


Remediation of the Gowrie Wash Plant Cape Breton, Nova Scotia

A seagull is shown in flight over a body of water, with its wings spread and its head turned back. The water is a mix of blue and green, with a gradient overlay on the right side of the image.

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Safety Stewardship – *Building a Safety Culture on Project Sites*

- **Zero Tolerance on Safety Compliance**
- **Plan all actions**
- ***What is the worst that can happen?***
- **Courage to engage**
- ***Everybody goes home safe!***



Cape Breton Mining History

Coal mining on Cape Breton began over 250 years ago

1784-1820: coal deposits were mined on a small scale by either the colonial government or through lease by private individuals.



1903: the Dominion Coal Company was producing 3,250,000 tonnes per year.

1912: the Dominion Coal Company had 16 collieries in full operation and its production accounted for 40% of Canada's total output.



ECBC / PWGSC

- ECBC managed the process of closing former coal mining operations and disposing of its assets
- >600 individual properties (PIDs) covering more than 4500 hectares (ha)
- variety of issues associated with former coal mining and processing operations
- obliged to determine the condition of its properties before they are transferred and/or divested.
- Closure plans are required for many sites in advance of transfer and/or divestiture
- PWGSC “Cape Breton Operations” manages former ECBC mandate



While PWGSC has been engaged to manage the program, AECOM is retained under standing offer agreement to provide mine reclamation services.

- Gap Analysis, and intrusive Gap Analysis Investigation
- Phase I Environmental Site Assessments
- Canadian Environmental Assessment Screening reports
- Remedial Action Plans
- Capital cost estimating of environmental liability
- Assessment of ARD and water treatment
- Feasibility Study, Conceptual and Detailed Design
- Environmental Monitoring and Trend Analysis
- Closure documents

Green & Sustainable Remediation

The opportunity to utilize green and sustainable principles has been undertaken at various stages and levels.

Examples we will discuss in the following slides, include:

- Understanding the remedial options
- strategic sequencing of remediation,
- use of local and owner supplied material borrow sites,
- community engagement for Future Land Use on remediated sites,
- creation of wetland areas for passive treatment.

Remedial Options

REMEDIAL ACTION PLAN :

- OPTIONS:
 - i. DO NOTHING
 - ii. INSTITUTIONAL CONTROLS (Signage & Fencing)
 - iii. EXCAVATION & OFFSITE DISPOSAL
 - iv. CAPPING IN PLACE
 - a. Gowrie material alone
 - b. Central repository
- Each option was evaluated against qualitative, financial and loadings criteria

Strategic Sequencing

Gowrie Wash Plant

History

- former coal washing facility.
- large stockpile of waste rock.
- acid rock drainage adversely impacted local groundwater and surface water.

Feasibility Study and Remedial Action Plan.

Detailed Design and Technical oversight support during construction.



Strategic Sequencing - continued

Action

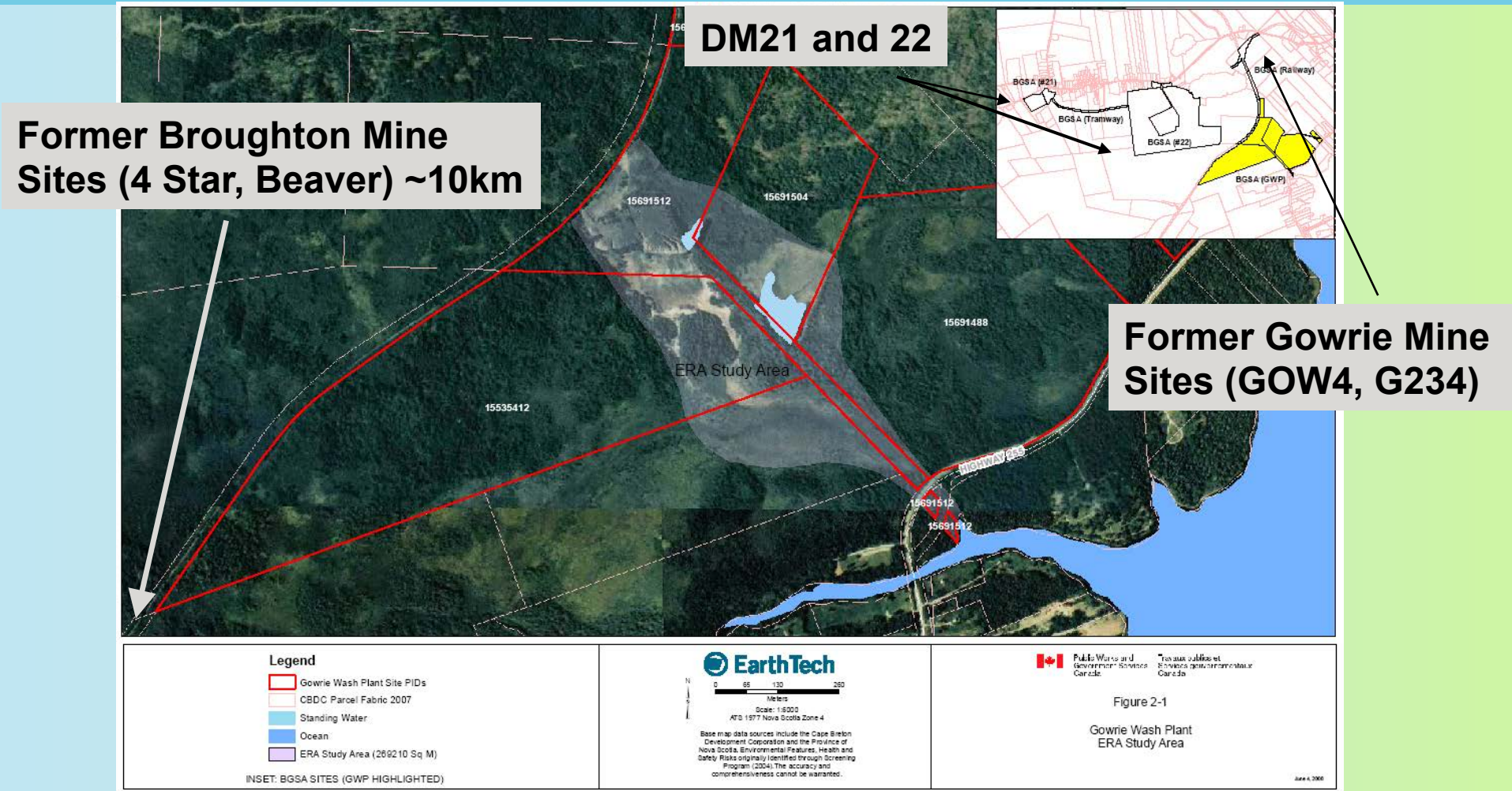
Use GWP Site as a central repository for consolidation of similar material from many local ECBC sites.

The final solution is a shaped central repository of waste material with an engineered cap surface which includes groundwater and surface water collection and treatment

Benefit

- Nearby sites are remediated.
- Reduces construction of additional cover sites.
- One location requiring treatment (passive) and long term monitoring
- Efficiency and cost benefits
- Fewer loaded trucks due uses of rail lines

Gowrie Wash Plant Remediation Sources of Imported Waste Rock



Use of Local Material

Dominion No. 26

History

Dominion No. 26 Colliery was a submarine coal mine with underground workings extending north under the Atlantic Ocean. The colliery was closed in 1984.

Issues of concern:

- Waste rock and coal fines / elevated ARD potential
- Construction debris, foundations and paved areas
- An unsealed mine Shaft, Buildings and WTF
- Settling Pond
- Sediments - metals and hydrocarbons
- Groundwater - PAHs and metals



Use of Local Material - continued

Remedial Option

The preferred remedial option for coal fines and waste rock is placement of an onsite soil cover followed by establishment of vegetation.

Action

AECOM proposed the use of local source material from the adjacent site GBU3 to be used for cover material.

Benefit

Minimal and controlled environmental disturbance at the cover material source site.

Reduce transportation issue for community stakeholders.

Use of Local Material - continued

Dominion No. 5 and No. 10 Collieries (D510)



Community Engagement

Dominion 4 Waste Rock Pile (Stone Dump)

History

- Mining activities between 1866 and 1961.
- Generating acid rock drainage (ARD).
- Wetland to the southeast exhibited signs of ARD impacts.
- Sediment - metal impacts.
- Surface water – metals, depressed pH and acutely toxic.

Remedial Option

The RAP recommended ‘Capping in Place and Groundwater Control’ as the preferred remedial option.

Community Engagement

Action

The detailed design / Feasibility report included incorporated an End Use Plan consisting of a soccer field, running track and parking lot.

Benefit

The end land use is passive recreational. Which is considered consistent with the legacy statement in the strategic plan related to providing recreational activity.

Community Engagement



Dominion 4 Waste Rock Pile



Wetlands for Passive Treatment

Gowrie Wash Plant

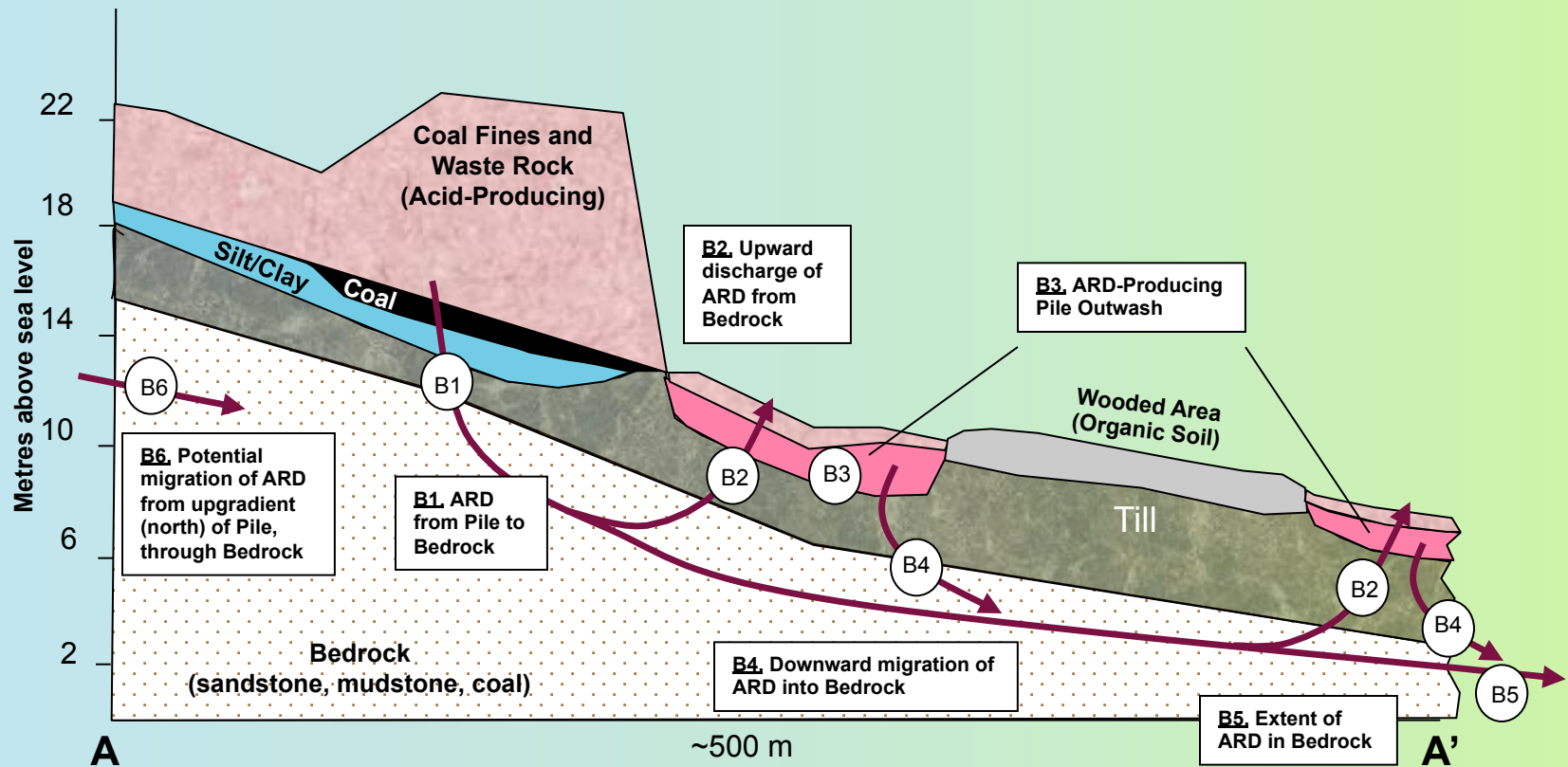
Action

A shaped repository of all the waste material capped with an impermeable membrane. Drainage from the layer and groundwater from upward seeps are directed to settlement ponds for passive treatment.

Benefit

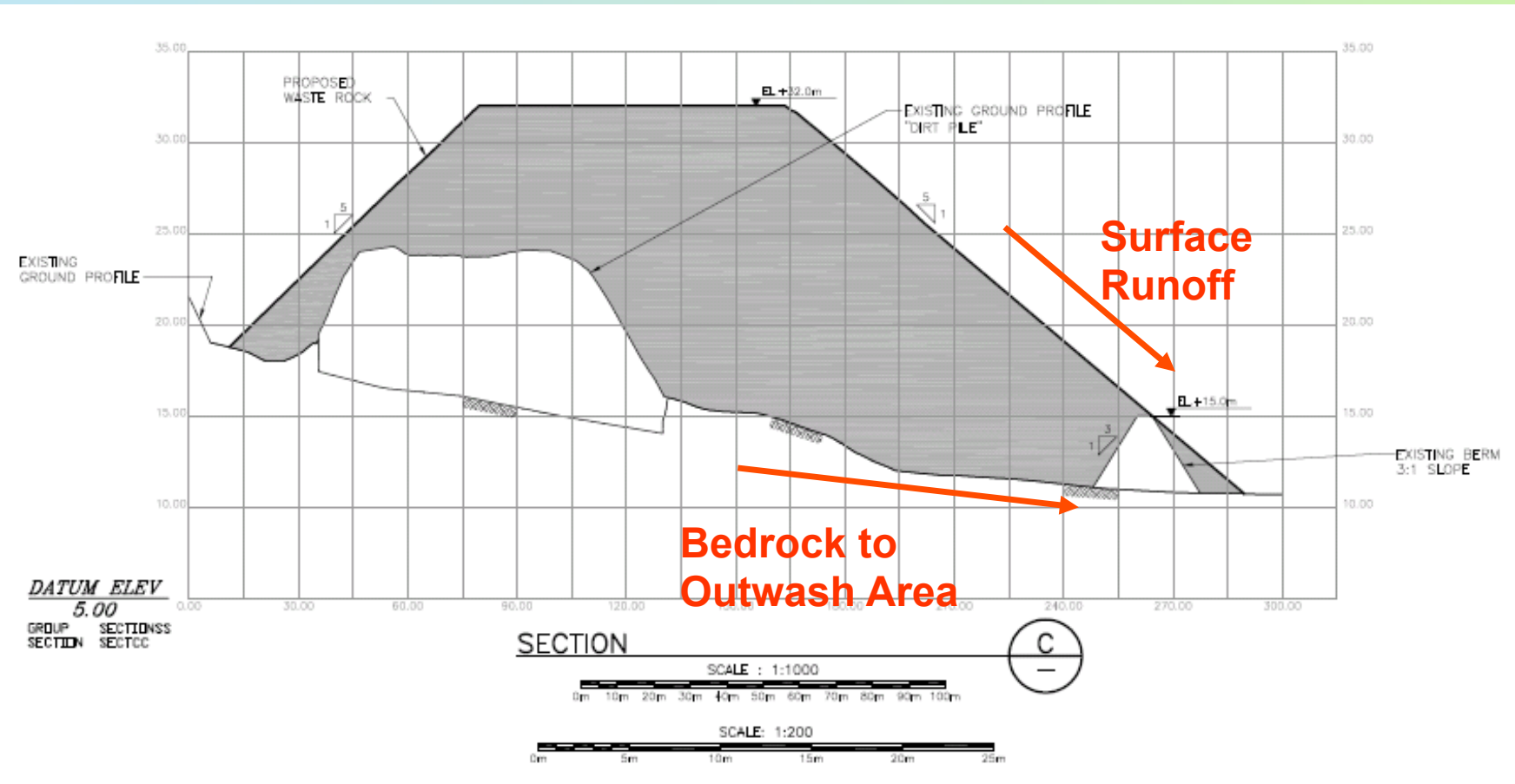
- Reduces air emissions from on-site construction equipment.
- Reduces potable water use.
- Reduces off site disposal of waste.
- Reduces energy use.

Groundwater Model



Conceptualization of ARD Generation and Migration in Bedrock at the Gowrie Wash Plant Site (APEC 05)

Major Water Sources



Chemistry and Flows

Parameter	Passive Treatment Design Criteria	Post-Construction (Before ARD Flushing)	Post-Construction (After ARD Flushing)
Flow (m ³ /day)	1296	131	131
Sulfate (mg/L)	3000	422	29
Aluminum (mg/L)	300	0.06	0.06
Iron (mg/L)	300	79	1
Alkalinity (mg/L as CaCO ₃)		46	56
pH		6.5	7.6

NOTE: All parameters below Passive Treatment design values.

IMPLEMENTATION



Implementation



Long Term Geotechnical Monitoring Activities

- Engineered Cover;
- Surface Water Collection and Diversion Channels;
- Settlement Ponds;
- Access Roads;

Long Term Water Monitoring Activities

- Surface Water Chemistry –
 - Chemistry, Metals, Field Parameters
- Sediment Chemistry
 - Total Organic Carbon; Particle size; Available Metals
- Benthic Invertebrate Survey
 - Total invertebrate density;
 - Taxon (Family) richness; density, proportion presence/absence
 - Simpson's Diversity Index;
 - Bray Curtis Index;
 - Evenness;

SUMMARY

- **ABANDONED MINES LEAVE HAZARDS TO PUBLIC**
- **IMPACTS MANY ECBC PROPERTIES inc. GWP**
- **ECBC IMPLEMENTING MINE SITE CLOSURE PROGRAM**
- **SUCCESSFUL REMEDIATION**
 - **remediation of the Gowrie Wash Plant Site from Phase I to VI,**
 - **RAP assessed the remedial response options for the site and selected capping in place as a preferred remedial option due to:**
 - **provide a protective barrier from contaminants,**
 - **reduce ARD generation and**
 - **allow the site to be used as a central repository for waste rock**
 - **implemented an impermeable cap with HDPE liner**
 - **drainage from the geosynthetic layer and groundwater from upward seeps are controlled and directed to new settlement ponds for treatment on a monitor and develop basis.**
- **ONGOING LONG-TERM MONITORING & MAINTENANCE**



AECOM – Nova Scotia – Strength Through Experience

	Sydney	David Forrester	Jennifer Hood	Sarah MacNeil	Dana McEachren	Bruce Noble	Randy Pointkoski	Lori Brisson	Maureen MacDonald	Denitra Ross	Halifax	Tim Bachui	Nora Donald	Derek Heath	Craig Hatt	Mike McGrenere	Krista Phillips	Steve Murphy
Environment																		
Remediation and Design		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
Air Quality/Design			X	X		X							X	X				
Water and Natural Resources, Hydrogeology		X	X		X	X	X					X	X	X	X		X	X
Sampling and Data Management		X	X	X		X	X	X		X		X	X	X	X		X	X
Assessments and Approvals		X	X	X	X	X	X					X	X	X	X		X	
Engineering																		
Water and Waste Water Treatment		X	X		X	X	X					X	X	X	X	X	X	X
Engineering (Highway, Infrastructure, Facilities)		X				X	X									X	X	X
Project & Construction Management		X	X	X	X	X	X		X	X			X	X		X	X	X
Surveying, CADD, Quantity Assessment		X			X	X	X					X	X	X	X	X	X	X
Project Delivery																		
Project Scheduling & Sequencing		X	X		X	X	X						X	X				X
Project Health & Safety Administration and Monitoring		X	X	X	X	X	X			X			X	X		X	X	X
Program Quality Management Systems		X	X	X	X	X	X	X	X	X			X	X	X	X	X	X
Specification Development and Management		X	X	X	X	X	X	X	X	X			X	X			X	X
Project Delivery (document / design deliverables)		X	X	X	X	X	X	X	X	X			X	X				X
Contract Administration (CCO/CO, etc.)		X	X	X	X	X	X		X	X			X	X		X	X	X

AECOM – URS

- **Transaction Closes October 17, 2014**
- Nearly 100,000 employees
- Architects, engineers, designers, planners, scientists and management and construction services professionals
- Fully integrated infrastructure and support services firm.
- 150 countries around the world
- AECOM is ranked as the #1 engineer firm by *Engineering News-Record* magazine
- Leader in all of the key markets that it serves, including transportation, facilities, environmental, energy, oil and gas, water, high-rise buildings and government.
- AECOM provides a blend of global reach, local knowledge, innovation and technical excellence in delivering solutions that create, enhance and sustain the world's built, natural and social environments.
- A *Fortune 500* company, AECOM companies, including URS, had revenue of \$19.2 billion during the 12 months ended June 30, 2014
- Watch out for exciting Branding News in Months to come

Acknowledgements

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Questions

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