Canada Inc. (403 514-6509/ cel:403 771-1426),

Thank you for meeting with us during the site inspection and audit sampling conducted on February 16, 2012. Please forward the final sample results/lab sheets for TEH (Total Extractable Hydrocarbons) and fish toxicity (Rainbow Trout) so that our lab specialist may review them.

As indicated in the two emails below, we have forwarded questions/issues that were discussed with Kinder Morgan during the inspection to the National Energy Board so that Kinder Morgan can address them during the investigation and follow up of the spill incident.

If you have any questions, please contact us.

Sincerely,

Alan Chor
Senior Environmental Protection Officer
[BC Ministry of Environment](#) (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3
Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk) | Fax: 604 584-9751 www.gov.bc.ca/env
24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)
24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Chor, Alan ENV:EX
Sent: Thursday, March 1, 2012 2:26 PM
To: 'Dan Barghshoon'
Cc: Caunce, Cassandra ENV:EX; Riedler, Harold ENV:EX; Veale, J Graham ENV:EX; Hebert, David ENV:EX; Barrett, Janet ENV:EX; Mensah-Yeboah, Felix ENV:EX
Subject: Kinder Morgan Sumas Tank Farm Oil Spill Incident #DGIR112840, Effluent Permit PE-13418

Hi Dan,

This is further to our discussion yesterday.

During a site inspection of the Sumas Tank Farm on February 16, 2012, the BC Ministry of Environment (Alan Chor, Dave Hebert and Felix Mensah-Yeboah) met with Kinder Morgan Canada Inc. (Curtis Wakulchyk and others) and their consultant, Golder Associates (Shaun Lamoureux), at the Sumas Tank Farm to conduct an inspection and audit sampling of stormwater effluent discharge authorized by Permit PE-13418.

It is our understanding that the National Energy Board (NEB) has requested Kinder Morgan to conduct a full investigation into the cause of the oil spill incident and the corrective measures that are necessary to prevent future spill incidents. It is requested that the NEB ask Kinder Morgan, and their qualified professionals, to include in their incident investigation report the results of investigation/review of the issues listed below to determine the corrective actions/improvements that are required to prevent spills/pollution and minimize the risk to the environment. Some of the following issues were raised during the inspection while other issues were determined after discussions with the Environmental Emergency Response Officer in the ministry office.

- 1) The tank/facility inspection program should be reviewed to determine what improvements need to be implemented to prevent future spills (including how often the tanks should be drained to conduct a full inspection of the tanks);
- 2) What measures/improvements need to be implemented to facilitate immediate detection of and response to any spill or leak?
- 3) Kinder Morgan advised that stormwater (that accumulates on top of the tank's floating roof) drains through a piping system located inside the tank, passes through the tank's crude oil product and drains to the diked tank containment area via a valve/outlet near the bottom of the tank. The drainage piping system consists of rigid pipe segments connected by sealed elbow joints in a scissor-like fashion that allow the piping system to "extend and retract" with the "rise and fall" of the floating roof.

Kinder Morgan advised that one possible cause of the spill was leakage of crude oil into the drainage piping system through one of the elbow joint seals and out of the drain valve outlet near the bottom of the tank. The incident investigation report should include a review of the design of the roof drainage system and the inspection/preventative maintenance program;

- 4) Kinder Morgan advised that valves on the stormwater drainage pipes between the diked tank containment areas (e.g. Tank 104 area and Tank 101 area) are typically left in the open position as the default. Should the valves for the stormwater drains between the diked tank containment areas, instead, be left in the closed position as the default to:
 - a) Isolate/confine any potential oil spill to the diked area of the leaking tank and prevent spreading of the oil spill to adjacent diked containment areas via open drains and
 - b) Prevent any potential oil spill from entering the diked containment area for Tank 101 (where all storm runoff from the entire site is collected and treated by the oil separator) and compromising the ability of the site to treat and discharge stormwater should a rainfall event occur (e.g. by overwhelming the treatment capability of the oil separator)?
- 5) Kinder Morgan advised that after opening the valve to release stormwater that has accumulated on the floating tank roof, the operator would observe the drainage flow for approximately 10 minutes to determine if any leaked oil is present. If no leaked oil is observed, the drain is then left open until later in the day to allow the remaining accumulated stormwater to drain while the operator carries out other duties. Since oil is lighter than water, there is the concern that any oil that may leak onto the roof (e.g. through roof seals) may not be observed by the operator because the oil would be floating on top of the stormwater. During the first 10 minutes, the operator may only observe the relatively clean stormwater which would tend to drain out first instead of the floating oil which would tend to drain out later. The incident investigation report should include a review of this procedure;

- 6) What measures/monitoring have been conducted to ensure that the oil spill did not leak through the liner or otherwise escape from the tank's diked containment area? Does the existing groundwater monitoring program need to be improved to ensure that the operation is not causing groundwater/site contamination?
- 7) Kinder Morgan advised that there are currently no air quality monitors located on site to detect spills/release of air emissions. The incident investigation report should include a review of the need for installation of on-site monitors and other devices to detect oil spills/leaks (including release of emissions into the air and spillage of contaminants to the ground/ stormwater/surface water);
- 8) Are there operational activities which may cause high risk of air emissions such as draining of the tank after the spill incident and subsequent refilling of the tank to resume normal operations?
 - a) Kinder Morgan advised that when the tank is emptied, the floating roof is supported by "legs" which extend through the roof. At this time, is there an increased risk of leakage of air contaminants through the rim seals around the perimeter of the floating roof (or other roof seals such as the seals for the support legs) because the seals are in contact with the vapour headspace instead of liquid product/crude oil?
 - b) When the tank is refilled, does the liquid oil product entering the tank displace the vapour headspace and cause contaminants to be emitted into the air?
 - c) Kinder Morgan advised that some tanks on site have only a floating roof while other tanks have a floating roof and a fixed dome roof overtop. Which type of roof system is better for preventing air emissions? Also, is collection and treatment of air emissions necessary to prevent air pollution during emptying and refilling of tanks after a spill incident (and during normal operations)?
- 9) Would installation of fixed dome roofs over existing floating tank roofs eliminate the need for floating roof drainage piping systems and the associated risk of oil spills/leaks inherent with the drainage piping systems? Would this also protect the roof seals from adverse weather impacts, reduce the maintenance required on the seals and allow the seals to perform better with respect to preventing the escape of air emissions?

The above concerns/questions are by no means a complete list of issues that should be reviewed during the investigation of the incident. The incident investigation report should include, but not be limited to, the cause/details of the oil spill incident, the corrective measures that are necessary to prevent future spill incidents and all other relevant information.

The following websites are included for Kinder Morgan's reference:

- 1) *Environmental Management Act Spill Reporting Regulation* (www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/46_263_90);
- 2) B.C. Guidelines for Industry Emergency Response Plans (www.env.gov.bc.ca/eemp);
- 3) *Environmental Management Act Hazardous Waste Regulation* (www.env.gov.bc.ca/epd/hazwaste/index.htm);
- 4) *Environmental Management Act Contaminated Sites Regulation* (www.env.gov.bc.ca/epd/remediation/index.htm);
- 5) BC Ministry of Environment (www.gov.bc.ca/env).

If there are any questions, please contact us.

Sincerely,

Alan Chor
 Senior Environmental Protection Officer
 BC Ministry of Environment (South Coast) | #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk)| Fax: 604 584-9751 www.gov.bc.ca/env
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24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

Chor, Alan ENV:EX

From: Mullen, Andrew [Andrew.Mullen@kindermorgan.com]
Sent: Monday, January 23, 2012 1:22 PM
To: Chor, Alan ENV:EX
Subject: RE: Site Visit on December 13, 2011, 9:00 am at Kinder Morgan Vancouver Wharves Terminal in North Vancouver, Effluent Permit PE-1386
Attachments: L1095263_XLR.xls; L1095263_COA.PDF; Outfall - 1.15 - Dec 13, 2011.pdf; Outfall - 1.1 - Dec 13, 2011.pdf

Hi Alan,

Attached are the analytical chemistry and bioassay results for the December 13, 2011 sampling per your request. Let me know if you require anything further.

Thank you.

Best regards,

Andrew Mullen, P. Eng.
Director, Engineering & Environment
Kinder Morgan Canada Terminals, Limited Partnership
Vancouver Wharves Operation
1995 West First St., North Vancouver, B.C. V7P 1A8
Direct Tel: (604) 904-7225 Fax: (604) 982-7116
Email: Andrew.Mullen@kindermorgan.com

"DO THE RIGHT THING EVERY DAY"

Kinder Morgan Core Principles:

- 1) Safety will not be compromised.
- 2) Environmentally compliant and responsible operator.
- 3) Ethics and integrity.
- 4) Commitment to employees and resources.
- 5) Customer service and fiscal responsibility.
- 6) Quality focus.

-----Original Message-----

From: Chor, Alan ENV:EX [<mailto:Alan.Chor@gov.bc.ca>]
Sent: Wednesday, January 11, 2012 3:22 PM
To: Mullen, Andrew
Subject: RE: Site Visit on December 13, 2011, 9:00 am at Kinder Morgan Vancouver Wharves Terminal in North Vancouver, Effluent Permit PE-1386

Dear Andrew Mullen, Kinder Morgan Canada Terminals, Limited Partnership:

Further to the inspection and audit sampling conducted on December 13, 2011, please forward the final sample results/lab sheets for the parameters listed in the emails below so that our lab specialist may review them.

Sincerely,

Alan Chor
Senior Environmental Protection Officer

BC Ministry of Environment (South Coast)| #200 - 10470 152 St., Surrey BC V3R 0Y3
Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk)| Fax: 604 584-9751
www.gov.bc.ca/env<<http://www.gov.bc.ca/env>>

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Chor, Alan ENV:EX

Sent: December 12, 2011 2:44 PM

To: 'Mullen, Andrew'

Subject: RE: Site Visit on December 13, 2011, 9:00 am at Kinder Morgan Vancouver Wharves Terminal in North Vancouver, Effluent Permit PE-1386

Dear Andrew Mullen, Kinder Morgan Canada Terminals, Limited Partnership:

Thank you for your email. My sampling for both outfalls will include sampling for Total Oil & Grease.

I'll see you tomorrow at 9:00am.

Sincerely,

Alan Chor

Senior Environmental Protection Officer

BC Ministry of Environment (South Coast)| #200 - 10470 152 St., Surrey BC V3R 0Y3

Tel: 604 582-5271 (direct)/ 604 582-5200 (front desk)| Fax: 604 584-9751

www.gov.bc.ca/env<<http://www.gov.bc.ca/env>>

24-hour Spill/Environmental Emergency Reporting: 1 800 663-3456 (Provincial Emergency Program)

24-hour RAPP (Report All Poachers and Polluters) tip-line: 1 877 952-7277 (Conservation Officer Service)

From: Mullen, Andrew [<mailto:Andrew.Mullen@kindermorgan.com>]

Sent: Monday, December 12, 2011 8:12 AM

To: Chor, Alan ENV:EX

Cc: Schira, Kim

Subject: RE: Site Visit on December 13, 2011, 9:00 am at Kinder Morgan Vancouver Wharves Terminal in North Vancouver, Effluent Permit PE-1386

Hi Alan,

Thank you for your voicemail on Friday confirming your sample collection visit on Tuesday of this week. Starting at 9:00 A.M. on Tuesday will not be a problem.

Each month we sample both outfalls (1.1 and 1.5) for total oil and grease per the ALS protocol:

[[cid:image003.png@01CCB8A5.B50A0870](#)]

Let me know if you require any further information on the method of analysis. I look forward to meeting with you tomorrow.

Best regards,

Andrew Mullen, P. Eng.

Director, Engineering & Environment

Kinder Morgan Canada Terminals, Limited Partnership Vancouver Wharves Operation

1995 West First St., North Vancouver, B.C. V7P 1A8
Direct Tel: (604) 904-7225 Fax: (604) 982-7116
Email: Andrew.Mullen@kindermorgan.com<<mailto:Andrew.Mullen@kindermorgan.com>>

"DO THE RIGHT THING EVERY DAY"

Kinder Morgan Core Principles:

- 1) Safety will not be compromised.
- 2) Environmentally compliant and responsible operator.
- 3) Ethics and integrity.
- 4) Commitment to employees and resources.
- 5) Customer service and fiscal responsibility.
- 6) Quality focus.

From: Chor, Alan ENV:EX [<mailto:Alan.Chor@gov.bc.ca>]

Sent: Friday, December 09, 2011 4:03 PM

To: Mullen, Andrew

Subject: Site Visit on December 13, 2011, 9:00 am at Kinder Morgan Vancouver Wharves Terminal in North Vancouver, Effluent Permit PE-1386

Dear Andrew Mullen, Kinder Morgan Canada Terminals, Limited Partnership (Tel: 904-7225, Cel: 786-3044):

As mentioned in my telephone message today,

1) I'll be conducting the inspection and sampling audit myself (No one else will be attending from our office);

2) I plan to sample both effluent discharges for all parameters with permit limits including:

pH
TSS
Dissolved Cu, Fe, Pb & Zn
Oil & Grease
Rainbow Trout LT50

3) Total Organic Carbon (TOC) will be also be sampled for Outfall 1.1

4) I plan to arrive at your site in a ministry vehicle at 9:00 am.

Please advise whether you sample for Total or Mineral Oil & Grease.

Sincerely,

Alan Chor
Senior Environmental Protection Officer
Business & Standards Unit
Ministry of Environment (South Coast)

Project	
Report To	Andrew Mullen, KINDER MORGAN CANADA TERMINALS LTD
ALS File No.	L1095263
Date Received	13-Dec-11 14:51
Date	23-Dec-11

RESULTS OF ANALYSIS

Sample ID	5775-N (OF1.1)	5775-U (OF1.1)	5776 (OF1.1)	5777 (OF1.1)	5778 (OF1.1)	5779 (OF1.1)	5780 (OF1.5)	5781 (OF1.5)	5782 (OF1.5)	5783-N (OF1.5)	5783-U (OF1.5)	5784 (OF1.5)	5785 (OF1.5)	5786 (OF1.5)
Date Sampled	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11
Time Sampled	10:30	10:30	10:30	10:30	10:30	10:30	11:30	11:30	11:30	11:30	11:30	11:30	11:30	11:30
ALS Sample ID	L1095263-1	L1095263-2	L1095263-3	L1095263-4	L1095263-5	L1095263-6	L1095263-7	L1095263-8	L1095263-9	L1095263-10	L1095263-11	L1095263-12	L1095263-13	L1095263-14
Matrix	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water

Physical Tests														
Hardness (as CaCO3)	317	318	-	-	-	-	-	-	-	590	589	-	-	-
pH	-	-	-	-	9.29	-	-	-	-	-	-	-	-	9.09
Total Suspended Solids	-	-	-	-	38.2	-	-	-	-	-	-	-	-	12.2

Anions and Nutrients														
Ammonia (as N)	-	-	-	-	-	-	0.42	-	-	-	-	-	-	-
Phosphorus (P)-Total	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0136

Organic / Inorganic Carbon														
Total Organic Carbon	-	-	-	-	-	1.34	-	-	-	-	-	-	-	-

Total Metals														
Aluminum (Al)-Total	-	-	<0.20	-	-	-	-	-	-	-	-	0.45	-	-
Antimony (Sb)-Total	-	-	<0.20	-	-	-	-	-	-	-	-	<0.20	-	-
Arsenic (As)-Total	-	-	<0.20	-	-	-	-	-	-	-	-	<0.20	-	-
Barium (Ba)-Total	-	-	0.040	-	-	-	-	-	-	-	-	<0.010	-	-
Beryllium (Be)-Total	-	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	-	-
Bismuth (Bi)-Total	-	-	<0.20	-	-	-	-	-	-	-	-	<0.20	-	-
Boron (B)-Total	-	-	0.11	-	-	-	-	-	-	-	-	0.29	-	-
Cadmium (Cd)-Total	-	-	0.010	-	-	-	-	-	-	-	-	<0.010	-	-
Calcium (Ca)-Total	-	-	96.4	-	-	-	-	-	-	-	-	96.8	-	-
Chromium (Cr)-Total	-	-	<0.010	-	-	-	-	-	-	-	-	<0.010	-	-
Cobalt (Co)-Total	-	-	<0.010	-	-	-	-	-	-	-	-	<0.010	-	-
Copper (Cu)-Total	-	-	0.577	-	-	-	-	-	-	-	-	0.017	-	-
Iron (Fe)-Total	-	-	4.44	-	-	-	-	-	-	-	-	1.40	-	-
Lead (Pb)-Total	-	-	0.340	-	-	-	-	-	-	-	-	<0.050	-	-
Lithium (Li)-Total	-	-	0.037	-	-	-	-	-	-	-	-	0.014	-	-
Magnesium (Mg)-Total	-	-	23.9	-	-	-	-	-	-	-	-	84.4	-	-
Manganese (Mn)-Total	-	-	0.0526	-	-	-	-	-	-	-	-	0.166	-	-
Molybdenum (Mo)-Total	-	-	<0.030	-	-	-	-	-	-	-	-	<0.030	-	-
Nickel (Ni)-Total	-	-	<0.050	-	-	-	-	-	-	-	-	<0.050	-	-
Phosphorus (P)-Total	-	-	<0.30	-	-	-	-	-	-	-	-	<0.30	-	-
Potassium (K)-Total	-	-	15.0	-	-	-	-	-	-	-	-	35.6	-	-
Selenium (Se)-Total	-	-	<0.20	-	-	-	-	-	-	-	-	<0.20	-	-
Silicon (Si)-Total	-	-	0.892	-	-	-	-	-	-	-	-	1.96	-	-
Silver (Ag)-Total	-	-	<0.010	-	-	-	-	-	-	-	-	<0.010	-	-
Sodium (Na)-Total	-	-	275	-	-	-	-	-	-	-	-	749	-	-
Strontium (Sr)-Total	-	-	0.562	-	-	-	-	-	-	-	-	0.674	-	-
Thallium (Tl)-Total	-	-	<0.20	-	-	-	-	-	-	-	-	<0.20	-	-
Tin (Sn)-Total	-	-	<0.030	-	-	-	-	-	-	-	-	<0.030	-	-
Titanium (Ti)-Total	-	-	<0.010	-	-	-	-	-	-	-	-	<0.010	-	-
Vanadium (V)-Total	-	-	<0.030	-	-	-	-	-	-	-	-	<0.030	-	-
Zinc (Zn)-Total	-	-	1.95	-	-	-	-	-	-	-	-	0.0581	-	-

Dissolved Metals														
Aluminum (Al)-Dissolved	<0.20	<0.20	-	-	-	-	-	-	-	0.22	<0.20	-	-	-
Antimony (Sb)-Dissolved	<0.20	<0.20	-	-	-	-	-	-	-	<0.20	<0.20	-	-	-

Arsenic (As)-Dissolved	<0.20	<0.20	-	-	-	-	-	-	-	<0.20	<0.20	-	-	-
Barium (Ba)-Dissolved	0.033	0.032	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Beryllium (Be)-Dissolved	<0.0050	<0.0050	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Bismuth (Bi)-Dissolved	<0.20	<0.20	-	-	-	-	-	-	-	<0.20	<0.20	-	-	-
Boron (B)-Dissolved	<0.10	0.10	-	-	-	-	-	-	-	0.28	0.29	-	-	-
Cadmium (Cd)-Dissolved	<0.010	<0.010	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Calcium (Ca)-Dissolved	88.9	89.1	-	-	-	-	-	-	-	96.5	94.8	-	-	-
Chromium (Cr)-Dissolved	<0.010	<0.010	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Cobalt (Co)-Dissolved	<0.010	<0.010	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Copper (Cu)-Dissolved	0.018	0.014	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Iron (Fe)-Dissolved	<0.030	0.133	-	-	-	-	-	-	-	<0.030	<0.030	-	-	-
Lead (Pb)-Dissolved	<0.050	<0.050	-	-	-	-	-	-	-	<0.050	<0.050	-	-	-
Lithium (Li)-Dissolved	0.035	0.036	-	-	-	-	-	-	-	0.014	0.016	-	-	-
Magnesium (Mg)-Dissolved	23.1	23.3	-	-	-	-	-	-	-	84.7	85.6	-	-	-
Manganese (Mn)-Dissolved	<0.0050	<0.0050	-	-	-	-	-	-	-	0.125	0.0503	-	-	-
Molybdenum (Mo)-Dissolved	<0.030	<0.030	-	-	-	-	-	-	-	<0.030	<0.030	-	-	-
Nickel (Ni)-Dissolved	<0.050	<0.050	-	-	-	-	-	-	-	<0.050	<0.050	-	-	-
Phosphorus (P)-Dissolved	<0.30	<0.30	-	-	-	-	-	-	-	<0.30	<0.30	-	-	-
Potassium (K)-Dissolved	14.6	14.9	-	-	-	-	-	-	-	35.8	37.2	-	-	-
Selenium (Se)-Dissolved	<0.20	<0.20	-	-	-	-	-	-	-	<0.20	<0.20	-	-	-
Silicon (Si)-Dissolved	0.357	0.353	-	-	-	-	-	-	-	1.65	1.68	-	-	-
Silver (Ag)-Dissolved	<0.010	<0.010	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Sodium (Na)-Dissolved	269	272	-	-	-	-	-	-	-	751	779	-	-	-
Strontium (Sr)-Dissolved	0.539	0.545	-	-	-	-	-	-	-	0.669	0.685	-	-	-
Thallium (Tl)-Dissolved	<0.20	<0.20	-	-	-	-	-	-	-	<0.20	<0.20	-	-	-
Tin (Sn)-Dissolved	<0.030	<0.030	-	-	-	-	-	-	-	<0.030	<0.030	-	-	-
Titanium (Ti)-Dissolved	<0.010	<0.010	-	-	-	-	-	-	-	<0.010	<0.010	-	-	-
Vanadium (V)-Dissolved	<0.030	<0.030	-	-	-	-	-	-	-	<0.030	<0.030	-	-	-
Zinc (Zn)-Dissolved	0.0337	0.0132	-	-	-	-	-	-	-	0.0069	<0.0050	-	-	-
Aggregate Organics														
BOD	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-
COD	-	-	-	-	-	-	-	-	50	-	-	-	-	-
Oil and Grease	-	-	-	<5.0	-	-	-	-	-	-	-	-	<5.0	-

Project	
Report To	Andrew Mullen, KINDER MORGAN CANADA TERMINALS LTD
ALS File No.	L1095263
Date Received	13-Dec-11 14:51
Date	23-Dec-11

DETECTION LIMITS

Sample ID	5775-N (OF1.1)	5775-U (OF1.1)	5776 (OF1.1)	5777 (OF1.1)	5778 (OF1.1)	5779 (OF1.1)	5780 (OF1.5)	5781 (OF1.5)	5782 (OF1.5)	5783-N (OF1.5)	5783-U (OF1.5)	5784 (OF1.5)	5785 (OF1.5)	5786 (OF1.5)
Date Sampled	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11
Time Sampled	10:30	10:30	10:30	10:30	10:30	10:30	11:30	11:30	11:30	11:30	11:30	11:30	11:30	11:30
ALS Sample ID	L1095263-1	L1095263-2	L1095263-3	L1095263-4	L1095263-5	L1095263-6	L1095263-7	L1095263-8	L1095263-9	L1095263-10	L1095263-11	L1095263-12	L1095263-13	L1095263-14
Matrix	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water

Physical Tests

Hardness (as CaCO3)	0.50	0.50	-	-	-	-	-	-	-	0.50	0.50	-	-	-
pH	-	-	-	-	0.10	-	-	-	-	-	-	-	-	0.10
Total Suspended Solids	-	-	-	-	3.0	-	-	-	-	-	-	-	-	3.0

Anions and Nutrients

Ammonia (as N)	-	-	-	-	-	-	0.13	-	-	-	-	-	-	-
Phosphorus (P)-Total	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0020

Organic / Inorganic Carbon

Total Organic Carbon	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-
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Total Metals

Aluminum (Al)-Total	-	-	0.20	-	-	-	-	-	-	-	-	0.20	-	-
Antimony (Sb)-Total	-	-	0.20	-	-	-	-	-	-	-	-	0.20	-	-
Arsenic (As)-Total	-	-	0.20	-	-	-	-	-	-	-	-	0.20	-	-
Barium (Ba)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Beryllium (Be)-Total	-	-	0.0050	-	-	-	-	-	-	-	-	0.0050	-	-
Bismuth (Bi)-Total	-	-	0.20	-	-	-	-	-	-	-	-	0.20	-	-
Boron (B)-Total	-	-	0.10	-	-	-	-	-	-	-	-	0.10	-	-
Cadmium (Cd)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Calcium (Ca)-Total	-	-	0.050	-	-	-	-	-	-	-	-	0.050	-	-
Chromium (Cr)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Cobalt (Co)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Copper (Cu)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Iron (Fe)-Total	-	-	0.030	-	-	-	-	-	-	-	-	0.030	-	-
Lead (Pb)-Total	-	-	0.050	-	-	-	-	-	-	-	-	0.050	-	-
Lithium (Li)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Magnesium (Mg)-Total	-	-	0.10	-	-	-	-	-	-	-	-	0.10	-	-
Manganese (Mn)-Total	-	-	0.0050	-	-	-	-	-	-	-	-	0.0050	-	-
Molybdenum (Mo)-Total	-	-	0.030	-	-	-	-	-	-	-	-	0.030	-	-
Nickel (Ni)-Total	-	-	0.050	-	-	-	-	-	-	-	-	0.050	-	-
Phosphorus (P)-Total	-	-	0.30	-	-	-	-	-	-	-	-	0.30	-	-
Potassium (K)-Total	-	-	2.0	-	-	-	-	-	-	-	-	2.0	-	-
Selenium (Se)-Total	-	-	0.20	-	-	-	-	-	-	-	-	0.20	-	-
Silicon (Si)-Total	-	-	0.050	-	-	-	-	-	-	-	-	0.050	-	-
Silver (Ag)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Sodium (Na)-Total	-	-	2.0	-	-	-	-	-	-	-	-	2.0	-	-
Strontium (Sr)-Total	-	-	0.0050	-	-	-	-	-	-	-	-	0.0050	-	-
Thallium (Tl)-Total	-	-	0.20	-	-	-	-	-	-	-	-	0.20	-	-
Tin (Sn)-Total	-	-	0.030	-	-	-	-	-	-	-	-	0.030	-	-
Titanium (Ti)-Total	-	-	0.010	-	-	-	-	-	-	-	-	0.010	-	-
Vanadium (V)-Total	-	-	0.030	-	-	-	-	-	-	-	-	0.030	-	-
Zinc (Zn)-Total	-	-	0.0050	-	-	-	-	-	-	-	-	0.0050	-	-

Dissolved Metals

Aluminum (Al)-Dissolved	0.20	0.20	-	-	-	-	-	-	-	0.20	0.20	-	-	-
Antimony (Sb)-Dissolved	0.20	0.20	-	-	-	-	-	-	-	0.20	0.20	-	-	-
Arsenic (As)-Dissolved	0.20	0.20	-	-	-	-	-	-	-	0.20	0.20	-	-	-
Barium (Ba)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Beryllium (Be)-Dissolved	0.0050	0.0050	-	-	-	-	-	-	-	0.0050	0.0050	-	-	-
Bismuth (Bi)-Dissolved	0.20	0.20	-	-	-	-	-	-	-	0.20	0.20	-	-	-
Boron (B)-Dissolved	0.10	0.10	-	-	-	-	-	-	-	0.10	0.10	-	-	-
Cadmium (Cd)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Calcium (Ca)-Dissolved	0.050	0.050	-	-	-	-	-	-	-	0.050	0.050	-	-	-
Chromium (Cr)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Cobalt (Co)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Copper (Cu)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Iron (Fe)-Dissolved	0.030	0.030	-	-	-	-	-	-	-	0.030	0.030	-	-	-

Lead (Pb)-Dissolved	0.050	0.050	-	-	-	-	-	-	-	-	0.050	0.050	-	-	-
Lithium (Li)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Magnesium (Mg)-Dissolved	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	-	-	-
Manganese (Mn)-Dissolved	0.0050	0.0050	-	-	-	-	-	-	-	-	0.0050	0.0050	-	-	-
Molybdenum (Mo)-Dissolved	0.030	0.030	-	-	-	-	-	-	-	-	0.030	0.030	-	-	-
Nickel (Ni)-Dissolved	0.050	0.050	-	-	-	-	-	-	-	-	0.050	0.050	-	-	-
Phosphorus (P)-Dissolved	0.30	0.30	-	-	-	-	-	-	-	-	0.30	0.30	-	-	-
Potassium (K)-Dissolved	2.0	2.0	-	-	-	-	-	-	-	-	2.0	2.0	-	-	-
Selenium (Se)-Dissolved	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	-	-	-
Silicon (Si)-Dissolved	0.050	0.050	-	-	-	-	-	-	-	-	0.050	0.050	-	-	-
Silver (Ag)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Sodium (Na)-Dissolved	2.0	2.0	-	-	-	-	-	-	-	-	2.0	2.0	-	-	-
Strontium (Sr)-Dissolved	0.0050	0.0050	-	-	-	-	-	-	-	-	0.0050	0.0050	-	-	-
Thallium (Tl)-Dissolved	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	-	-	-
Tin (Sn)-Dissolved	0.030	0.030	-	-	-	-	-	-	-	-	0.030	0.030	-	-	-
Titanium (Ti)-Dissolved	0.010	0.010	-	-	-	-	-	-	-	-	0.010	0.010	-	-	-
Vanadium (V)-Dissolved	0.030	0.030	-	-	-	-	-	-	-	-	0.030	0.030	-	-	-
Zinc (Zn)-Dissolved	0.0050	0.0050	-	-	-	-	-	-	-	-	0.0050	0.0050	-	-	-
Aggregate Organics															
BOD	-	-	-	-	-	-	-	5.0	-	-	-	-	-	-	-
COD	-	-	-	-	-	-	-	-	20	-	-	-	-	-	-
Oil and Grease	-	-	-	5.0	-	-	-	-	-	-	-	-	-	5.0	-

Project	Andrew Mullen, KINDER MORGAN CANADA TERMINALS LTD													
Report To	L1095263													
ALS File No.	13-Dec-11 14:51													
Date Received	23-Dec-11													
Date														
UNITS														
Sample ID	5775-N (OF1.1)	5775-U (OF1.1)	5776 (OF1.1)	5777 (OF1.1)	5778 (OF1.1)	5779 (OF1.1)	5780 (OF1.5)	5781 (OF1.5)	5782 (OF1.5)	5783-N (OF1.5)	5783-U (OF1.5)	5784 (OF1.5)	5785 (OF1.5)	5786 (OF1.5)
Date Sampled	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11	13-DEC-11
Time Sampled	10:30	10:30	10:30	10:30	10:30	10:30	11:30	11:30	11:30	11:30	11:30	11:30	11:30	11:30
ALS Sample ID	L1095263-1	L1095263-2	L1095263-3	L1095263-4	L1095263-5	L1095263-6	L1095263-7	L1095263-8	L1095263-9	L1095263-10	L1095263-11	L1095263-12	L1095263-13	L1095263-14
Matrix	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Physical Tests														
Hardness (as CaCO3)	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
pH	-	-	-	-	pH	-	-	-	-	-	-	-	-	pH
Total Suspended Solids	-	-	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L
Anions and Nutrients														
Ammonia (as N)	-	-	-	-	-	-	mg/L	-	-	-	-	-	-	-
Phosphorus (P)-Total	-	-	-	-	-	-	-	-	-	-	-	-	-	mg/L
Organic / Inorganic Carbon														
Total Organic Carbon	-	-	-	-	-	mg/L	-	-	-	-	-	-	-	-
Total Metals														
Aluminum (Al)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Antimony (Sb)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Arsenic (As)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Barium (Ba)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Beryllium (Be)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Bismuth (Bi)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Boron (B)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Cadmium (Cd)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Calcium (Ca)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Chromium (Cr)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Cobalt (Co)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Copper (Cu)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Iron (Fe)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Lead (Pb)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Lithium (Li)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Magnesium (Mg)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Manganese (Mn)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Molybdenum (Mo)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Nickel (Ni)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Phosphorus (P)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Potassium (K)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Selenium (Se)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Silicon (Si)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Silver (Ag)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Sodium (Na)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Strontium (Sr)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Thallium (Tl)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Tin (Sn)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Titanium (Ti)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Vanadium (V)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Zinc (Zn)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	mg/L	-	-
Dissolved Metals														
Aluminum (Al)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Antimony (Sb)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Arsenic (As)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Barium (Ba)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Beryllium (Be)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Bismuth (Bi)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Boron (B)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Cadmium (Cd)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Calcium (Ca)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Chromium (Cr)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Cobalt (Co)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Copper (Cu)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Iron (Fe)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-

Lead (Pb)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Lithium (Li)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Magnesium (Mg)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Manganese (Mn)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Molybdenum (Mo)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Nickel (Ni)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Phosphorus (P)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Potassium (K)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Selenium (Se)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Silicon (Si)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Silver (Ag)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Sodium (Na)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Strontium (Sr)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Thallium (Tl)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Tin (Sn)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Titanium (Ti)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Vanadium (V)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Zinc (Zn)-Dissolved	mg/L	mg/L	-	-	-	-	-	-	-	-	mg/L	mg/L	-	-	-
Aggregate Organics															
BOD	-	-	-	-	-	-	-	-	mg/L	-	-	-	-	-	-
COD	-	-	-	-	-	-	-	-	-	mg/L	-	-	-	-	-
Oil and Grease	-	-	-	mg/L	-	-	-	-	-	-	-	-	-	mg/L	-

Project
Report To Andrew Mullen, KINDER MORGAN CANADA TERMINALS LTD
ALS File No. L1095263
Date Received 13-Dec-11 14:51
Date 23-Dec-11

QUALITY CONTROL RESULTS

Matrix	QC Type	Analyte	QC Spl. No.	Reference	Result	Target	Units	%	Limits	Qualifier
Physical Tests										
Water	CRM	pH	WG1404126-1	VA-PH7-BUF	7.05	7.00	pH	7.05	6.9-7.1	
Water	LCS	Total Suspended Solids	WG1404806-2		69.3	75.0	mg/L	92.3	85-115	
Water	LCS	Total Suspended Solids	WG1404806-5		72.3	75.0	mg/L	96.3	85-115	
Water	LCS	Total Suspended Solids	WG1404806-8		72.3	75.0	mg/L	96.3	85-115	
Water	LCS	Total Suspended Solids	WG1404806-11		65.3	75.0	mg/L	87.0	85-115	
Water	MB	Total Suspended Solids	WG1404806-1		<3.0	<3	mg/L	-	3	
Water	MB	Total Suspended Solids	WG1404806-4		<3.0	<3	mg/L	-	3	
Water	MB	Total Suspended Solids	WG1404806-7		<3.0	<3	mg/L	-	3	
Water	MB	Total Suspended Solids	WG1404806-10		<3.0	<3	mg/L	-	3	
Anions and Nutrients										
Water	CRM	Ammonia (as N)	WG1404113-2	VA-NH3-F	0.125	0.120	mg/L	104.5	85-115	
Water	CRM	Ammonia (as N)	WG1404113-4	VA-NH3-F	0.111	0.120	mg/L	92.5	85-115	
Water	CRM	Ammonia (as N)	WG1404113-6	VA-NH3-F	0.108	0.120	mg/L	89.7	85-115	
Water	CRM	Ammonia (as N)	WG1404113-8	VA-NH3-F	0.106	0.120	mg/L	87.9	85-115	
Water	CRM	Phosphorus (P)-Total	WG1405031-2	VA-ERA-PO4	4.08	3.99	mg/L	102.4	80-120	
Water	CRM	Phosphorus (P)-Total	WG1405031-5	VA-ERA-PO4	3.93	3.99	mg/L	98.5	80-120	
Water	CRM	Phosphorus (P)-Total	WG1405031-8	VA-ERA-PO4	3.99	3.99	mg/L	99.9	80-120	
Water	CRM	Ammonia (as N)	WG1404113-10	VA-NH3-F	0.107	0.120	mg/L	89.3	85-115	
Water	CRM	Phosphorus (P)-Total	WG1405031-11	VA-ERA-PO4	3.92	3.99	mg/L	98.1	80-120	
Water	CRM	Phosphorus (P)-Total	WG1405031-14	VA-ERA-PO4	3.90	3.99	mg/L	97.7	80-120	
Water	MB	Ammonia (as N)	WG1404113-1		<0.0050	<0.005	mg/L	-	0.005	
Water	MB	Ammonia (as N)	WG1404113-3		<0.0050	<0.005	mg/L	-	0.005	
Water	MB	Ammonia (as N)	WG1404113-5		<0.0050	<0.005	mg/L	-	0.005	
Water	MB	Ammonia (as N)	WG1404113-7		<0.0050	<0.005	mg/L	-	0.005	
Water	MB	Ammonia (as N)	WG1404113-9		<0.0050	<0.005	mg/L	-	0.005	
Water	MB	Phosphorus (P)-Total	WG1405031-1		<0.0020	<0.002	mg/L	-	0.002	
Water	MB	Phosphorus (P)-Total	WG1405031-4		<0.0020	<0.002	mg/L	-	0.002	
Water	MB	Phosphorus (P)-Total	WG1405031-7		<0.0020	<0.002	mg/L	-	0.002	
Water	MB	Phosphorus (P)-Total	WG1405031-10		<0.0020	<0.002	mg/L	-	0.002	
Water	MB	Phosphorus (P)-Total	WG1405031-13		<0.0020	<0.002	mg/L	-	0.002	

Water	MS	Ammonia (as N)	WG1404113-12	Anonymous	0.177	0.200	mg/L	88.5	75-125
Water	MS	Ammonia (as N)	WG1404113-16	Anonymous	0.192	0.200	mg/L	96.2	75-125

Organic / Inorganic Carbon

Water	CRM	Total Organic Carbon	WG1405666-1	A-TOC-C-CAFFEIN	8.36	8.57	mg/L	97.5	80-120
Water	CRM	Total Organic Carbon	WG1405666-3	A-TOC-C-CAFFEIN	8.66	8.57	mg/L	101.1	80-120
Water	CRM	Total Organic Carbon	WG1405666-5	A-TOC-C-CAFFEIN	8.58	8.57	mg/L	100.1	80-120
Water	CRM	Total Organic Carbon	WG1405666-7	A-TOC-C-CAFFEIN	8.57	8.57	mg/L	100.0	80-120
Water	CRM	Total Organic Carbon	WG1405666-9	A-TOC-C-CAFFEIN	8.55	8.57	mg/L	99.8	80-120

Water	MB	Total Organic Carbon	WG1405666-2		<0.50	<0.5	mg/L	-	0.5
Water	MB	Total Organic Carbon	WG1405666-4		<0.50	<0.5	mg/L	-	0.5
Water	MB	Total Organic Carbon	WG1405666-6		<0.50	<0.5	mg/L	-	0.5
Water	MB	Total Organic Carbon	WG1405666-8		<0.50	<0.5	mg/L	-	0.5

Water	MS	Total Organic Carbon	WG1405666-11	L1095263-6	6.35	6.34	mg/L	100.2	70-130
Water	MS	Total Organic Carbon	WG1405666-12	Anonymous	7.80	8.02	mg/L	95.6	70-130
Water	MS	Total Organic Carbon	WG1405666-16	Anonymous	6.89	6.98	mg/L	98.2	70-130

Total Metals

Water	CRM	Aluminum (Al)-Total	WG1404360-3	VA-HIGH-WATRM	2.06	2.00	mg/L	103.0	80-120
Water	CRM	Antimony (Sb)-Total	WG1404360-3	VA-HIGH-WATRM	1.04	1.00	mg/L	103.7	80-120
Water	CRM	Arsenic (As)-Total	WG1404360-3	VA-HIGH-WATRM	1.01	1.00	mg/L	101.4	80-120
Water	CRM	Barium (Ba)-Total	WG1404360-3	VA-HIGH-WATRM	0.258	0.250	mg/L	103.1	80-120
Water	CRM	Beryllium (Be)-Total	WG1404360-3	VA-HIGH-WATRM	0.102	0.100	mg/L	101.7	80-120
Water	CRM	Bismuth (Bi)-Total	WG1404360-3	VA-HIGH-WATRM	1.02	1.00	mg/L	101.8	80-120
Water	CRM	Boron (B)-Total	WG1404360-3	VA-HIGH-WATRM	1.02	1.00	mg/L	101.6	80-120
Water	CRM	Cadmium (Cd)-Total	WG1404360-3	VA-HIGH-WATRM	0.102	0.100	mg/L	101.9	80-120
Water	CRM	Calcium (Ca)-Total	WG1404360-3	VA-HIGH-WATRM	51.3	50.0	mg/L	102.5	80-120
Water	CRM	Chromium (Cr)-Total	WG1404360-3	VA-HIGH-WATRM	0.257	0.250	mg/L	103.0	80-120
Water	CRM	Cobalt (Co)-Total	WG1404360-3	VA-HIGH-WATRM	0.247	0.250	mg/L	98.7	80-120
Water	CRM	Copper (Cu)-Total	WG1404360-3	VA-HIGH-WATRM	0.257	0.250	mg/L	102.9	80-120
Water	CRM	Iron (Fe)-Total	WG1404360-3	VA-HIGH-WATRM	1.02	1.00	mg/L	101.9	80-120
Water	CRM	Lead (Pb)-Total	WG1404360-3	VA-HIGH-WATRM	0.499	0.500	mg/L	99.7	80-120
Water	CRM	Lithium (Li)-Total	WG1404360-3	VA-HIGH-WATRM	0.260	0.250	mg/L	104.1	80-120
Water	CRM	Magnesium (Mg)-Total	WG1404360-3	VA-HIGH-WATRM	51.2	50.0	mg/L	102.3	80-120
Water	CRM	Manganese (Mn)-Total	WG1404360-3	VA-HIGH-WATRM	0.257	0.250	mg/L	102.8	80-120
Water	CRM	Molybdenum (Mo)-Total	WG1404360-3	VA-HIGH-WATRM	0.259	0.250	mg/L	103.6	80-120
Water	CRM	Nickel (Ni)-Total	WG1404360-3	VA-HIGH-WATRM	0.519	0.500	mg/L	103.8	80-120
Water	CRM	Phosphorus (P)-Total	WG1404360-3	VA-HIGH-WATRM	2.56	2.50	mg/L	102.6	80-120
Water	CRM	Potassium (K)-Total	WG1404360-3	VA-HIGH-WATRM	51.7	50.0	mg/L	103.3	80-120
Water	CRM	Selenium (Se)-Total	WG1404360-3	VA-HIGH-WATRM	1.03	1.00	mg/L	102.6	80-120
Water	CRM	Silicon (Si)-Total	WG1404360-3	VA-HIGH-WATRM	1.08	1.00	mg/L	107.7	80-120
Water	CRM	Silver (Ag)-Total	WG1404360-3	VA-HIGH-WATRM	0.098	0.100	mg/L	97.8	80-120
Water	CRM	Sodium (Na)-Total	WG1404360-3	VA-HIGH-WATRM	51.6	50.0	mg/L	103.1	80-120

Water	CRM	Strontium (Sr)-Total	WG1404360-3	VA-HIGH-WATRM	0.260	0.250	mg/L	104.0	80-120
Water	CRM	Thallium (Tl)-Total	WG1404360-3	VA-HIGH-WATRM	1.01	1.00	mg/L	101.2	80-120
Water	CRM	Tin (Sn)-Total	WG1404360-3	VA-HIGH-WATRM	0.504	0.500	mg/L	100.7	80-120
Water	CRM	Titanium (Ti)-Total	WG1404360-3	VA-HIGH-WATRM	0.268	0.250	mg/L	107.1	80-120
Water	CRM	Vanadium (V)-Total	WG1404360-3	VA-HIGH-WATRM	0.514	0.500	mg/L	102.8	80-120
Water	CRM	Zinc (Zn)-Total	WG1404360-3	VA-HIGH-WATRM	0.488	0.500	mg/L	97.5	80-120
Water	MB	Aluminum (Al)-Total	WG1404360-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Antimony (Sb)-Total	WG1404360-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Arsenic (As)-Total	WG1404360-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Barium (Ba)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Beryllium (Be)-Total	WG1404360-1		<0.0050	<0.005	mg/L	-	0.005
Water	MB	Bismuth (Bi)-Total	WG1404360-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Boron (B)-Total	WG1404360-1		<0.10	<0.1	mg/L	-	0.1
Water	MB	Cadmium (Cd)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Calcium (Ca)-Total	WG1404360-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Chromium (Cr)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Cobalt (Co)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Copper (Cu)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Iron (Fe)-Total	WG1404360-1		<0.030	<0.03	mg/L	-	0.03
Water	MB	Lead (Pb)-Total	WG1404360-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Lithium (Li)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Magnesium (Mg)-Total	WG1404360-1		<0.10	<0.1	mg/L	-	0.1
Water	MB	Manganese (Mn)-Total	WG1404360-1		<0.0050	<0.005	mg/L	-	0.005
Water	MB	Molybdenum (Mo)-Total	WG1404360-1		<0.030	<0.03	mg/L	-	0.03
Water	MB	Nickel (Ni)-Total	WG1404360-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Phosphorus (P)-Total	WG1404360-1		<0.30	<0.3	mg/L	-	0.3
Water	MB	Potassium (K)-Total	WG1404360-1		<2.0	<2	mg/L	-	2
Water	MB	Selenium (Se)-Total	WG1404360-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Silicon (Si)-Total	WG1404360-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Silver (Ag)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Sodium (Na)-Total	WG1404360-1		<2.0	<2	mg/L	-	2
Water	MB	Strontium (Sr)-Total	WG1404360-1		<0.0050	<0.005	mg/L	-	0.005
Water	MB	Thallium (Tl)-Total	WG1404360-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Tin (Sn)-Total	WG1404360-1		<0.030	<0.03	mg/L	-	0.03
Water	MB	Titanium (Ti)-Total	WG1404360-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Vanadium (V)-Total	WG1404360-1		<0.030	<0.03	mg/L	-	0.03
Water	MB	Zinc (Zn)-Total	WG1404360-1		<0.0050	<0.005	mg/L	-	0.005

Dissolved Metals

Water	CRM	Aluminum (Al)-Dissolved	WG1404759-4	VA-HIGH-WATRM	2.00	2.00	mg/L	100.1	80-120
Water	CRM	Antimony (Sb)-Dissolved	WG1404759-4	VA-HIGH-WATRM	1.00	1.00	mg/L	100.5	80-120
Water	CRM	Arsenic (As)-Dissolved	WG1404759-4	VA-HIGH-WATRM	1.00	1.00	mg/L	100.1	80-120
Water	CRM	Barium (Ba)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.251	0.250	mg/L	100.6	80-120
Water	CRM	Beryllium (Be)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.0992	0.100	mg/L	99.2	80-120
Water	CRM	Bismuth (Bi)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.99	1.00	mg/L	98.8	80-120

Water	CRM	Boron (B)-Dissolved	WG1404759-4	VA-HIGH-WATRM	1.00	1.00	mg/L	99.6	80-120
Water	CRM	Cadmium (Cd)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.101	0.100	mg/L	101.0	80-120
Water	CRM	Calcium (Ca)-Dissolved	WG1404759-4	VA-HIGH-WATRM	50.9	50.0	mg/L	101.8	80-120
Water	CRM	Chromium (Cr)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.254	0.250	mg/L	101.6	80-120
Water	CRM	Cobalt (Co)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.239	0.250	mg/L	95.5	80-120
Water	CRM	Copper (Cu)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.254	0.250	mg/L	101.4	80-120
Water	CRM	Iron (Fe)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.990	1.00	mg/L	99.0	80-120
Water	CRM	Lead (Pb)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.488	0.500	mg/L	97.7	80-120
Water	CRM	Lithium (Li)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.253	0.250	mg/L	101.4	80-120
Water	CRM	Magnesium (Mg)-Dissolved	WG1404759-4	VA-HIGH-WATRM	50.7	50.0	mg/L	101.4	80-120
Water	CRM	Manganese (Mn)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.250	0.250	mg/L	100.1	80-120
Water	CRM	Molybdenum (Mo)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.246	0.250	mg/L	98.4	80-120
Water	CRM	Nickel (Ni)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.505	0.500	mg/L	101.0	80-120
Water	CRM	Phosphorus (P)-Dissolved	WG1404759-4	VA-HIGH-WATRM	2.52	2.50	mg/L	100.7	80-120
Water	CRM	Potassium (K)-Dissolved	WG1404759-4	VA-HIGH-WATRM	50.2	50.0	mg/L	100.4	80-120
Water	CRM	Selenium (Se)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.98	1.00	mg/L	98.4	80-120
Water	CRM	Silicon (Si)-Dissolved	WG1404759-4	VA-HIGH-WATRM	1.06	1.00	mg/L	106.2	80-120
Water	CRM	Silver (Ag)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.097	0.100	mg/L	96.8	80-120
Water	CRM	Sodium (Na)-Dissolved	WG1404759-4	VA-HIGH-WATRM	51.3	50.0	mg/L	102.6	80-120
Water	CRM	Strontium (Sr)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.257	0.250	mg/L	102.8	80-120
Water	CRM	Thallium (Tl)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.99	1.00	mg/L	98.5	80-120
Water	CRM	Tin (Sn)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.495	0.500	mg/L	99.0	80-120
Water	CRM	Titanium (Ti)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.261	0.250	mg/L	104.3	80-120
Water	CRM	Vanadium (V)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.498	0.500	mg/L	99.7	80-120
Water	CRM	Zinc (Zn)-Dissolved	WG1404759-4	VA-HIGH-WATRM	0.482	0.500	mg/L	96.3	80-120
Water	MB	Aluminum (Al)-Dissolved	WG1404759-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Antimony (Sb)-Dissolved	WG1404759-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Arsenic (As)-Dissolved	WG1404759-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Barium (Ba)-Dissolved	WG1404759-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Beryllium (Be)-Dissolved	WG1404759-1		<0.0050	<0.005	mg/L	-	0.005
Water	MB	Bismuth (Bi)-Dissolved	WG1404759-1		<0.20	<0.2	mg/L	-	0.2
Water	MB	Boron (B)-Dissolved	WG1404759-1		<0.10	<0.1	mg/L	-	0.1
Water	MB	Cadmium (Cd)-Dissolved	WG1404759-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Calcium (Ca)-Dissolved	WG1404759-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Chromium (Cr)-Dissolved	WG1404759-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Cobalt (Co)-Dissolved	WG1404759-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Copper (Cu)-Dissolved	WG1404759-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Iron (Fe)-Dissolved	WG1404759-1		<0.030	<0.03	mg/L	-	0.03
Water	MB	Lead (Pb)-Dissolved	WG1404759-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Lithium (Li)-Dissolved	WG1404759-1		<0.010	<0.01	mg/L	-	0.01
Water	MB	Magnesium (Mg)-Dissolved	WG1404759-1		<0.10	<0.1	mg/L	-	0.1
Water	MB	Manganese (Mn)-Dissolved	WG1404759-1		<0.0050	<0.005	mg/L	-	0.005
Water	MB	Molybdenum (Mo)-Dissolved	WG1404759-1		<0.030	<0.03	mg/L	-	0.03
Water	MB	Nickel (Ni)-Dissolved	WG1404759-1		<0.050	<0.05	mg/L	-	0.05
Water	MB	Phosphorus (P)-Dissolved	WG1404759-1		<0.30	<0.3	mg/L	-	0.3

Water	MB	Potassium (K)-Dissolved	WG1404759-1	<2.0	<2	mg/L	-	2
Water	MB	Selenium (Se)-Dissolved	WG1404759-1	<0.20	<0.2	mg/L	-	0.2
Water	MB	Silicon (Si)-Dissolved	WG1404759-1	<0.050	<0.05	mg/L	-	0.05
Water	MB	Silver (Ag)-Dissolved	WG1404759-1	<0.010	<0.01	mg/L	-	0.01
Water	MB	Sodium (Na)-Dissolved	WG1404759-1	<2.0	<2	mg/L	-	2
Water	MB	Strontium (Sr)-Dissolved	WG1404759-1	<0.0050	<0.005	mg/L	-	0.005
Water	MB	Thallium (Tl)-Dissolved	WG1404759-1	<0.20	<0.2	mg/L	-	0.2
Water	MB	Tin (Sn)-Dissolved	WG1404759-1	<0.030	<0.03	mg/L	-	0.03
Water	MB	Titanium (Ti)-Dissolved	WG1404759-1	<0.010	<0.01	mg/L	-	0.01
Water	MB	Vanadium (V)-Dissolved	WG1404759-1	<0.030	<0.03	mg/L	-	0.03
Water	MB	Zinc (Zn)-Dissolved	WG1404759-1	<0.0050	<0.005	mg/L	-	0.005
Water	MB	Aluminum (Al)-Dissolved	WG1404759-5	<0.20	<0.2	mg/L	-	0.2
Water	MB	Antimony (Sb)-Dissolved	WG1404759-5	<0.20	<0.2	mg/L	-	0.2
Water	MB	Arsenic (As)-Dissolved	WG1404759-5	<0.20	<0.2	mg/L	-	0.2
Water	MB	Barium (Ba)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Beryllium (Be)-Dissolved	WG1404759-5	<0.0050	<0.005	mg/L	-	0.005
Water	MB	Bismuth (Bi)-Dissolved	WG1404759-5	<0.20	<0.2	mg/L	-	0.2
Water	MB	Boron (B)-Dissolved	WG1404759-5	<0.10	<0.1	mg/L	-	0.1
Water	MB	Cadmium (Cd)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Calcium (Ca)-Dissolved	WG1404759-5	<0.050	<0.05	mg/L	-	0.05
Water	MB	Chromium (Cr)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Cobalt (Co)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Copper (Cu)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Iron (Fe)-Dissolved	WG1404759-5	<0.030	<0.03	mg/L	-	0.03
Water	MB	Lead (Pb)-Dissolved	WG1404759-5	<0.050	<0.05	mg/L	-	0.05
Water	MB	Lithium (Li)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Magnesium (Mg)-Dissolved	WG1404759-5	<0.10	<0.1	mg/L	-	0.1
Water	MB	Manganese (Mn)-Dissolved	WG1404759-5	<0.0050	<0.005	mg/L	-	0.005
Water	MB	Molybdenum (Mo)-Dissolved	WG1404759-5	<0.030	<0.03	mg/L	-	0.03
Water	MB	Nickel (Ni)-Dissolved	WG1404759-5	<0.050	<0.05	mg/L	-	0.05
Water	MB	Phosphorus (P)-Dissolved	WG1404759-5	<0.30	<0.3	mg/L	-	0.3
Water	MB	Potassium (K)-Dissolved	WG1404759-5	<2.0	<2	mg/L	-	2
Water	MB	Selenium (Se)-Dissolved	WG1404759-5	<0.20	<0.2	mg/L	-	0.2
Water	MB	Silicon (Si)-Dissolved	WG1404759-5	<0.050	<0.05	mg/L	-	0.05
Water	MB	Silver (Ag)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Sodium (Na)-Dissolved	WG1404759-5	<2.0	<2	mg/L	-	2
Water	MB	Strontium (Sr)-Dissolved	WG1404759-5	<0.0050	<0.005	mg/L	-	0.005
Water	MB	Thallium (Tl)-Dissolved	WG1404759-5	<0.20	<0.2	mg/L	-	0.2
Water	MB	Tin (Sn)-Dissolved	WG1404759-5	<0.030	<0.03	mg/L	-	0.03
Water	MB	Titanium (Ti)-Dissolved	WG1404759-5	<0.010	<0.01	mg/L	-	0.01
Water	MB	Vanadium (V)-Dissolved	WG1404759-5	<0.030	<0.03	mg/L	-	0.03
Water	MB	Zinc (Zn)-Dissolved	WG1404759-5	<0.0050	<0.005	mg/L	-	0.005

Aggregate Organics

Water	LCS	BOD	WG1404668-2	203	198	mg/L	102.6	85-115
Water	LCS	BOD	WG1404668-5	209	198	mg/L	105.7	85-115

Water	LCS	COD	WG1407148-2	757	750	mg/L	100.9	85-115
Water	LCS	COD	WG1407148-5	748	750	mg/L	99.7	85-115
Water	LCS	COD	WG1407148-8	750	750	mg/L	99.98	85-115
Water	LCS	Oil and Grease	WG1408168-2	84.6	100	mg/L	84.6	70-130
Water	MB	BOD	WG1404668-1	<5.0	<5	mg/L	-	5
Water	MB	BOD	WG1404668-4	<5.0	<5	mg/L	-	5
Water	MB	COD	WG1407148-1	<20	<20	mg/L	-	20
Water	MB	COD	WG1407148-4	<20	<20	mg/L	-	20
Water	MB	COD	WG1407148-7	<20	<20	mg/L	-	20
Water	MB	Oil and Grease	WG1408168-1	<5.0	<5	mg/L	-	5

Project

Report To

ALS File No.

Date Received

Date

Andrew Mullen, KINDER MORGAN CANADA TERMINALS LTD

L1095263

13-Dec-11 14:51

23-Dec-11

Hold Time Exceedances

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Manual Meter	5	13-DEC-11 10:30	14-DEC-11 00:12	0.25	14	hours	EHTR-FM
	14	13-DEC-11 11:30	14-DEC-11 00:12	0.25	13	hours	EHTR-FM

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.

Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

QUALIFIER	DESCRIPTION
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Page 202 to/à Page 210

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Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

Page ____ of ____

Report To			Report Format / Distribution			Service Request: (Rush subject to availability - Contact ALS to confirm TAT)											
Company: <u>NANCUEN WAANES KINCA MOUNT</u>			Standard: _____ Other (specify): _____			Regular (Standard Turnaround Times - Business Days)											
Contact: <u>KIM SCHIRN</u>			Select: PDF Excel Digital Fax			Priority (2-4 Business Days) - 50% surcharge - Contact ALS to confirm TAT											
Address: <u>1995 W. FIRST ST.</u>			Email 1: _____			Emergency (1-2 Business Days) - 100% Surcharge - Contact ALS to confirm TAT											
<u>NUNTA UNW.</u>			Email 2: _____			Same Day or Weekend Emergency - Contact ALS to confirm TAT											
Phone: <u>985 3177</u> Fax: _____						Analysis Request											
Invoice To Same as Report? (circle) Yes or No (if No, provide details)			Client / Project Information			(Indicate Filtered or Preserved, F/P)											
Copy of Invoice with Report? (circle) Yes or No			Job #:														
Company:			PO / A/E:														
Contact:			LSD:														
Address:			Quote #:														
Phone: _____ Fax: _____																	
Lab Work Order # (lab use only): <u>L1095263</u>			ALS Contact: _____			Sampler: _____									Number of Containers		
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type													
5775	DISS METAL N & U. (O.F. 1.1)	13/Dec/11	10:30														
5776	METALS TOT (O.F. 1.1)	"	10:30														
5777	OIL & GREASE 2 SAMPLES (O.F. 1.1)	"	10:30														
5778	PARAMETERS (O.F. 1.1)	"	10:30														
5779	T.O.C. (O.F. 1.1)	"	10:30														
5780	AMPHIA (O.F. 1.5)	"	11:30														
5781	BODS (O.F. 1.5)	"	11:30														
5782	COD (O.F. 1.5)	"	11:30														
5783	DISS METALS N & U. (O.F. 1.5)	"	11:30														
5784	METALS TOT (O.F. 1.5)	"	11:30														
5785	OIL & GREASE (O.F. 1.5)	"	11:30														
5786	PARAMETERS (O.F. 1.5)	"	11:30														
Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details																	
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.																	
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.																	
SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)										
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:							
<u>K. SCHIRN</u>	<u>13 Dec 2011</u>	<u>2:55</u>	<u>DEU</u>	<u>13 Dec 11</u>	<u>251pm</u>	<u>9.4 °C</u>											

FILE: KINDERMORGAN/1112063.RTL

DATE: 21 December 2011

TO: Mr. Andrew Mullen
Kinder Morgan Canada Terminals LP
1995 West First Street
North Vancouver, B.C.
V7P 1A8

RECEIVED
JAN 10 2012

REPORT ON: RAINBOW TROUT BIOASSAY RESULTS

SAMPLE DESCRIPTION:

IRC Sample ID No.:	1112063
Sample Name:	#5787 Outfall 1.1
Date collected:	13 December 2011
Date, time received:	13 December 2011; 1325 hrs.
Collection Method:	Grab
Amount, Container:	2 x 20 L plastic containers
Physical description:	Clear, colourless liquid
Date, time tested:	13 December 2011; 1610 hrs

RAINBOW TROUT 96 HR RESULTS:

The 96 hour (static) LC₅₀ was greater than 100% (v/v sample).
0% trout mortality in 100% concentration.

The LC₅₀ is defined as the median lethal concentration or the concentration at which there is 50% fish mortality. Results are calculated using the method described by Stephan (Methods for calculating an LC₅₀ in: Aquatic Toxicology and Hazard Evaluation, American Society for Testing and Materials, 1977).

The method used for this test was as per the IRC laboratory "Standard Operating Procedure for Rainbow Trout Holding and Testing" RTver5. This procedure was modified from the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" EPS 1/RM/13, Second Edition – December 2000. Test volume was 15 litres with 10 fish in each test vessel. Aeration was by forced air through airstones at a rate of approximately 6.5 ± 1 ml/L/min. The sample was adjusted to pH 7.5 (± 1.0) using 1N HCl and was not filtered prior to testing

The initial dissolved oxygen was 11.8 mg/L at 9.0°C, the conductivity was 2030 µS/cm and the initial pH was 9.4. After 20 minutes of aeration the pH was 9.24; as it was not 7.5 (± 1.0) the pH was adjusted to 7.5. After warming the sample to 14.5°C and pre-aerating the sample for 120 minutes, the dissolved oxygen level was 10.5 mg/L. Although the dissolved oxygen level was greater than 100% saturation, the maximum aeration time had been reached and so the test was initiated at this time. The test set up technicians were TS, DL and DB.

Please call should you have any questions.

IRC Integrated Resource Consultants Inc.

Ditty Chacko
Laboratory Biologist
b008.1
enclosure

Ditty Chacko

TEST FISH STOCK INFORMATION

Date received:	8 November 2011	
Source:	Miracle Springs Trout Hatchery	
Species:	<i>Oncorhynchus mykiss</i> (Rainbow Trout)	
Fork Length:	Mean:	36.6 mm \pm 3.1 mm
	Range:	32.0 mm – 41.0 mm
Wet weight:	Mean:	0.48 g \pm 0.12 g
	Range:	0.32 – 0.68 g
Condition Factor (100xWt/length ³ cm):	0.98	

Acclimation History	
Acclimation temperature:	14.0 to 15.0°C CELSIUS
Treatments:	None
Water:	Dechlorinated tap water
Feeding:	Nutra 2000 fry feed
Mortality:	0.50%

RAINBOW TROUT REFERENCE TOXICANT DATA

Stock Arrival Date (y/m/d)	Test Date (y/m/d)	Toxicant	LC50 (mg/L)	95% Confidence Interval
10.04.21	10.05.07	Phenol	10.94	8.00 to 12.00
10.05.23	10.06.02	"	10.44	8.00 to 12.00
10.06.03	10.06.24	"	10.56	8.00 to 12.00
10.07.15	10.07.29	"	11.40	8.00 to 12.00
10.07.21	10.08.09	"	9.39	8.00 to 12.00
10.08.25	10.09.20	"	8.02	6.472 to 9.634
10.10.06	10.10.19	"	9.80	8.00 to 12.00
10.11.10	10.11.23	"	13.55	7.33 to 14.20
10.11.17	10.11.23	"	13.55	7.33 to 14.20
10.12.01	11.01.06	"	10.23	8.00 to 12.00
11.01.12	11.01.31	"	11.52	10.16 to 13.07
11.02.02	11.02.28	"	10.94	8.00 to 12.00
11.02.23	11.03.21	"	13.01	11.57 to 14.64
11.03.30	11.04.18	"	13.16	12.00 to 18.00
11.04.13	11.05.04	"	12.50	11.02 to 14.17
11.04.29	11.05.17	"	10.23	8.00 to 12.00
11.05.25	11.06.07	"	11.52	10.16 to 13.07
11.06.15	11.07.05	"	12.00	10.56 to 13.64
11.06.30	11.07.20	"	9.94	7.65 to 11.49
11.07.13	11.07.29	"	15.31	13.00 to 18.02
11.07.13	11.08.02	"	11.72	9.83 to 13.88
11.07.27	11.08.19	"	10.23	8.00 to 12.00
11.08.17	11.09.12	"	9.80	8.00 to 12.00
11.09.14	11.09.27	"	11.60	9.59 to 14.03
11.09.28	11.10.11	"	9.80	8.62 to 11.14
11.10.26	11.11.14	"	10.57	9.13 to 12.23
11.11.08	11.11.25	"	10.63	9.59 to 11.77
LAB GEOMETRIC MEAN \pm 2 standard deviations:				11.245 mg/L \pm 4.44
Warning Limits:				6.804 g/L to 15.685 mg/L

CONTROL/DILUTION WATER QUALITY:

Hardness:	16 mg/L
Total Residual Chlorine:	25 µg/L

RAW DATA:

TEST CONCENTRATION	HOURS					
		0	24	48	72	96
100%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.6	9.9	9.8	9.8	8.6
	Temperature (°C)	14.5	14.5	15.0	15.0	15.0
	pH	7.5	7.2→8.4	7.1→8.5	7.3→8.3	7.0
	Conductivity (µS/cm)	2110				2150
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.32	0.32	0.32	0.32	0.32
50%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.3	9.9	9.9	9.9	9.7
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.3	7.0→8.4	7.1→8.4	7.1→8.3	7.0
	Conductivity (µS/cm)	1104				1137
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.32	0.32	0.32	0.32	0.32
25%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.3	9.9	9.9	9.8	9.7
	Temperature (°C)	14.5	14.5	14.5	15.0	14.5
	pH	7.5	7.1	7.1	7.0	7.1
	Conductivity (µS/cm)	575				584
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.32	0.32	0.32	0.32	0.32
12.5%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.2	9.9	9.9	9.8	9.7
	Temperature (°C)	14.5	14.5	14.5	15.0	14.5
	pH	7.5	7.2	7.1	7.0	7.1
	Conductivity (µS/cm)	317				323
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.32	0.32	0.32	0.32	0.32
6.2%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.2	9.9	9.8	9.7	9.6
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.6	7.2	7.3	7.0	7.2
	Conductivity (µS/cm)	177				183
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.32	0.32	0.32	0.32	0.32
CONTROL	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.1	9.9	9.9	9.8	9.6
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.6	7.3	7.3	7.0	7.3
	Conductivity (µS/cm)	45				50
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.32	0.32	0.32	0.32	0.32
	Technician	NW	DB,DC	DB	DB	NW

KEY TO SYMPTOMS:

- 1 = no apparent effect
 2 = fish showing signs of stress
 3 = loss of equilibrium

FILE:KINDERMORGAN/1112064.RTL

DATE: 21 December 2011

TO: Mr. Andrew Mullen
Kinder Morgan Canada Terminals LP
1995 West First Street
North Vancouver, B.C.
V7P 1A8

RECEIVED
JAN 10 2012

REPORT ON: RAINBOW TROUT BIOASSAY RESULTS

SAMPLE DESCRIPTION:

IRC Sample ID No.:	1112064
Sample Name:	#5788 Outfall 1.5
Date collected:	13 December 2011
Date, time received:	13 December 2011; 1325 hrs.
Collection Method:	Grab
Amount, Container:	2 x 20 L plastic containers
Physical description:	Clear, yellow liquid
Date, time tested:	13 December 2011; 1735 hrs

RAINBOW TROUT 96 HR RESULTS:

The 96 hour (static) LC₅₀ was greater than 100% (v/v sample).
0% trout mortality in 100% concentration.

The LC₅₀ is defined as the median lethal concentration or the concentration at which there is 50% fish mortality. Results are calculated using the method described by Stephan (Methods for calculating an LC₅₀ in: Aquatic Toxicology and Hazard Evaluation, American Society for Testing and Materials, 1977).

The method used for this test was as per the IRC laboratory "Standard Operating Procedure for Rainbow Trout Holding and Testing" RTver5. This procedure was modified from the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" EPS 1/RM/13, Second Edition – December 2000. Test volume was 15 litres with 10 fish in each test vessel. Aeration was by forced air through airstones at a rate of approximately 6.5 ± 1 ml/L/min. The sample was adjusted to pH 7.5 (± 1.0) using 1N HCl and was not filtered prior to testing

The initial dissolved oxygen was 12.9 mg/L at 7.0°C, the conductivity was 4690 µS/cm and the initial pH was 9.2. After 20 minutes of aeration the pH was 9.03; as it was not 7.5 (± 1.0) the pH was adjusted to 7.2. After warming the sample to 14.5°C and pre-aerating the sample for 120 minutes, the dissolved oxygen level was 10.8 mg/L. Although the dissolved oxygen level was greater than 100% saturation, the maximum aeration time had been reached and so the test was initiated at this time. The test set up technician was TS and DB.

Please call should you have any questions.

IRC Integrated Resource Consultants Inc.

Ditty Chacko
Laboratory Biologist
b008.1
enclosure

Ditty Chacko

RAW DATA:

TEST CONCENTRATION	HOURS					
		0	24	48	72	96
100%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.8	9.8	9.7	9.8	9.6
	Temperature (°C)	14.5	14.5	15.0	15.0	15.0
	pH	7.2	7.3→8.4	7.4→8.5	7.6→8.3	7.2
	Conductivity (µS/cm)	4730				4820
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.26	0.26	0.26	0.26	0.26
50%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.5	9.9	9.8	9.8	9.3
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.1	7.2→8.4	7.4→8.4	7.4→8.5	7.1
	Conductivity (µS/cm)	2470				2550
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.26	0.26	0.26	0.26	0.26
25%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.3	9.9	9.9	9.7	9.3
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.2	7.2	7.2	7.3	7.0
	Conductivity (µS/cm)	1512				1532
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.26	0.26	0.26	0.26	0.26
12.5%	Percent Survival	100%	100%	90%	90%	90%
	Dissolved Oxygen (mg/L)	10.3	9.8	9.7	9.9	9.6
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.2	7.2	7.2	7.3	7.1
	Conductivity (µS/cm)	730				741
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.26	0.26	0.23	0.23	0.23
6.2%	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.2	10.0	9.9	9.9	9.7
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.2	7.2	7.2	7.2	7.1
	Conductivity (µS/cm)	367				374
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.26	0.26	0.26	0.26	0.26
CONTROL	Percent Survival	100%	100%	100%	100%	100%
	Dissolved Oxygen (mg/L)	10.2	10.0	9.9	9.8	9.5
	Temperature (°C)	14.5	14.5	14.5	15.0	15.0
	pH	7.1	7.3	7.2	7.2	7.1
	Conductivity (µS/cm)	45				50
	Symptoms	1	1	1	1	1
	Loading Density (g/L)	0.26	0.26	0.26	0.26	0.26
	Technician	NW	DB,DC	DB	DB	NW

KEY TO SYMPTOMS:

- 1 = no apparent effect
 2 = fish showing signs of stress
 3 = loss of equilibrium

TEST FISH STOCK INFORMATION

Date received:	8 November 2011	
Source:	Miracle Springs Trout Hatchery	
Species:	<i>Oncorhynchus mykiss</i> (Rainbow Trout)	
Fork Length:	Mean:	35.5 mm \pm 2.8 mm
	Range:	30.0 mm – 39.0 mm
Wet weight:	Mean:	0.38 g \pm 0.09 g
	Range:	0.24 – 0.51 g
Condition Factor (100xWt/length ³ cm):	0.86	

Acclimation History	
Acclimation temperature:	14.0 to 15.0°C CELSIUS
Treatments:	None
Water:	Dechlorinated tap water
Feeding:	Nutra 2000 fry feed
Mortality:	0.50%

RAINBOW TROUT REFERENCE TOXICANT DATA

Stock Arrival Date (y/m/d)	Test Date (y/m/d)	Toxicant	LC50 (mg/L)	95% Confidence Interval
10.04.21	10.05.07	Phenol	10.94	8.00 to 12.00
10.05.23	10.06.02	"	10.44	8.00 to 12.00
10.06.03	10.06.24	"	10.56	8.00 to 12.00
10.07.15	10.07.29	"	11.40	8.00 to 12.00
10.07.21	10.08.09	"	9.39	8.00 to 12.00
10.08.25	10.09.20	"	8.02	6.472 to 9.634
10.10.06	10.10.19	"	9.80	8.00 to 12.00
10.11.10	10.11.23	"	13.55	7.33 to 14.20
10.11.17	10.11.23	"	13.55	7.33 to 14.20
10.12.01	11.01.06	"	10.23	8.00 to 12.00
11.01.12	11.01.31	"	11.52	10.16 to 13.07
11.02.02	11.02.28	"	10.94	8.00 to 12.00
11.02.23	11.03.21	"	13.01	11.57 to 14.64
11.03.30	11.04.18	"	13.16	12.00 to 18.00
11.04.13	11.05.04	"	12.50	11.02 to 14.17
11.04.29	11.05.17	"	10.23	8.00 to 12.00
11.05.25	11.06.07	"	11.52	10.16 to 13.07
11.06.15	11.07.05	"	12.00	10.56 to 13.64
11.06.30	11.07.20	"	9.94	7.65 to 11.49
11.07.13	11.07.29	"	15.31	13.00 to 18.02
11.07.13	11.08.02	"	11.72	9.83 to 13.88
11.07.27	11.08.19	"	10.23	8.00 to 12.00
11.08.17	11.09.12	"	9.80	8.00 to 12.00
11.09.14	11.09.27	"	11.60	9.59 to 14.03
11.09.28	11.10.11	"	9.80	8.62 to 11.14
11.10.26	11.11.14	"	10.57	9.13 to 12.23
11.11.08	11.11.25	"	10.63	9.59 to 11.77
LAB GEOMETRIC MEAN \pm 2 standard deviations:				11.245 mg/L \pm 4.44
Warning Limits:				6.804 g/L to 15.685 mg/L.

CONTROL/DILUTION WATER QUALITY:

Hardness: 16 mg/L
 Total Residual Chlorine: 25 µg/L

Jacobsen, Jaclyn ENV:EX

From: Mullen, Andrew [Andrew.Mullen@kindermorgan.com]
Sent: Monday, January 30, 2012 11:16 AM
To: Chor, Alan ENV:EX
Cc: Lees, Karen - Vancouver Wharves
Subject: BC MoE Permit PE-01386 - Kinder Morgan Canada Terminals Limited Partnership, Vancouver Wharves - Q4 Report 2011
Attachments: Permit PE-01386, BC MoE 2011 - Q4 Report - Jan 30, 2012.pdf

Hello Alan,

Please find attached the Kinder Morgan Canada Terminals Limited Partnership, Vancouver Wharves - Fourth Quarter 2011 Effluent Report as required under Permit PE-01386. The attached file includes my letter, data summary and discharge flow graphs for the quarter for your review and records.

I will have the original hardcopy documents forwarded via courier later today. Please call if you have any questions following your review. Thank you.

Sincerely,

Andrew Mullen, P. Eng.
Director, Engineering & Environment
Kinder Morgan Canada Terminals, Limited Partnership
Vancouver Wharves Operation
1995 West First St., North Vancouver, B.C. V7P 1A8
Direct Tel: (604) 904-7225 Fax: (604) 982-7116
Email: Andrew.Mullen@kindermorgan.com

"DO THE RIGHT THING EVERY DAY"

Kinder Morgan Core Principles:

- 1) Safety will not be compromised.
- 2) Environmentally compliant and responsible operator.
- 3) Ethics and integrity.
- 4) Commitment to employees and resources.
- 5) Customer service and fiscal responsibility.
- 6) Quality focus.

January 30, 2012

File: 84P.3.2.10.12

MINISTRY OF ENVIRONMENT

Attn: Mr. Alan Chor, Sr. EPO-LMR

10470 - 152nd Street

Surrey, B.C. V3R 0Y3

VIA Courier & EMAIL: Alan.Chor@gov.bc.ca

Re: KMCT Vancouver Wharves (PE-01386) – Fourth Quarter 2011

Dear Alan:

Please find enclosed, effluent sample chemistry data, toxicity results, and daily discharge volumes for Outfalls 1.1 and 1.5 obtained during the fourth quarter of 2011. There was no flow through Outfall 1.3 as there were no emergency incidents that would require the bypass valve to be opened or the outfall activated. As requested previously, the toxicity certificates are no longer included with this submission, but hard-copies are maintained on file for reference.

KMCT Vancouver Wharves experienced no 96-h LC₅₀ bioassay failures during the quarter for either water treatment plant (WTP) and met all permit requirements with the exception of one TSS result (57 mg/L) at Outfall 1.5 that occurred on December 6th. Our investigation determined that the field instrument at the final effluent discharge chamber was measuring 38 mg/L at the time of collection which is within the permit criteria of 50 mg/L and as a result the plant was in discharge mode. Based on this discrepancy between the field and laboratory results, we had the Laboratory re-test the residual sample, as I reported via email on December 22, 2011, and the result was 51.0 mg/L. In addition to this, our WTP instrumentation contractor has confirmed that the cleaning and calibration protocols used on the meter have been completed per the normal preventive maintenance schedule. KMCT will continue to monitor the accuracy of the on-line TSS meter and verify its correlation to lab results. We also completed a second sample collection on December 13th in conjunction with the Ministry of Environment and the laboratory result for the TSS at Outfall 1.5 was 12 mg/L.

I am pleased to advise that Kinder Morgan Canada Terminals has recently installed an automated isolation valve at the Berth #4 water treatment plant final discharge chamber outfall point to provide additional protection to prevent the release of any effluent not meeting the permit allowable pH and TSS parameters. The new valve is programmed to close at any time that the plant enters recycle mode and then re-open when the effluent is suitable to discharge. This valve will ensure that no off specification effluent will exit that plant even in the event of a recycle pump failure.

If you require additional information regarding this submission, please contact me at (604) 904-7225.

Yours truly,

KINDER MORGAN CANADA TERMINALS LIMITED PARTNERSHIP
VANCOUVER WHARVES TERMINAL



Andrew Mullen, P.Eng.
Director, Engineering & Environment

Encl.

BC MoE PERMIT PE-01386
Y-T-D 2011 QUARTERLY REPORT

OUTFALL 1.1	REPORTING FREQUENCY	UNITS	PERMISSIBLE LEVEL	Q1			Q2			Q3			Q4		
				JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
Flow Rate	Cont.	m ³ /day	10,900												
Sample Date		-		4-Jan	1-Feb	1-Mar	1-Apr	3-May	1-Jun	5-Jul	3-Aug	1-Sep	6-Oct	3-Nov	6-Dec
Sample Number (Chemistry)		-		5406	5432	5458	5484	5527	5553	5573	5600	5626	5676	5702	5757
pH	Cont.	pH	8.5 - 10.5	8.98	9.15	9.12	9.2	9.2	9.48	9.24	9.53	9.58	9.14	9.3	8.8
TSS	M	mg/l	50 mg/l	17.3	8	27.1	15	15.3	13.3	12.3	12.7	17.3	27.7	22.7	40
Copper Cu - Total	M	mg/l		0.417	0.123	0.388	0.213	0.107	0.322	0.152	0.26	0.333	0.553	0.422	0.612
- Dissolved - Un	M	mg/l	0.3mg/l	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	0.016	<0.010	<0.010
- Dissolved - N	M	mg/l		<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	0.026	0.012	0.014	<0.010	0.032
Iron Fe - Total	M	mg/l		2.43	0.954	3.04	2.01	1.25	1.92	1.06	1.7	2.27	3.48	3.06	4.1
- Dissolved - Un	M	mg/l	1.0mg/l	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.049
- Dissolved - N	M	mg/l		<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead Pb - Total	M	mg/l		0.262	0.106	0.419	0.308	0.183	0.247	0.124	0.181	0.203	0.269	0.218	0.295
- Dissolved - Un	M	mg/l	0.2mg/l	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
- Dissolved - N	M	mg/l		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Zinc Zn - Total	M	mg/l		1.12	0.805	3.23	1.71	1.02	1.79	0.797	1.12	1.37	1.94	1.57	1.88
- Dissolved - Un	M	mg/l	1.0mg/l	0.0193	0.036	0.0801	0.0465	0.0226	0.0292	0.0223	0.03	0.0381	0.0218	0.0143	0.0243
- Dissolved - N	M	mg/l		0.0211	0.0389	0.0578	0.107	0.115	0.0294	0.0318	0.18	0.121	0.0188	0.0215	0.266
Nickel Ni - Total	M	mg/l		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
- Dissolved - Un	M	mg/l		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
- Dissolved - N	M	mg/l		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium Cd - Total	-	mg/l		<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.01
- Dissolved - Un	-	mg/l		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
- Dissolved - N	-	mg/l		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Oil and Grease	M	mg/l	10 mg/l	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Organic Carbon (TOC)	M	mg/l	10 mg/l	1.75	2.67	1.5	1.04	1.72	1.55	1.59	0.69	1.65	1.55	1.69	1.64
Sample Number (Toxicity)	LAB : IRC Labs			5422	5448	5474	5501	5535	5564	5589	5616	5642	5692	5718	5747
Toxicity 96hrLC ₅₀	Q	%	96hrLC ₅₀ ≥ 100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
Percent Surviving - Undiluted		%		100%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%

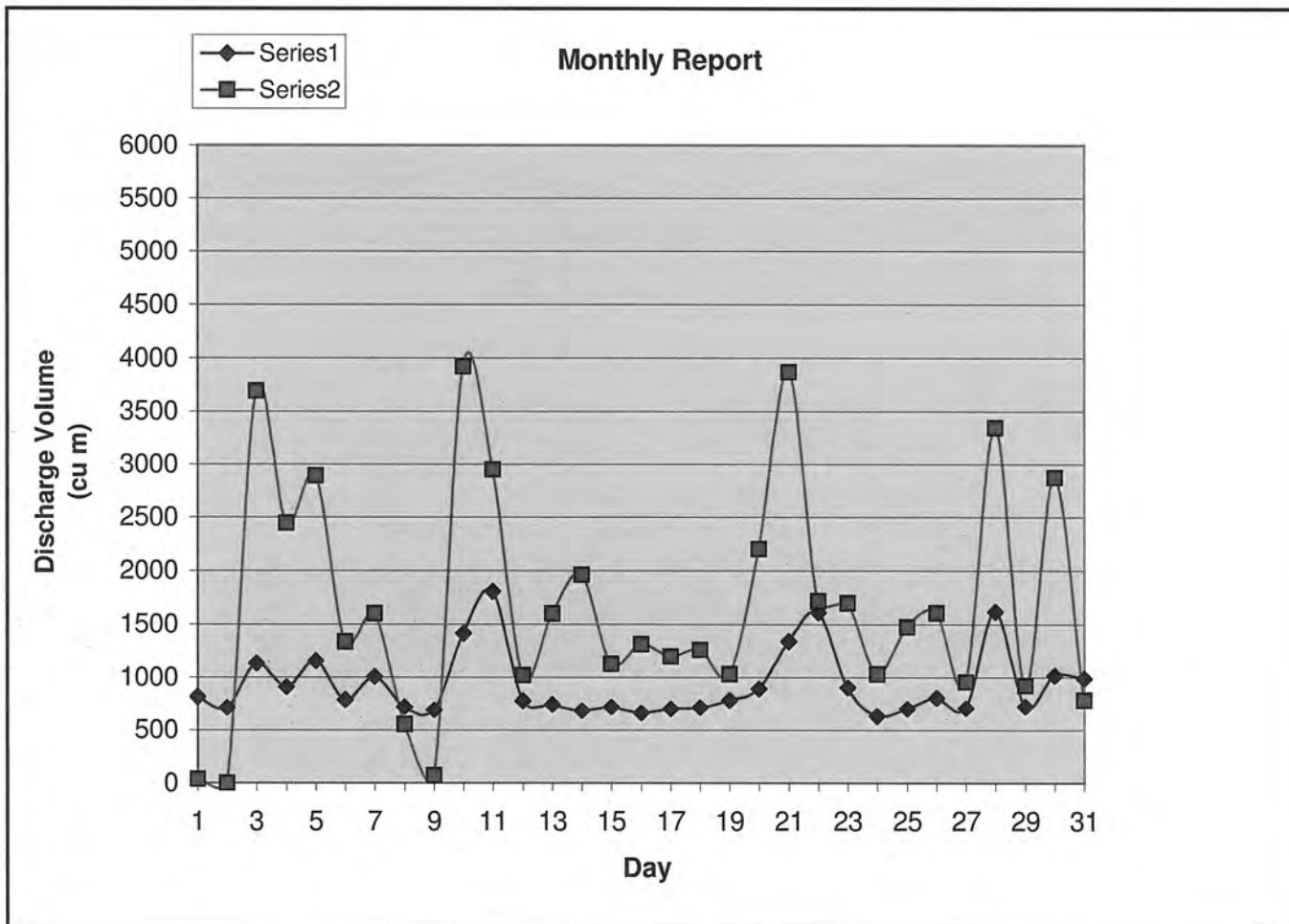
BC MoE PERMIT PE-01386
Y-T-D 2011 QUARTERLY REPORT

OUTFALL 1.5	REPORTING FREQUENCY	UNITS	PERMISSIBLE LEVEL	Q1			Q2			Q3			Q4		
				JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
Flow Rate	Cont.	m ³ /day	13,100												
Sample Date		-		4-Jan	1-Feb	1-Mar-11	1-Apr	3-May	1-Jun	5-Jul	3-Aug	1-Sep	6-Oct	3-Nov	6-Dec
Sample Number (Chemistry)		-		5421	5447	5473	5499	5534	5562	5588	5615	5641	5691	5717	5772
pH	Cont.	pH	8.5 - 10.5	9.07	8.91	8.7	8.94	9.01	8.71	8.69	8.94	9.12	8.97	9.21	8.77
TSS	M	mg/l	50 mg/l	18	10	11.8	8.3	15.3	6	17	9.3	8	23.7	6.7	57.3
Copper Cu - Total	M	mg/l		0.017	<0.020	0.032	0.029	0.027	0.026	<0.020	<0.020	0.042	<0.020	0.061	<0.020
- Dissolved - Un	M	mg/l	0.3mg/l	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	<0.020	<0.010	<0.020
- Dissolved - N	M	mg/l		<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	<0.020	<0.010	<0.020
Iron Fe - Total	M	mg/l		2.02	2.32	1.82	1.35	0.492	2.19	0.534	1.01	0.99	1.24	1.62	1.41
- Dissolved - Un	M	mg/l	1.0mg/l	<0.030	<0.030	<0.060	<0.030	<0.030	<0.030	<0.060	<0.060	<0.060	<0.060	<0.030	<0.060
- Dissolved - N	M	mg/l		<0.030	<0.030	<0.060	<0.030	<0.030	<0.030	<0.060	<0.060	<0.060	<0.060	<0.030	<0.060
Lead Pb - Total	M	mg/l		<0.050	<0.10	<0.10	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
- Dissolved - Un	M	mg/l	0.2mg/l	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
- Dissolved - N	M	mg/l		<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
Zinc Zn - Total	M	mg/l		0.0458	0.057	0.122	0.13	0.104	0.0871	0.08	0.063	0.235	0.059	0.22	0.049
- Dissolved - Un	M	mg/l	1.0mg/l	<0.0050	<0.0050	<0.010	0.0142	<0.0050	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010
- Dissolved - N	M	mg/l		<0.0050	<0.0050	<0.010	0.0102	<0.0050	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010
Nickel Ni - Total	M	mg/l		<0.050	<0.10	<0.10	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
- Dissolved - Un	M	mg/l		<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
- Dissolved - N	M	mg/l		<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.10	<0.10	<0.10	<0.10	<0.050	<0.10
Cadmium Cd - Total	-	mg/l		<0.010	<0.020	<0.020	<0.010	<0.010	<0.060	<0.020	<0.020	<0.020	<0.020	<0.010	<0.020
- Dissolved - Un	-	mg/l		<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	<0.020	<0.010	<0.020
- Dissolved - N	-	mg/l		<0.010	<0.010	<0.020	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	<0.020	<0.010	<0.020
Oil and Grease	N/A	-		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Phosphate Phosphorus	S	mg/l		0.0205	0.0537	0.0248	0.0299	0.0165	0.0263	0.0192	0.0142	0.0171	0.0115	0.0439	0.0198
Sample Number (Toxicity)	LAB : IRC Labs			5423	5449	5475	5500	5536	5563	5590	5617	5643	5693	5719	5748
Toxicity 96hrLC ₅₀	S	%	96hrLC ₅₀ ≥ 100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
Percent Surviving - Undiluted		%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

(m³/d)

Month & Year Oct-2011
OF 1.1 OF 1.5

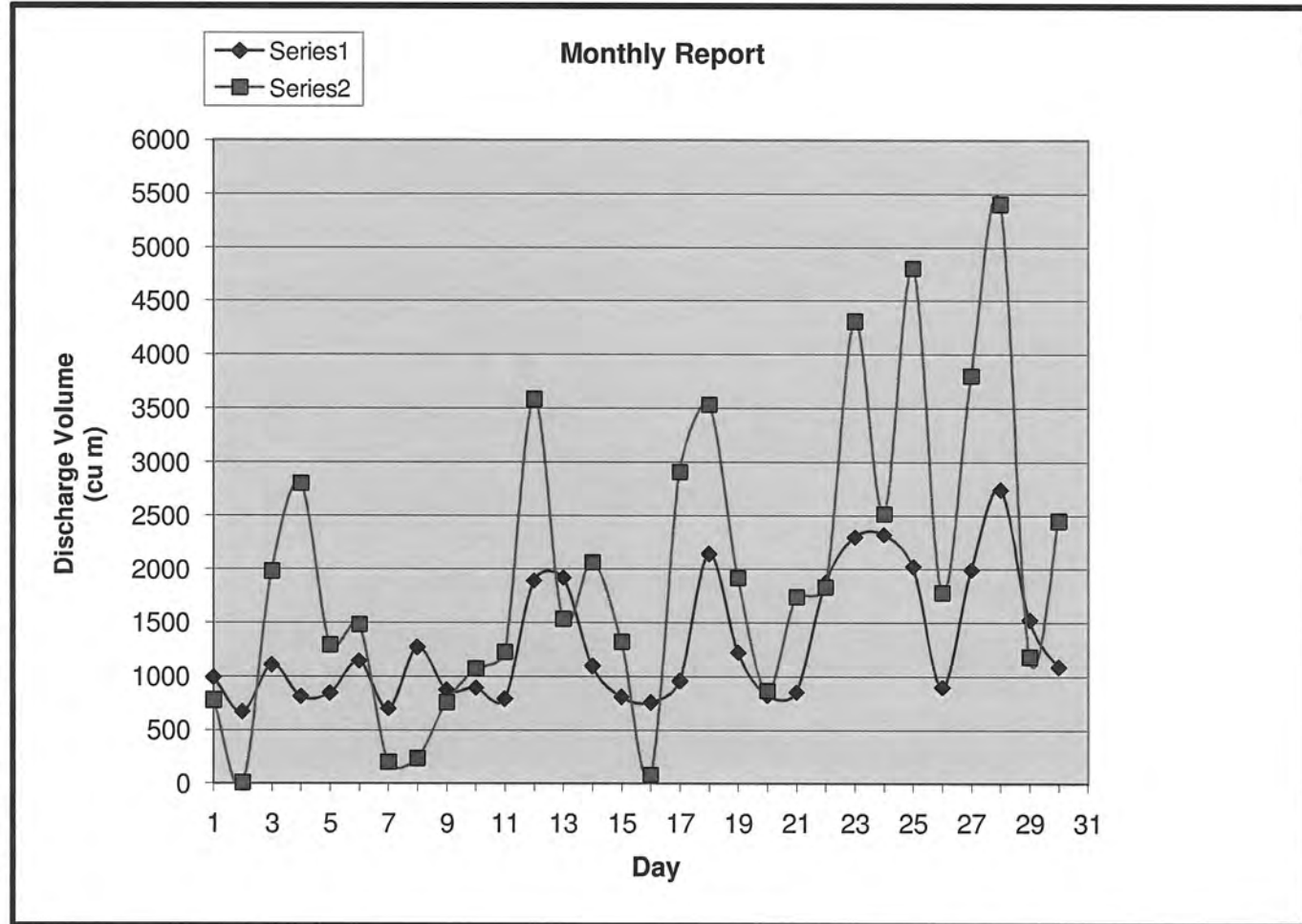
DateTime	Berth 1	Berth 4
Sat-Oct-01	818	37
Sun-Oct-02	710	0
Mon-Oct-03	1135	3687
Tue-Oct-04	909	2444
Wed-Oct-05	1153	2893
Thu-Oct-06	789	1333
Fri-Oct-07	1004	1595
Sat-Oct-08	717	552
Sun-Oct-09	689	68
Mon-Oct-10	1413	3922
Tue-Oct-11	1807	2949
Wed-Oct-12	774	1016
Thu-Oct-13	744	1599
Fri-Oct-14	682	1962
Sat-Oct-15	721	1124
Sun-Oct-16	659	1312
Mon-Oct-17	700	1197
Tue-Oct-18	714	1257
Wed-Oct-19	784	1026
Thu-Oct-20	892	2204
Fri-Oct-21	1340	3870
Sat-Oct-22	1612	1715
Sun-Oct-23	903	1697
Mon-Oct-24	633	1026
Tue-Oct-25	700	1472
Wed-Oct-26	806	1604
Thu-Oct-27	708	955
Fri-Oct-28	1617	3342
Sat-Oct-29	725	917
Sun-Oct-30	1016	2874
Mon-Oct-31	988	779



(m³/d)

Month & Year Nov-2011

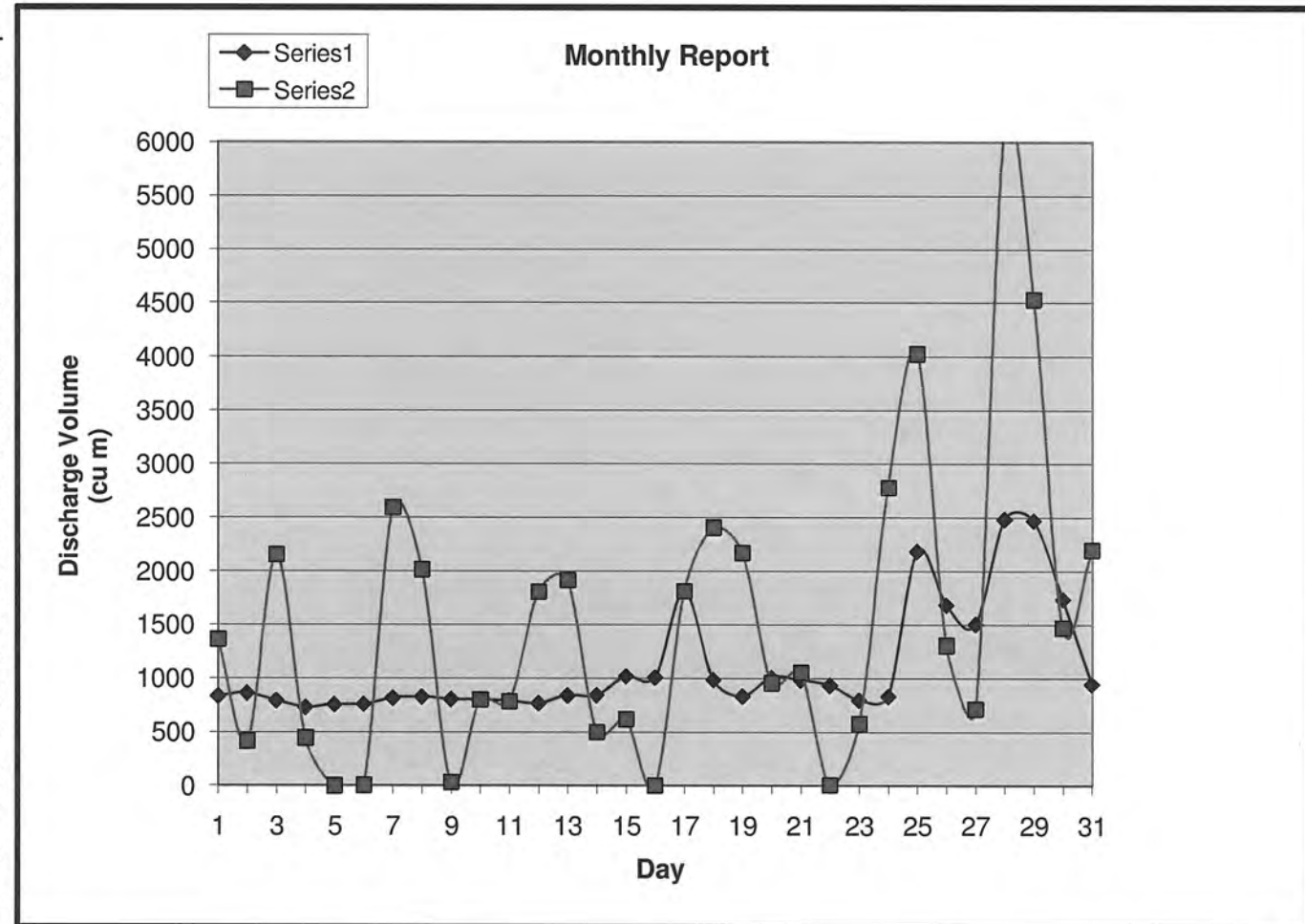
DateTime	OF 1.1 Berth 1	OF 1.5 Berth 4
Tue-Nov-01	988	779
Wed-Nov-02	667	9
Thu-Nov-03	1105	1980
Fri-Nov-04	813	2800
Sat-Nov-05	843	1294
Sun-Nov-06	1140	1480
Mon-Nov-07	698	201
Tue-Nov-08	1270	237
Wed-Nov-09	872	757
Thu-Nov-10	892	1072
Fri-Nov-11	789	1227
Sat-Nov-12	1887	3584
Sun-Nov-13	1915	1533
Mon-Nov-14	1094	2063
Tue-Nov-15	808	1324
Wed-Nov-16	757	81
Thu-Nov-17	957	2910
Fri-Nov-18	2141	3537
Sat-Nov-19	1223	1913
Sun-Nov-20	824	866
Mon-Nov-21	853	1738
Tue-Nov-22	1873	1827
Wed-Nov-23	2296	4312
Thu-Nov-24	2322	2518
Fri-Nov-25	2022	4804
Sat-Nov-26	898	1778
Sun-Nov-27	1991	3803
Mon-Nov-28	2744	5404
Tue-Nov-29	1522	1183
Wed-Nov-30	1087	2452



(m³ / d)

Month & Year Dec-2011
OF 1.1 OF 1.5

DateTime	Berth 1	Berth 4
Thu-Dec-01	834	1361
Fri-Dec-02	860	415
Sat-Dec-03	790	2152
Sun-Dec-04	728	443
Mon-Dec-05	755	0
Tue-Dec-06	757	6
Wed-Dec-07	815	2592
Thu-Dec-08	825	2014
Fri-Dec-09	804	29
Sat-Dec-10	799	799
Sun-Dec-11	790	784
Mon-Dec-12	767	1805
Tue-Dec-13	839	1912
Wed-Dec-14	841	498
Thu-Dec-15	1018	619
Fri-Dec-16	1007	2
Sat-Dec-17	1812	1813
Sun-Dec-18	986	2406
Mon-Dec-19	833	2168
Tue-Dec-20	1008	955
Wed-Dec-21	983	1056
Thu-Dec-22	934	8
Fri-Dec-23	797	574
Sat-Dec-24	831	2777
Sun-Dec-25	2183	4027
Mon-Dec-26	1682	1308
Tue-Dec-27	1504	712
Wed-Dec-28	2480	6121
Thu-Dec-29	2468	4533
Fri-Dec-30	1736	1472
Sat-Dec-31	944	2197



Chor, Alan ENV:EX

From: Mullen, Andrew [Andrew.Mullen@kindermorgan.com]
Sent: Thursday, March 15, 2012 2:36 PM
To: Chor, Alan ENV:EX
Cc: Schira, Kim; 'Andre Langlais'
Subject: PE 01386 - OF 1.5 - KMCT Vancouver Wharves Berth #4 WTP - March 5, 2011 sample TSS Exceedence of Permit Criteria

Hello Alan,

On March 5th, 2012 KMCT Vancouver Wharves collected an effluent sample at the Berth #4 water treatment plant (PE 01386 – OF 1.5) as part of the monthly monitoring. Today we received the analytical chemistry results from ALS Laboratories and the TSS result for the sample was 60.0 which is greater than the permit maximum allowable discharge condition of 50. The TSS reading on the field instrument at the time of sample collection was 44. I will be contacting the laboratory this afternoon to retest and will let you know if anything is adjusted following their QA/QC review.

The TSS at the Berth #4 water treatment plant is currently 25 but given the offset/discrepancy between the field and the laboratory instrument results we have contacted Western Control Systems, our monitoring instrumentation maintenance service provider and asked them to recalibrate the TSS meter. A technician from Western Systems will be on-site to complete this work tomorrow (March 16, 2012).

All other permit parameters of Outfall 1.5 and Outfall 1.1 were within acceptable ranges for the March 5th effluent samples.

Thank you.

Sincerely,

Andrew Mullen, P. Eng.
Director, Engineering & Environment
Kinder Morgan Canada Terminals, Limited Partnership
Vancouver Wharves Operation
1995 West First St., North Vancouver, B.C. V7P 1A8
Direct Tel: (604) 904-7225 Fax: (604) 982-7116
Email: Andrew.Mullen@kindermorgan.com

"DO THE RIGHT THING EVERY DAY"

Kinder Morgan Core Principles:

- 1) Safety will not be compromised.
- 2) Environmentally compliant and responsible operator.
- 3) Ethics and integrity.
- 4) Commitment to employees and resources.
- 5) Customer service and fiscal responsibility.
- 6) Quality focus.

Stuart M. Craig dba SMC Consulting

*1582 Lawrence Avenue, Penticton BC V2A 3C1
Phone/Fax: (250) 492-6193 Cell: (250) 770-0476
e-mail: SMCConsulting@shaw.ca
Stuart M. Craig, B.Sc., M.Sc., P.Ag.*

April 12, 2012

Ministry of Environment
102 Industrial Place
Penticton BC V2A 7C8

Attention: Jerry Vakenti, P.Ag., Senior Pesticide Officer

Re: **Kinder Morgan Canada (KMC) Notice of Intent to Treat Under PMP 827-0002-2011/2016**

Dear Jerry Vakenti:

As agent for KMC, please accept this as their 2012 Notice of Intent to Treat (NIT).

Name and Business Location of Confirmation Holder

Kinder Morgan Canada
7815 Shellmont Street
Burnaby BC V5A 4S9

Description of Proposed Treatment Areas

Proposed treatment areas may include all KMC pipeline rights-of-way within British Columbia and associated facilities and access roads. A list of KMC facilities and their locations is appended to document. An overview map of the KMC pipeline systems in BC is appended to this report. Detailed maps are available upon request.

Description of Proposed Treatments

Proposed treatments are for the control of problem vegetation growing within KMC facilities and pipeline right-of-way and their access roads. This problem vegetation must be controlled for reasons of safety and fire control, as well as to ensure pipeline or facility site security. Vegetation includes herbaceous grasses, broadleaf species, woody tree and shrub species, and noxious weeds and invasive plants. Treatments will be conducted on or after **May 3, 2012**. Precise scheduling will be determined following monitoring programs.

Pesticides Proposed for Use and their Method of Application

The pesticide active ingredients are proposed for use include: **aminopyralid, chlorsulfuron, clopyralid, dicamba, diuron, flumioxazin, glyphosate, imazapyr, metsulfuron-methyl, picloram, triclopyr, and 2,4-D Amine.**

The following application methods are proposed for use include **cut surface, basal bark, wick/wipe-on, foliar and soil applications**. Application equipment includes **backpack, power nose and nozzle (handgun), wick/wipe-on applicator, squirt bottle and boom sprayer**.

Total Area of Treatment

Total treatment area to be treated with herbicides is estimated to be a maximum of 300 hectares. Required usage has historically been significantly less than this.

Please advise the undersigned if further information is required with respect to this NIT.

Yours truly,

Stuart M. Craig, P.Ag.
SMC Consulting
Agent for KMC

cc: Lisa May, KMC

List of KMC Facility Names, Locations and Facility Types

Facility Name	Facility Location	Facility Type
Jet Fuel	On Grauer Bypass Road, Vancouver Airport	Terminal
Westridge	On the south shore of Burrard Inlet in Burnaby	Terminal
Burnaby	North of Shellmont Street in Burnaby	Terminal, Tank Farm and Maintenance Facility
Port Kells	On the 9400 Block of 189 th Street, Langley	Pump Station
Port Kells	18877 86 th Avenue Langley	Valve Station
Sumas	Off Whatcom Road, Sumas	Valve Station
Sumas	East side of McDermott Road, Sumas	Pump Station
Sumas	On Upper Sumas Mountain Road, Sumas	Tank Farm
Wahleach	On the south side of Bridal Falls Road, 0.5 km west of Trans Canada Highway exit 141	Pump Station
Hope	Between 6 th and 7 th Avenues, south of the Old Hope-Princeton Highway, Hope	Tank Farm and Maintenance Facility
Kingsvale	East side of Coldwater Road, 27 km south of Merritt	Pump Station
Stump Lake	4 km west off Highway 5A (Old Kamloops/Merritt Highway)	Pump Station
Petrocan	North side of Tranquille Road at the Kamloops Airport	Takeoff
Kamloops	2355 Trans Canada Highway, Kamloops	Tank Farm and Maintenance Facility
Darfield	East side of Highway 5, 29 km north of Barriere	Pump Station
Blackpool	East side of Highway 5, south of the community of Blackpool	Pump Station
McMurphy	North side of Highway 5, 17 km south of Avola	Pump Station
Finn	East side of Highway 5, 16 km north of Avola	Pump Station
Blue	East side of Highway 5, in Blue River	Pump Station and Maintenance Facility
Chappel	East side of Highway 5, 20.2 km north of Blue River	Pump Station
Albreda	East side of Highway 5, in the community of Albreda	Pump Station
Rearguard	North of Valemount on Highway 5	Pump Station