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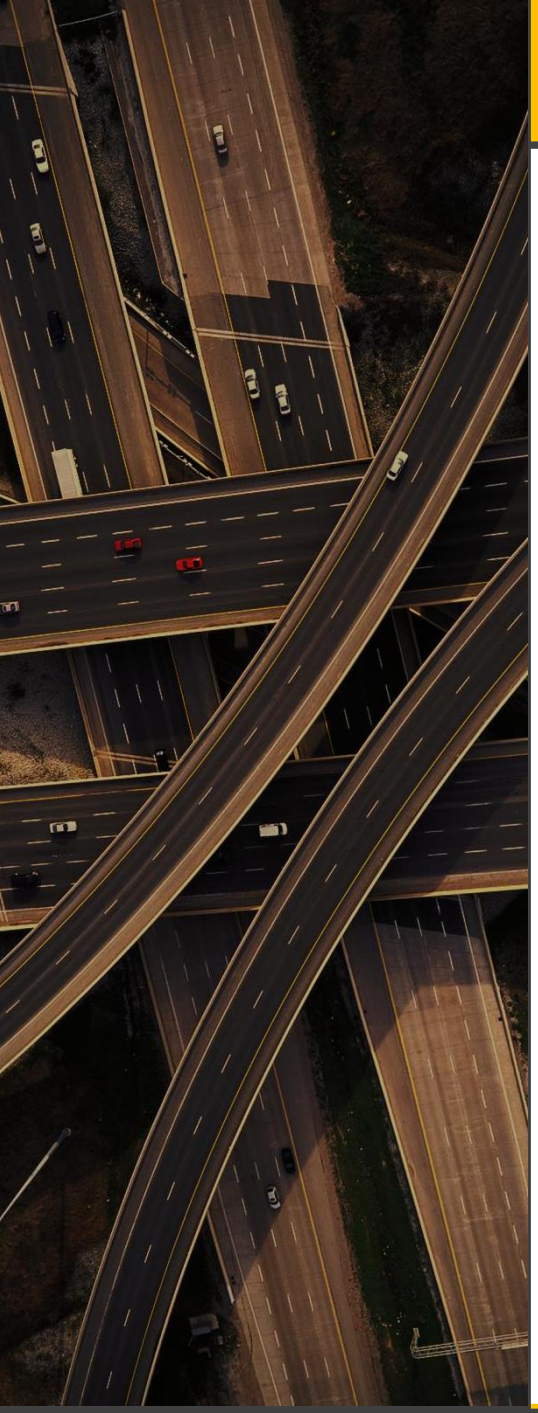


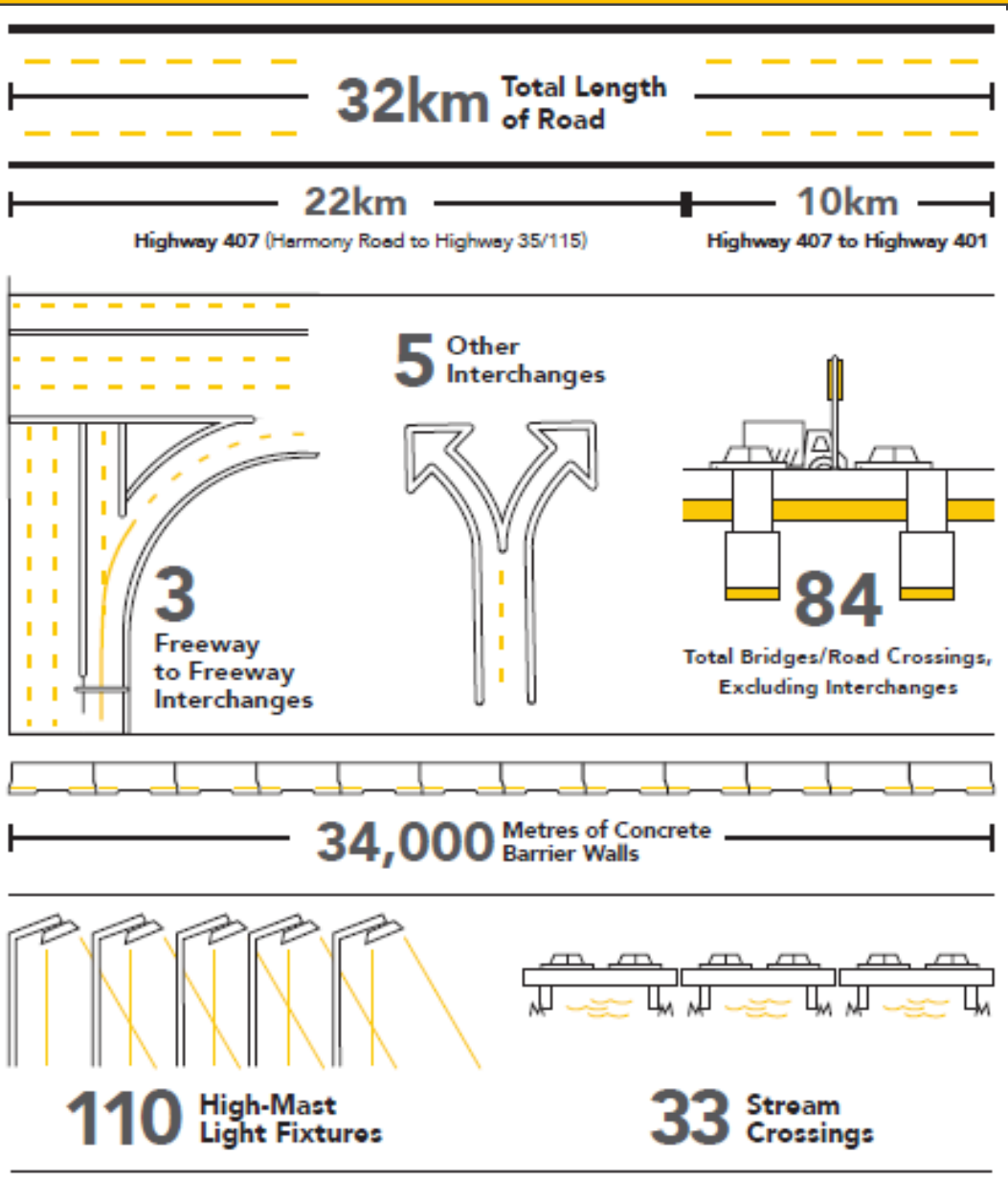
blackbird constructors 407 GP

Highway Construction Environmental Best Management Practices and Lessons Learned

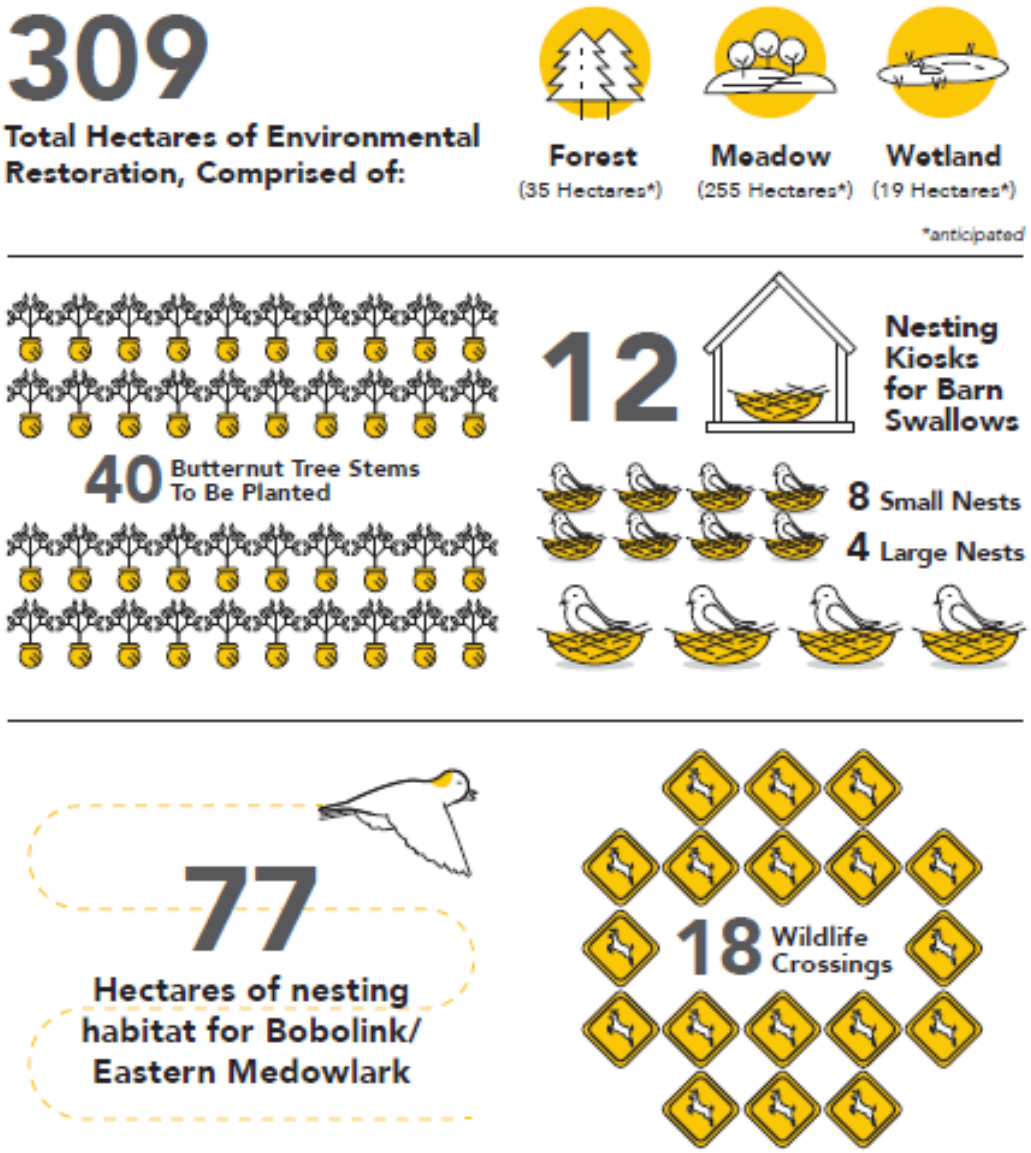
OUTLINE

1. Project Overview
2. Erosion and Sediment Control Planning
3. Collaboration, Communication, and Inspections
4. Training and Awareness
5. Drainage and Stormwater Management
6. Temporary Bridges
7. Winter Preparation
8. Questions

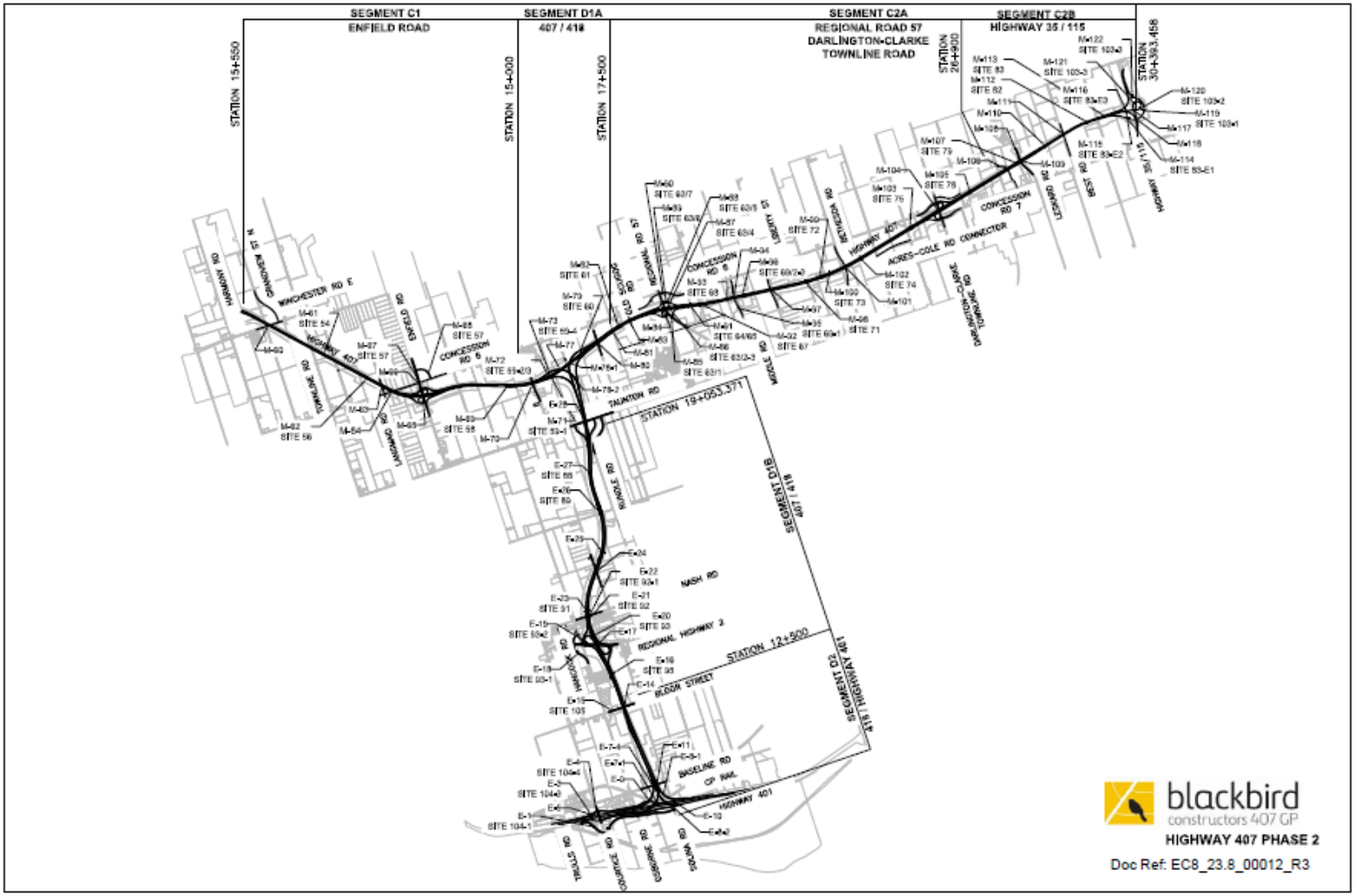
Project Overview



Project Overview



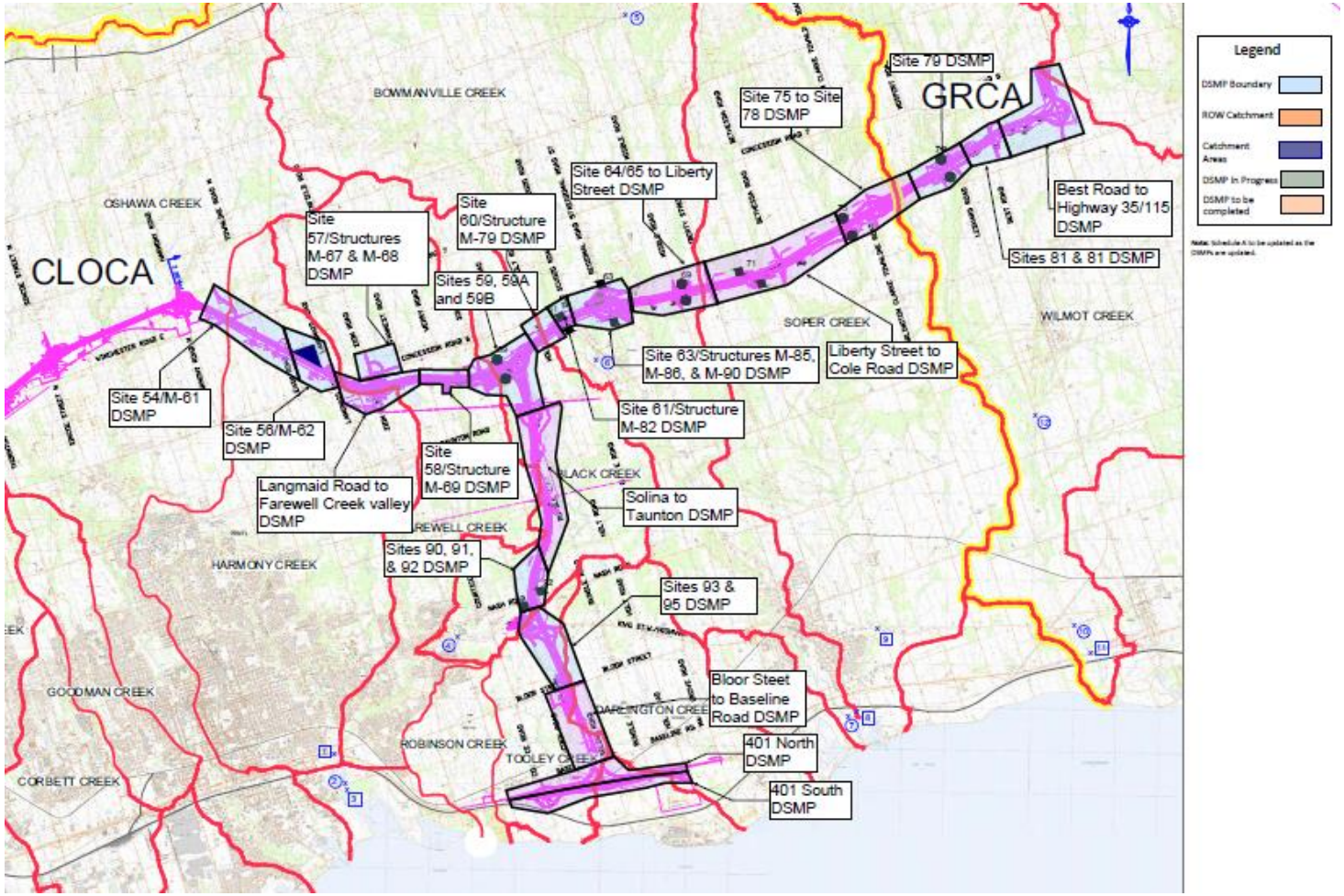
Project Overview



EROSION AND SEDIMENT CONTROL PLANNING

ESCP/DSMP's

- ESCP's: Specific to structures over watercourses.
- DSMP's: All other earthworks.
- Currently broken into 40 documents that are updated every four months.



ESCP/DSMP's

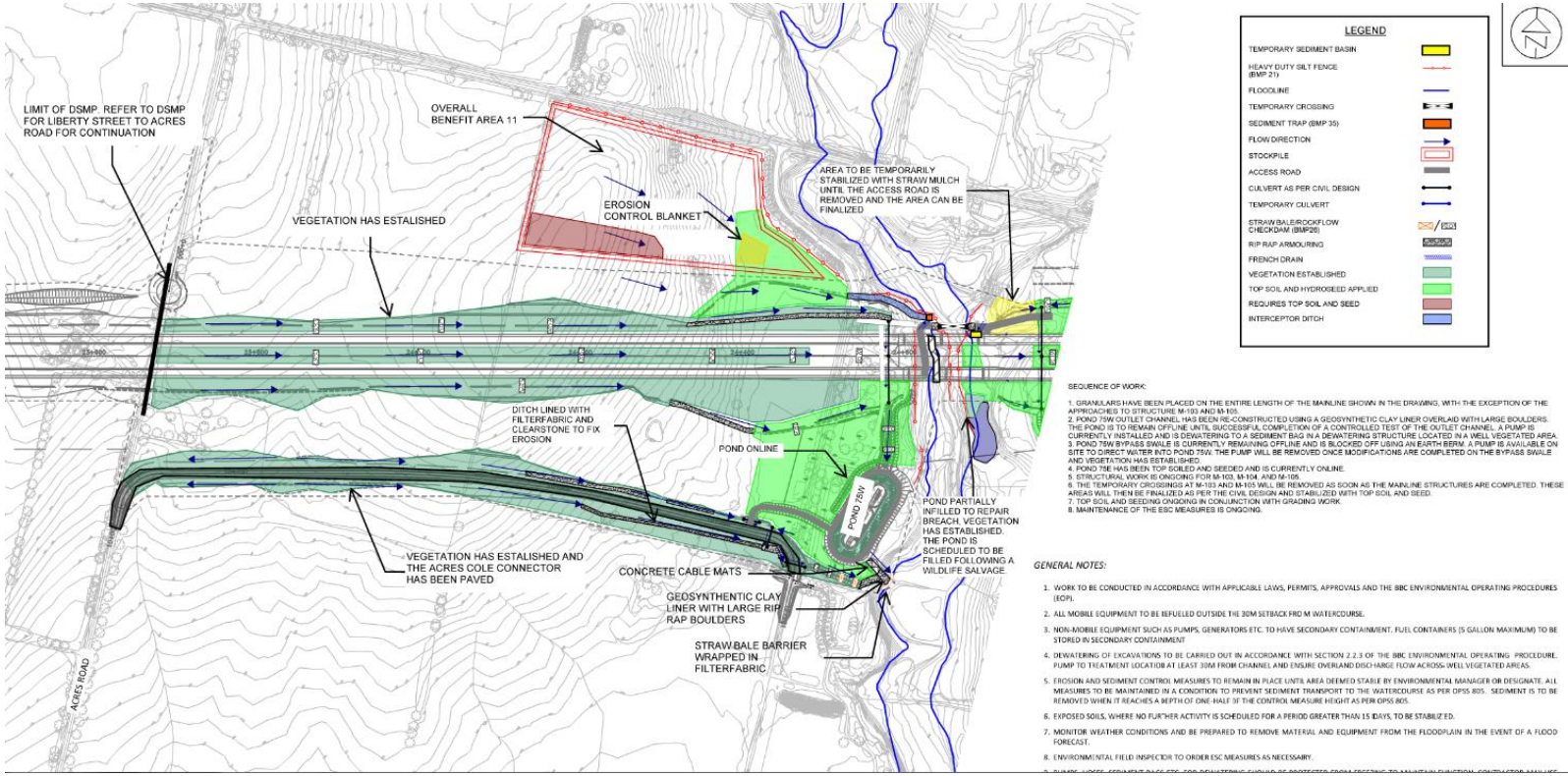
PURPOSE

- To minimize erosion potential using planning and procedures to implement proper stormwater management practices.
- To identify erosion control measures to implement to prevent the mobilization of sediment; and
- To identify sediment control measures to prevent off-site sediment releases into adjacent properties and watercourses in the event of sediment mobilization;

VALUE

- Identify ESC objectives before construction.
- Encourage stormwater management planning and ESC implementation by identifying potential impacts and mitigation measures.
- Provide a mechanism for clear communication to subcontractors.
- Define performance expectations and water quality targets.
- Provide confidence that we are practicing due diligence.

ESCP/DSMP's


LIMIT OF DSMP. REFER TO DSMP FOR LIBERTY STREET TO ACRES ROAD FOR CONTINUATION
OVERALL BENEFIT AREA 11
EROSION CONTROL BLANKET
VEGETATION HAS ESTALISHED
AREA TO BE TEMPORARILY STABILIZED WITH STRAW MULCH UNTIL THE ACCESS ROAD IS REMOVED AND THE AREA CAN BE FINALIZED
DITCH LINED WITH FILTERFABRIC AND CLEARSTONE TO FIX EROSION
POND ONLINE
POND 75W
POND PARTIALLY INFILLED TO REPAIR BREACH. VEGETATION HAS ESTABLISHED. THE POND IS SCHEDULED TO BE FILLED FOLLOWING A WILDLIFE SALVAGE.
VEGETATION HAS ESTALISHED AND THE ACRES COLE CONNECTOR HAS BEEN PAVED
CONCRETE CABLE MATS
GEOSYNTHENTIC CLAY LINER WITH LARGE RIP RAP BOULDERS
STRAW BALE BARRIER WRAPPED IN FILTERFABRIC
ACRES ROAD
LEGEND
TEMPORARY SEDIMENT BASIN
HEAVY DUTY SILT FENCE (BMP 21)
FLOODLINE
TEMPORARY CROSSING
SEDIMENT TRAP (BMP 35)
FLOW DIRECTION
STOCKPILE
ACCESS ROAD
CULVERT AS PER CIVIL DESIGN
TEMPORARY CULVERT
STRAW BALE/ROCKFLOW CHECKDAM (BMP26)
RIP RAP ARMOURING
FRENCH DRAIN
VEGETATION ESTABLISHED
TOP SOIL AND HYDROSEED APPLIED
REQUIRES TOP SOIL AND SEED
INTERCEPTOR DITCH
SEQUENCE OF WORK:
1. GRANULARS HAVE BEEN PLACED ON THE ENTIRE LENGTH OF THE MAINLINE SHOWN IN THE DRAWING, WITH THE EXCEPTION OF THE APPROACHES TO STRUCTURE M-103 AND M-105.
2. POND 75W OUTLET CHANNEL HAS BEEN RE-CONSTRUCTED USING A GEOSYNTHETIC CLAY LINER OVERLAID WITH LARGE BOULDERS. THE POND IS TO REMAIN OFFLINE UNTIL SUCCESSFUL COMPLETION OF A CONTROLLED TEST OF THE OUTLET CHANNEL. A PUMP IS CURRENTLY INSTALLED AND IS DEWATERING TO A SEDIMENT BAG IN A DEWATERING STRUCTURE LOCATED IN A WELL VEGETATED AREA.
3. POND 75W BYPASS SWALE IS CURRENTLY REMAINING OFFLINE AND IS BLOCKED OFF USING AN EARTH BERM. A PUMP IS AVAILABLE ON SITE TO DIRECT WATER INTO POND 75W. THE PUMP WILL BE REMOVED ONCE MODIFICATIONS ARE COMPLETED ON THE BYPASS SWALE AND VEGETATION HAS ESTABLISHED.
4. POND 75E HAS BEEN TOP SOILED AND SEEDED AND IS CURRENTLY ONLINE.
5. STRUCTURAL WORK IS ONGOING FOR M-103, M-104, AND M-105.
6. THE TEMPORARY CROSSINGS AT M-103 AND M-105 WILL BE REMOVED AS SOON AS THE MAINLINE STRUCTURES ARE COMPLETED. THESE AREAS WILL THEN BE FINALIZED AS PER THE CIVIL DESIGN AND STABILIZED WITH TOP SOIL AND SEED.
7. TOP SOIL AND SEEDING ONGOING IN CONJUNCTION WITH GRADING WORK.
8. MAINTENANCE OF THE ESC MEASURES IS ONGOING.
GENERAL NOTES:
1. WORK TO BE CONDUCTED IN ACCORDANCE WITH APPLICABLE LAWS, PERMITS, APPROVALS AND THE BBC ENVIRONMENTAL OPERATING PROCEDURES (EOP).
2. ALL MOBILE EQUIPMENT TO BE REFUELED OUTSIDE THE 30M SETBACK FROM WATERCOURSE.
3. NON-MOBILE EQUIPMENT SUCH AS PUMPS, GENERATORS ETC. TO HAVE SECONDARY CONTAINMENT. FUEL CONTAINERS (5 GALLON MAXIMUM) TO BE STORED IN SECONDARY CONTAINMENT
4. DEWATERING OF EXCAVATIONS TO BE CARRIED OUT IN ACCORDANCE WITH SECTION 2.2.3 OF THE BBC ENVIRONMENTAL OPERATING PROCEDURE. PUMP TO TREATMENT LOCATION AT LEAST 30M FROM CHANNEL AND ENSURE OVERLAND DISCHARGE FLOW ACROSS WELL VEGETATED AREAS.
5. EROSION AND SEDIMENT CONTROL MEASURES TO REMAIN IN PLACE UNTIL AREA DEEMED STABLE BY ENVIRONMENTAL MANAGER OR DESIGNATE. ALL MEASURES TO BE MAINTAINED IN A CONDITION TO PREVENT SEDIMENT TRANSPORT TO THE WATERCOURSE AS PER OPSS 805. SEDIMENT IS TO BE REMOVED WHEN IT REACHES A DEPTH OF ONE-HALF OF THE CONTROL MEASURE HEIGHT AS PER OPSS 805.
6. EXPOSED SOILS, WHERE NO FURTHER ACTIVITY IS SCHEDULED FOR A PERIOD GREATER THAN 15 DAYS, TO BE STABILIZED.
7. MONITOR WEATHER CONDITIONS AND BE PREPARED TO REMOVE MATERIAL AND EQUIPMENT FROM THE FLOODPLAIN IN THE EVENT OF A FLOOD FORECAST.
8. ENVIRONMENTAL FIELD INSPECTOR TO ORDER ESC MEASURES AS NECESSARY.

ESCP/DSMP's

CHALLENGES

- Very technical and complex project so there is difficulty in planning/predicting the work/grading sequencing.
- Limited room for "adaptive management" and a main and supplemental ESCP/DSMP process is closer to the actual way the documents are managed.
- Capturing portions of work that will be completed before the next update due to scheduling changes.
- Commitment from Subcontractors to implement what is on the plans.
- Consideration to implement BMP's that do not show up on the plans.

KEYS TO SUCCESS

- Ensure that all work to be completed prior to the next update is accounted for on the plans.
- Provide sufficient detail in the work sequencing notes and drawings to make it clear how the staging should progress.
- Don't overcommit.
- Ensure that BMP's are implemented in the field and go above and beyond the plans.
- Redline changes to the plans and audit that they reflect what is in the field.
- Need to build a culture that promotes environmental protection
- PLAN, PLAN, PLAN

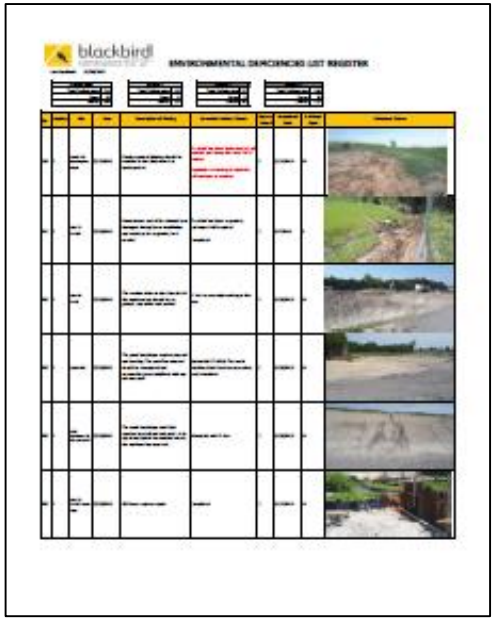
COLLABORATION, COMMUNICATION, AND INSPECTIONS

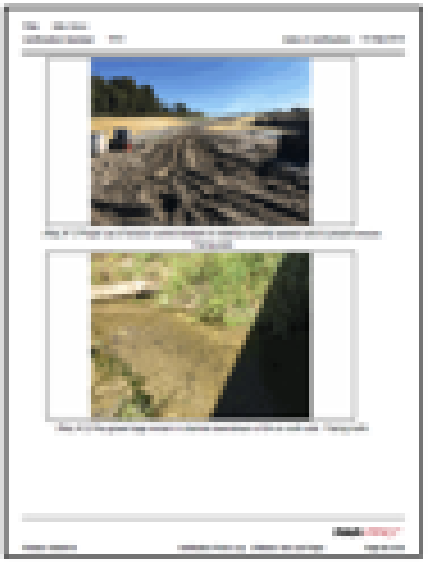
Collaboration

- Inspectors are on-site daily.
- The culture of contractors and their approach to environmental protection is evolving for the better and more full time dedicated environmental staff are helping drive this change.
- Environmental specialists chose their career because of a passion for protecting the environment.
- The shared goal for all parties environmental representatives (Contractors, Owners, Third Party Inspectors, Regulators, Public Servants) is to mitigate impacts to the environment.
- We all want the same thing!

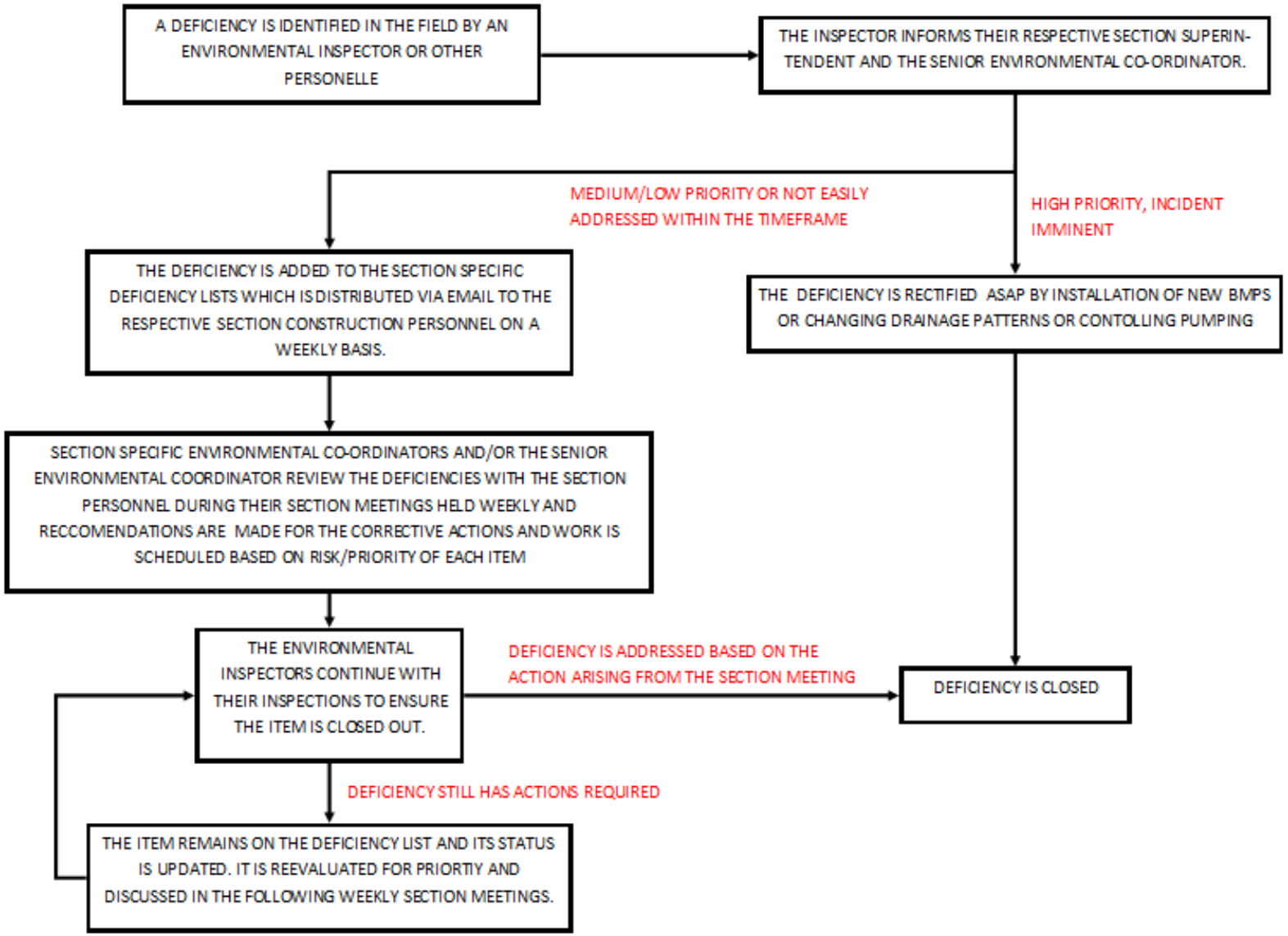
Communication

- Ongoing communication and collaboration at all times is paramount
- A notification system is established between internal and external inspectors to co-ordinate efforts
- Bi-weekly environmental working group meetings and monthly environmental quality meetings are conducted
- Meetings include a review of external inspectors noted deficiencies to ensure they are already captured in the internal tracking system and can be communicated to the subcontractors and rectified.
- Joint site tours are common





Inspections



Inspections

- A tracking system should be in place for metrics/KPI's such as timing, location, subcontractors, and number of open and closed items
- Additional inspection can be completed on phone app's and noted issues sent directly to the subcontractors. These are completed by construction field staff.

Environmental Inspection Report

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Your company has recieved this Enviromental Inspection Report which may include deficiencies that require corrective actions to be taken and a formal response back to the author of the report.

Date *

Day Month Year

Time

Hour Minutes

Name *

First Name Last Name

Your email *

Weather *

Section *

Erosion Sediment Controls Inspected:

	Yes	No	N/A
Is sediment fencing in place	☐	☐	☐
Are check dams in place and good repair	☐	☐	☐
Are erosion sediment controls in place as per the ESCP/DSMP's	☐	☐	☐
Are there any signs turbidity entering a nearby waterway	☐	☐	☐
Are there any areas where standing water could overflow	☐	☐	☐

Dewatering:

	Yes	No	N/A
Is dewatering taken place in the area	☐	☐	☐
Has BBC Environmental been notified of the dewatering	☐	☐	☐
Is dewatering being directed into a sediment bag	☐	☐	☐
Is sediment bag located 30m away from watercourses and in vegetation	☐	☐	☐
Are discharge hoses operating properly and secured to sediment bag	☐	☐	☐
Are there any signs of turbidity entering a nearby watercourse	☐	☐	☐

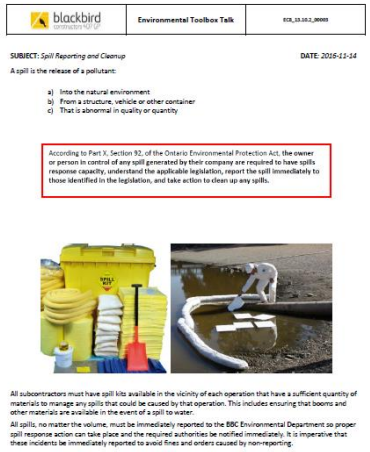
Communication [Example Taken From Actual Staff Training]

- If you see a problem, stop and say/do something
  - Inform the environmental team
  - Inform construction team
- If you see someone pumping turbid water, do something to stop an environmental incident
- Change begins with **YOU**!

TRAINING AND AWARENESS

Training and Awareness

- Mandatory Environmental Orientation for all site personnel (~4211 trained to date)
- Environmental Best Management Practices Training for construction staff (BMP's for Installation)
- Safety Interactive Pauses
- Ongoing toolbox talks
- Environmental Alerts (forecasted storms, nesting birds, etc.)
- CAN-CISEC training and certification for internal environmental inspectors
- Hands on training with ESC subcontractors



blackbird | Environmental Toolbox Talk | ECS_13.10.2_00003

SUBJECT: *Spill Reporting and Cleanup* DATE: *2016-11-14*

A spill is the release of a pollutant:

a) Into the natural environment
b) From a structure, vehicle or other container
c) That is abnormal in quality or quantity

According to Part X, Section 92, of the Ontario Environmental Protection Act, **the owner** or person in control of any spill generated by their company are required to have spills response capacity, understand the applicable legislation, report the spill immediately to those identified in the legislation, and take action to clean up any spills.

All subcontractors must have spill kits available in the vicinity of each operation that have a sufficient quantity of materials to manage any spills that could be caused by that operation. This includes ensuring that booms and other materials are available in the event of a spill to water.

All spills, no matter the volume, must be immediately reported to the BBC Environmental Department so proper spill response action can take place and the required authorities be notified immediately. It is imperative that these incidents be immediately reported to avoid fines and orders caused by non-reporting.

Environmental Alert: Migratory Birds

Did you know?
Migratory birds are protected under Canadian federal law and it is illegal to disturb them.

The *Migratory Birds Convention Act (MBCA)* prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or other damaging, destroying, removing or disturbing of nests.

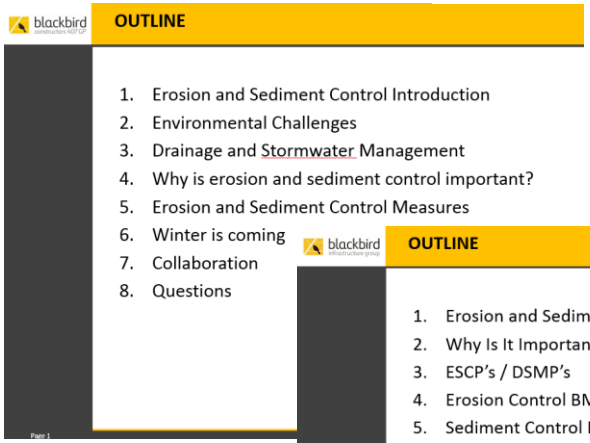
This summer, Barn Swallows, Cliff Swallows, and Eastern Phoebe have been observed at the following sites:

- Section 2: Site 59, Site 63, Site 67,
- Section 3: Site 88, Site 89, Site 92, Site 93, Site 104-4

What can you do!

- **Immediately** report any found bird nests to Blackbird's Environmental Department and secure the location with flagging tape (if possible);
- Maintain a **10m (minimum)** buffer from the nest until notified otherwise;
- Be aware **no vegetation clearing is permitted between May 1st and July 31st** of every year;
- Pay attention to the natural environment around you, and take action to protect it.

Barn Swallow	Cliff Swallow	Eastern Phoebe



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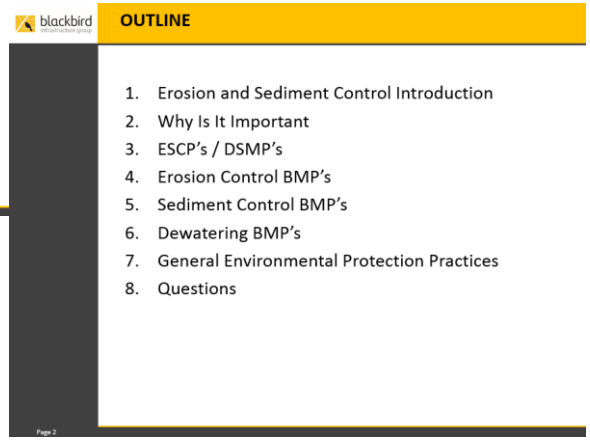
OUTLINE

1. Erosion and Sediment Control Introduction
2. Environmental Challenges
3. Drainage and Stormwater Management
4. Why is erosion and sediment control important?
5. Erosion and Sediment Control Measures
6. Winter is coming
7. Collaboration
8. Questions

Page 1



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OUTLINE

1. Erosion and Sediment Control Introduction
2. Why Is It Important
3. ESCP's / DSMP's
4. Erosion Control BMP's
5. Sediment Control BMP's
6. Dewatering BMP's
7. General Environmental Protection Practices
8. Questions

Page 2

DRAINAGE AND STORM WATER MANAGEMENT

Ditches and Ponds

- Water Management is key for preventing impacts to the streams.
- Ponds should be built immediately to act as detention basins which can be pumped out through water quality controls at a controlled rate during dry weather
- Detention areas need to be pumped out prior to forecasted rainfalls.
- Less active dewatering is needed once ditches and ponds are completed
- Ideal construction sequencing is the outlet channels, ponds, then ditches.

Pumping

- All planned pumping/dewatering operations must be reviewed by internal environmental staff. This requirement needs to be communicated to field staff!
- Sediment structures or sediment bags must be used and should be located a minimum 30m away from any watercourse in a well vegetated area

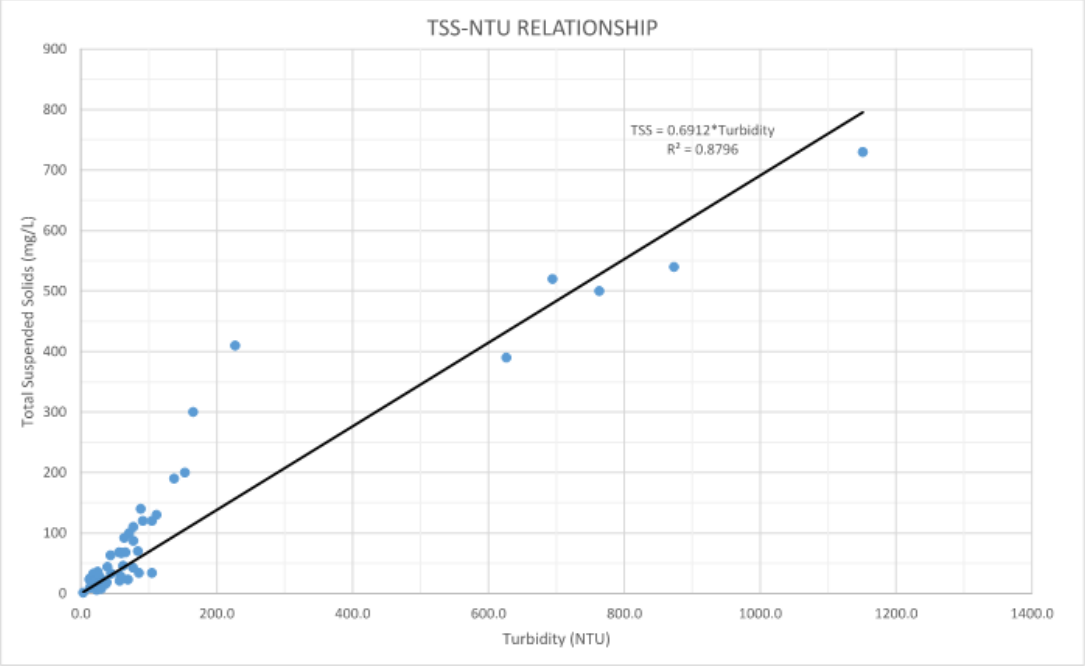
Pumping

- Hoses into sediment bags must be tied off well.
- Remove old sediment bag prior to placing new sediment bag.
- Bags CAN fail! Ensure the contractors do not increase pumping rates without appropriately assessing the bag size.

Water Management

- Flows must be **monitored regularly** to ensure that no turbid water is entering a watercourse.
- TSS/NTU correlation was established to assist with this testing process.

Figure 1. Relationship between Total Suspended Solid (mg/L) and Turbidity (NTU). The line represents the linear regression



Proper Release of Impounded Water

- Impounded water should not be released unless absolutely necessary and if that is the case it should be done at a controlled rate with a contingency plan in place

Proper Release of Impounded Water

Pond Dewatering

Polyacrylamide – Dosing Rector - Mixing

Settling

Finishing/Polishing

Monitoring

Fish Rescue

Wildlife Salvage

Drainage Sequencing

- It is important to remember that properly planning and sequencing earthworks allows you to utilize drainage patterns to your advantage.

Flow Control and Containment

- By temporarily blocking culverts you can quickly and easily create storage areas behind them which can be pumped out at a controlled rate.
- You can also partially block culverts to allow for some backwatering and a diminished flow.

Flow Management

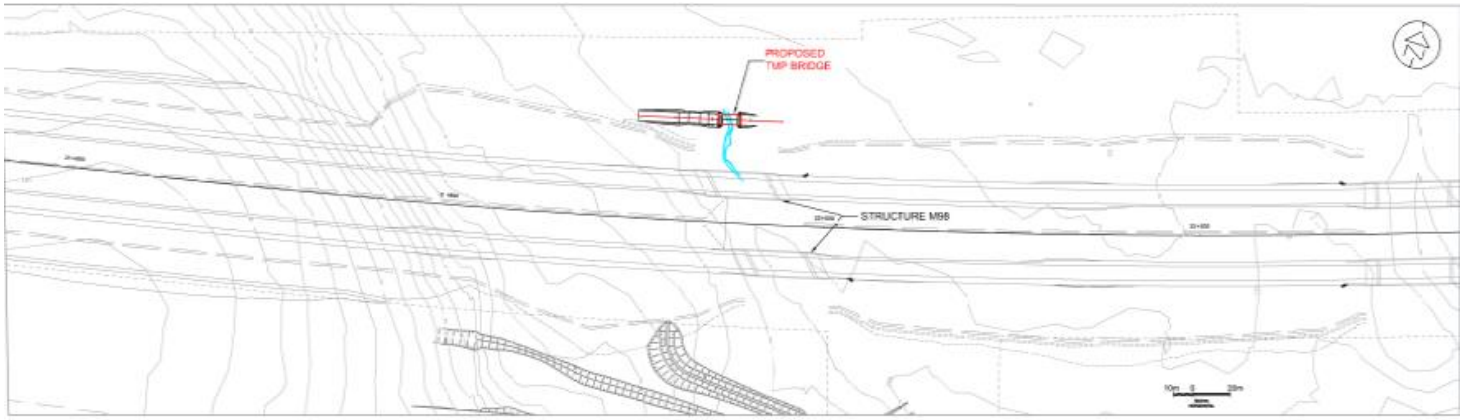
Flow Management

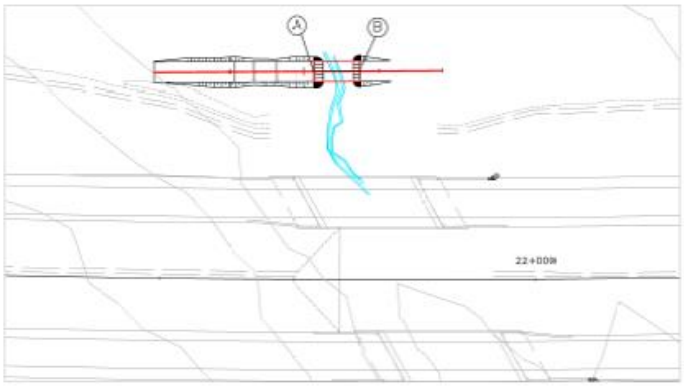
Flow Management

Hickenbottoms

TEMPORARY BRIDGES

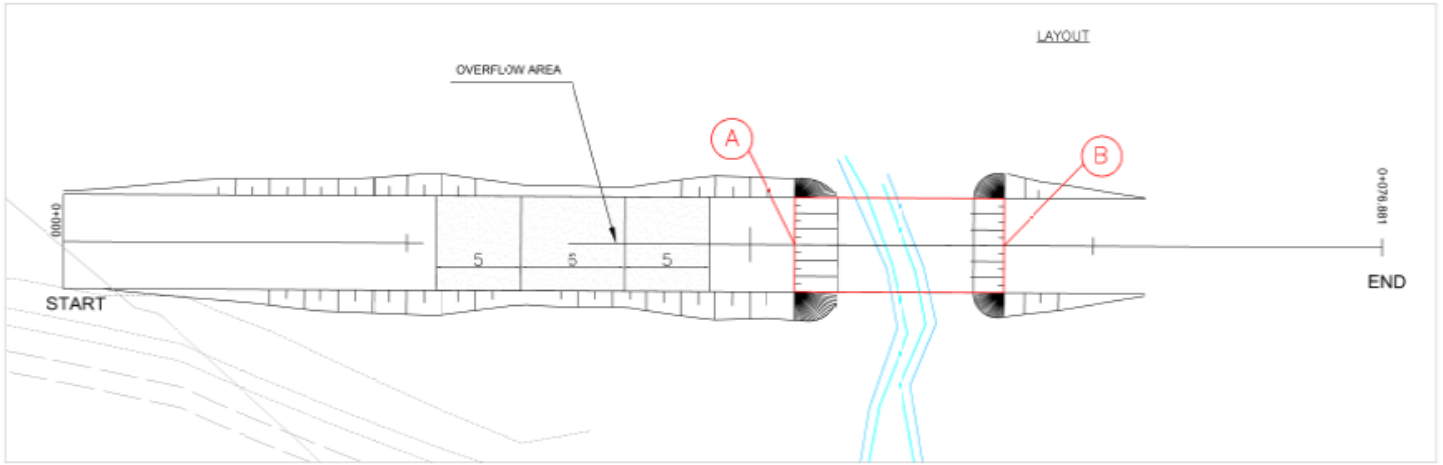
Temporary Bridge Planning

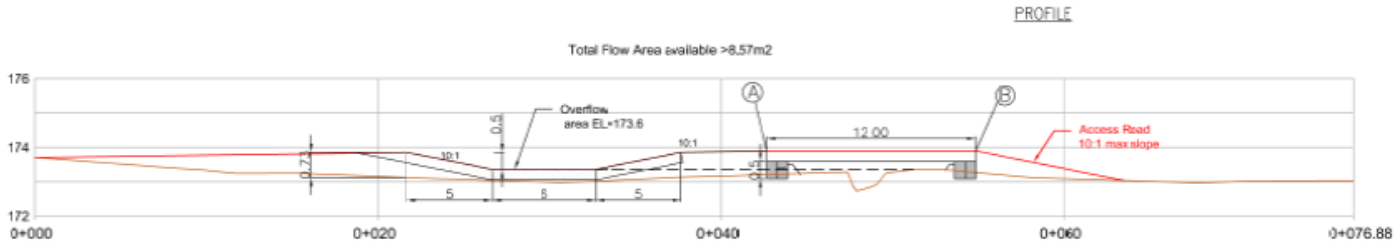




POINT	X(m)	Y(m)	Z(m)
A	368600.884	4872208.205	173.590
B	368812.621	4872211.532	173.590

Temporary Bridge Planning





Full Span Temporary Bridge Example #1

Full Span Temporary Bridge Example #2

Temporary Culvert Crossing

Very Short Duration Crossing

Very Short Duration Crossing

WINTER PREPARATION

Winter Preparation

- Planning for winter shutdown and the following spring freshet is extremely important.
- Construction crews will begin to diminish from the jobsite and areas where there is ongoing construction disturbance will now be untouched until the crews return in the spring.
- With less forces to complete earthworks and ESC installation it is important to ensure that any risks from the spring freshet and snow/melt cycles over the winter are mitigated.
- Internal meetings are held every month in the fall leading up to winter to identify where additional measures should be implemented and where temporary stabilization should occur.
- Drone videos and aerial photographs are utilized to identify areas where temporary stabilization and additional ESC measures could be installed.

Wind rows

- Example of a small windrow evolving over time when it isn't addressed early

December 2016

January 2017

Wind rows

- Example of a small windrow evolving over time when it isn't addressed early

March 2017

Seeding

Mulching

Mulching

RECP's

RECP's

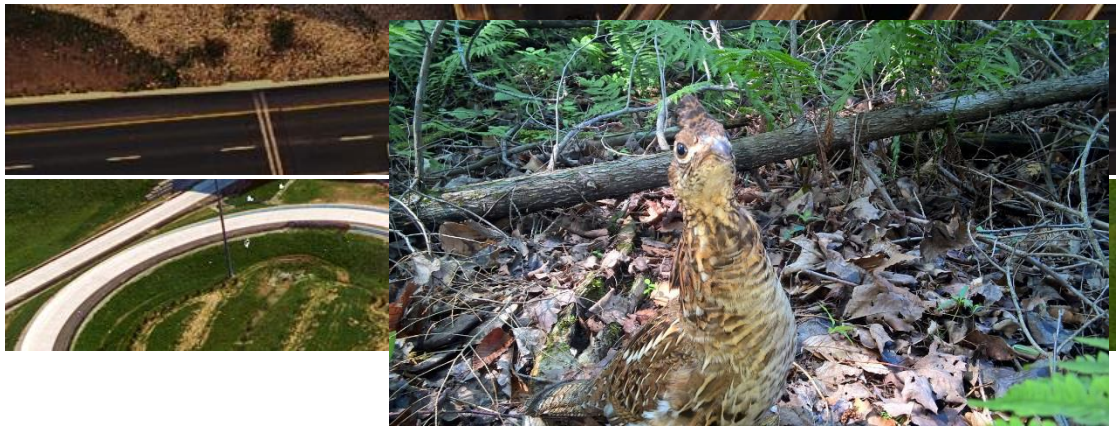
Pneumatic Mulch/Seed Mix Application

Ditch Stabilization

Hard Armouring

Bolstering Sedimentation Control Measures

Sometimes you Have to get Creative…



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