Sustainability
Planning, Operations & Measurement

Adam J.T. Hand, PhD, PE

Alaska Asphalt Summit

Anchorage, AK November 10, 2015

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Intended Takeaways

- A commitment to sustainability can be documented, communicated, and demonstrated that creates value for customers, companies, and society
- How important sustainability and transparency are today, and will likely be more important in the future
- Exposure to example sustainable materials and production operational activities
- Introduction to how sustainability may be measured and quantified today and in the future
- Exposure to the first *Greenroad* Project in Alaska
  - Robert Devassie, Alaska DOT

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What is Sustainability to Us?

- The integration of economic, environmental, and social considerations, including opportunities and risks, into our business strategy and decision-making processes
- It supports a prosperous and resilient business by addressing financial and non-financial considerations and emerging trends in society
- A marriage of sustainability of the organization and sustainability in the broader sense

Affected Triple Bottom Line Principles

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Its in Our Roots and Our Plan Today

Walter J. Wilkinson

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WHY *SUSTAINABILITY* IS IMPORTANT TO BUSINESSES

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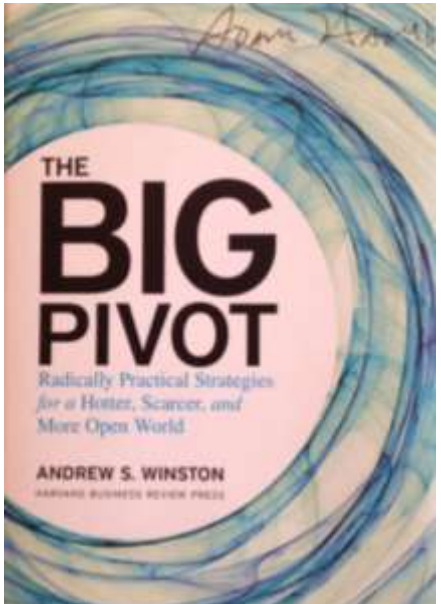
Sustainability will be an Increasingly more Important National and Global Issue

- Growing Population and Wealth
  - 9B by 2050, New Middle Classes; Resource Demands
- Depleting Ecological Wealth
  - Once Renewables (forest & water) finite; 2/3 world water stressed 2025
- Climate Change
  - Fossil-fuel based economy = GHG; extreme weather drought/flood; policy
- Radical Transparency
  - Digital communications in last 20 years; reputation
- Highly Interconnected Economies
  - Awareness of interconnectedness of global economies



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Studies & Reports

The UN Global Compact-Accenture CEO Study on Sustainability 2013

accenture

GAINING GROUND:

CORPORATE PROGRESS ON THE CERES ROADMAP FOR SUSTAINABILITY

2014

A JOINT REPORT BY CERES AND SUSTAINALYTICS

Ceres | SUSTAINALYTICS

2013 six growing trends in corporate sustainability

An EY survey in cooperation with GreenBiz Group

EY Building a better working world

Sustainability goes mainstream: Insights into investor views

pwc

Sustainability Matters 2014

THE CONFERENCE BOARD
Trusted Insights for Business Worldwide

Key Themes from Studies/Reports

- Sustainability issues more prominent on company agendas
- More needs to be done to address sustainability
- CEOs challenged to justify what really needs to be done
- Governments not doing much (enough)
- Sustainable products & services as well as supply chain focus on the rise
- Influence from investors is on the rise

"CEOs are unequivocal in their belief that the global economy is not on the right track – and that business is not doing enough to address global sustainability challenges"

Source: ***Accenture – UN Global Compact 2013***

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Voice of the CEOs

93%	Sustainability is important to the success of their business
80%	Source of competitive advantage and innovation
80%	Important to measure and try and reduce their environmental footprint
75%	Satisfying societal needs and protecting the interests of future generations is important
74%	Measuring and reporting their total (non-financial) impacts contributes to their long term success

Transparency Forces Change

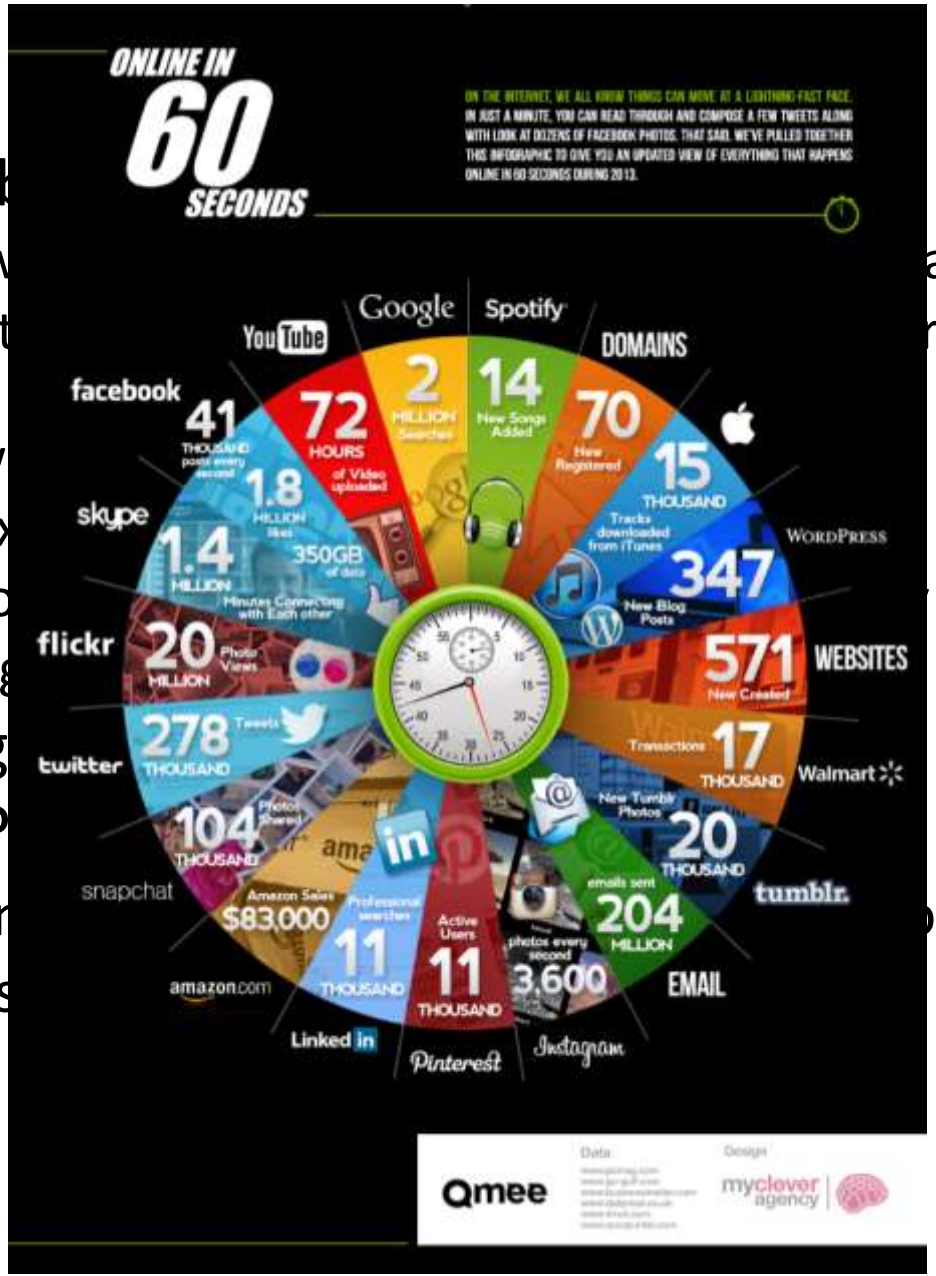
- Technology
  - Internet: k
    - 571 new
    - 1+B Yout
      daily
    - 280k tw
    - 3000 tex
    - Faceboo
    - Twitter g
  - Reporting
- Who Cares?
  - Generation
  - Should Bus

acebook likes/min

rs of Video watched

users

overnment,…



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Transparency and Change

- Show of Hands
  - Your Company Use Internet/Social Media?
  - You Personally Use Internet/Social Media?

Transparency Forces Change

- What is at Stake?

- Exa

oam cups

Voice of our Customers

- Increase in RFPs and RFQs with questions related to aspects of Sustainability
- Almost all required Proposals require addressing elements of Sustainability
- Alternate Procurement and Federal pursuits increasingly oriented towards sustainability
- A Sustainability Plan is a Difference Maker – a BD Tool

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Customers

Chevron Human Energy

bp

TESORO

ConocoPhillips

FLUOR

U.S. Department of Transportation Federal Highway Administration

UNION PACIFIC BUILDING AMERICA

RioTinto | Kennecott

ppl PPL Electric Utilities

BNSF RAILWAY

BARRICK

Companies

SKANSKA

Turner

Holcim US

Layne WATER · MINERAL · ENERGY

HOCHTIEF

COLAS

LAFARGE Building better cities™

FLUOR

ferrovial Intelligent infrastructure

BECHTEL

Vulcan Materials Company

PCL CONSTRUCTION

SUNDT

CLARK CONSTRUCTION

Balfour Beatty Construction

Our Sustainability Plan - *The Road Ahead*

www.graniteconstruction.com

- History
- 7 Pillars
- Aspirational Goals
- Key Initiatives with Commitments & Targets (Metrics)
- Existing Programs
- Committed Champions & Mgmt Support

THE ROAD AHEAD

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Employees

This is all about being the employer of choice in our industry.

Infrastructure Investment

This is about a sustained increase in public infrastructure funding

Health & Safety

This is about no injuries, our friends and coworkers should not getting hurt at work - period. Our customers truly care about safety also.

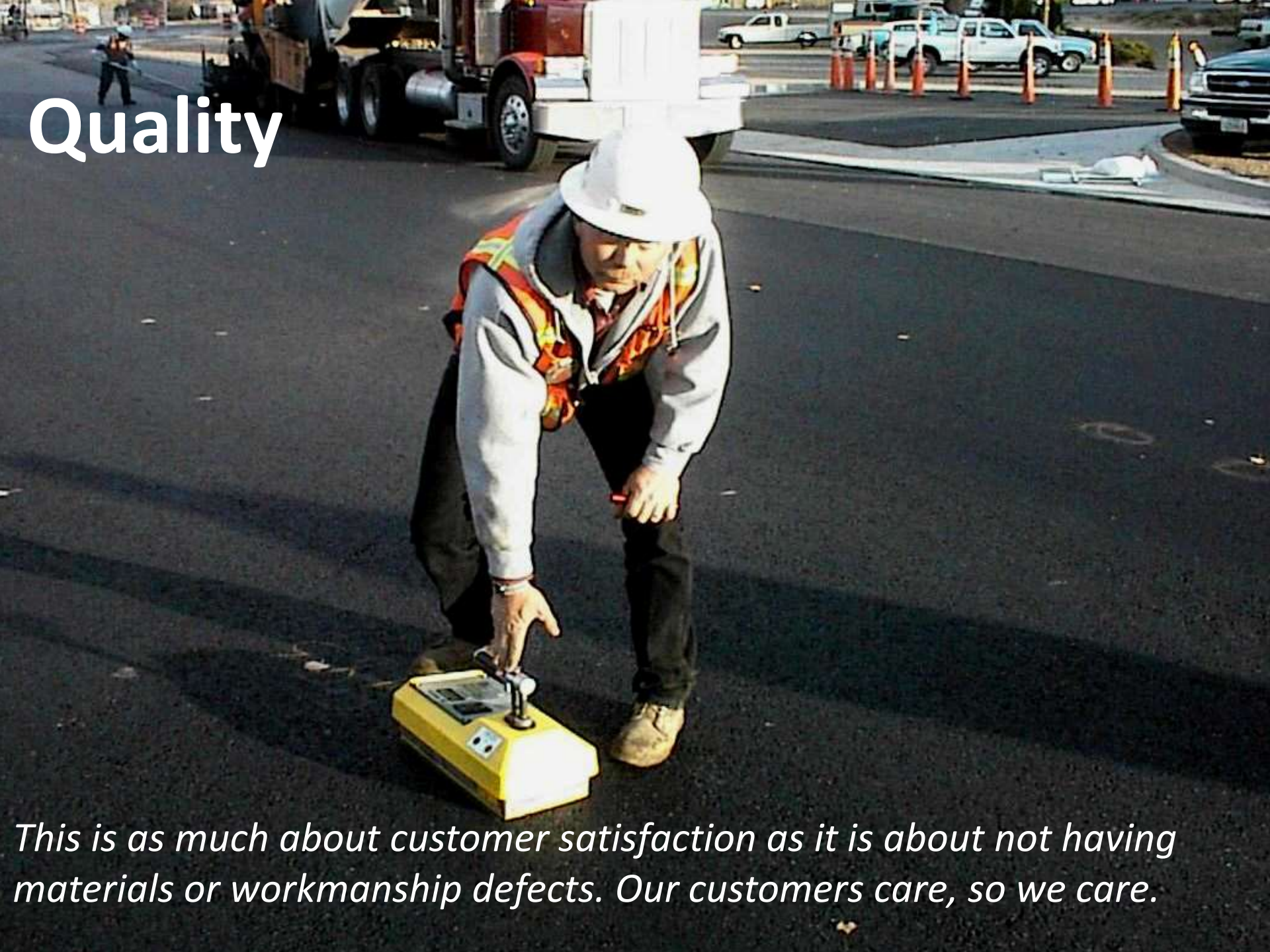
Compliance & Ethics

This is about who were are. We work in an unforgiving world with high expectations on businesses. Our reputation is everything…

Environment

This is about meeting our environmental responsibilities and contributing to environmental sustainability through resources conservation.

Quality



This is as much about customer satisfaction as it is about not having materials or workmanship defects. Our customers care, so we care.

Community Involvement

The bottom line is that this is about relationships with people our business touches and relies on. Our stakeholders are a broad group that covers people from neighbors to government representatives.

Seven Aspirational Goals

- Employer of choice in the industry
- A sustained increase in public infrastructure spending
- Zero injuries
- Zero ethical breaches
- Zero environmental incidents
- Zero materials or workmanship defects
- Zero complaints from affected community members

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THE ROAD AHEAD
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Commitments, Initiatives & Targets

- Environmental Pillar Example Commitment
  - Conserve Natural Resources and Energy
    - Key Initiatives and Targets
      - Increase sale and use of WMA by 20%
      - Increase sale and use of Recycled materials (RAP, RAS, CRM) by 15%
      - Operate Energy-Efficient Asphalt Plant Facilities on per-unit Basis (10-1-1): Reduce power and fuel by 7%/ton from baseline at 10 asphalt plants
  - …
    - …
      - …

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THE ROAD AHEAD

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Our Systems

- Safety & Health Management System – OHSAS 18001
- Quality Management System – ISO 9001
- Environmental Management System – ISO 14001

Granite Management System

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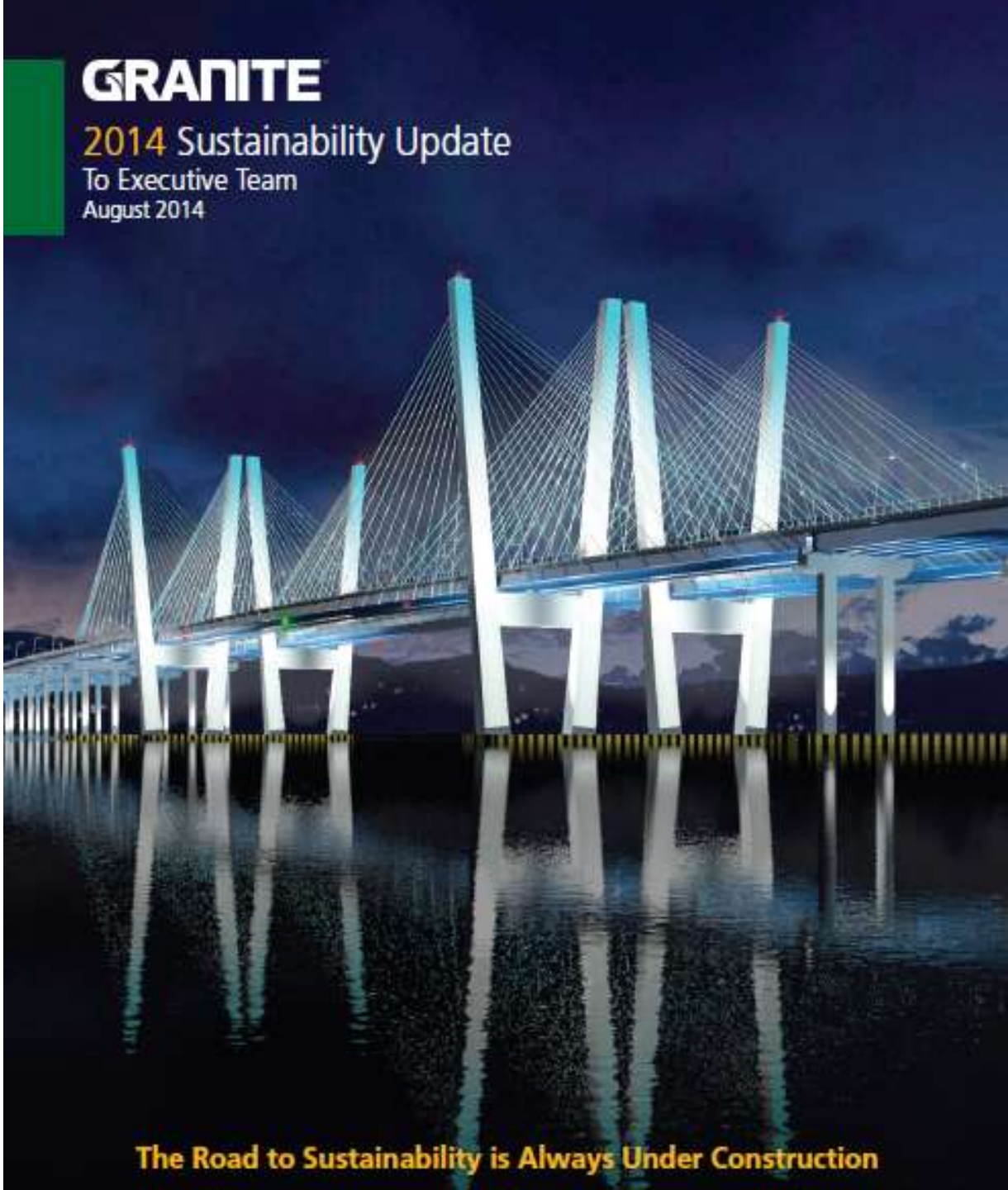
2014 Update

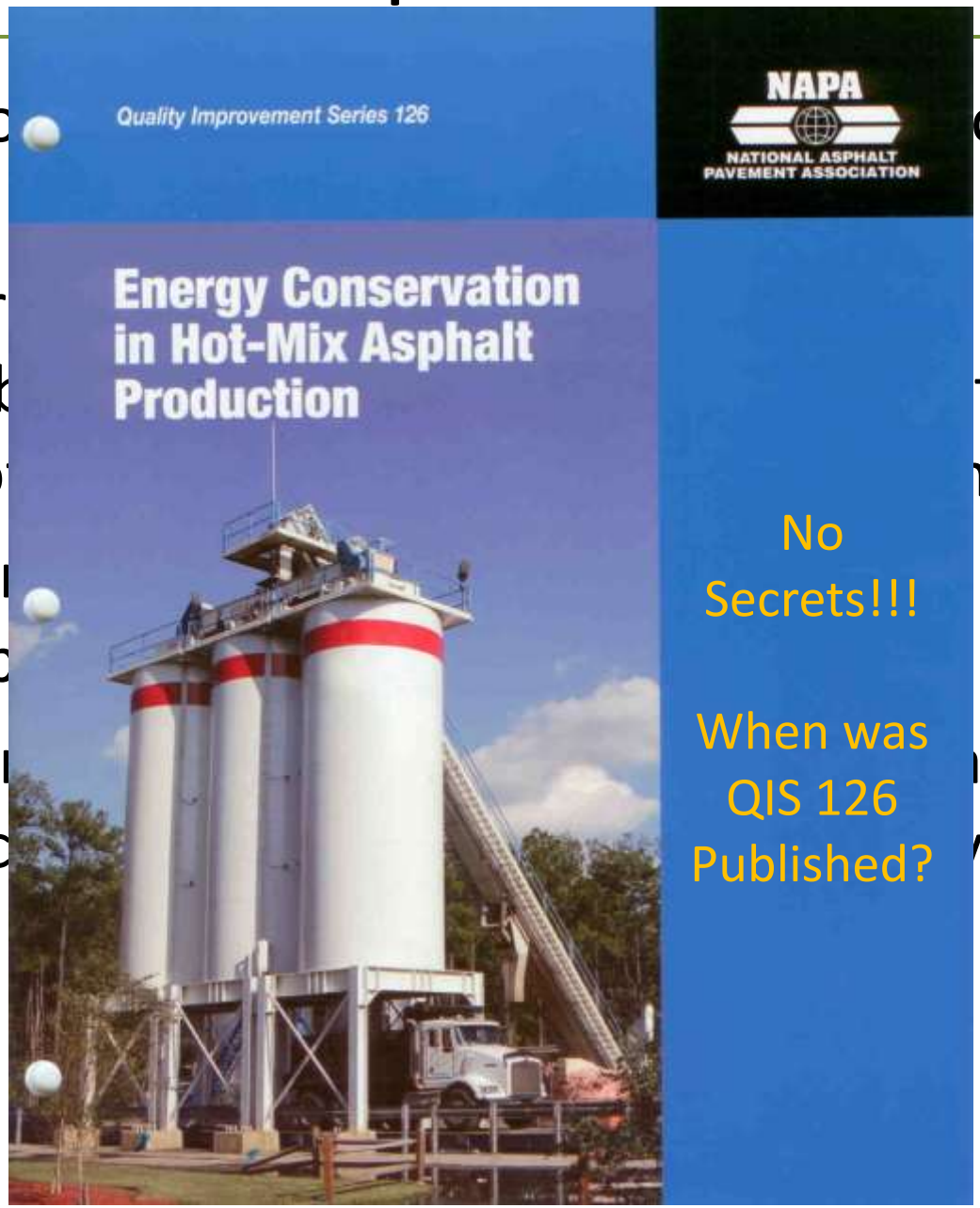
- Changes
- Performance
- Management Commitment



CONTINUOUS IMPROVEMENT
Achieving the Possible

Operational Examples of Sustainability

- We will c oduction facilities
- We will r sustainab the quality o mpromised.
- We will i als in asphalt p
- We will i rm-mix asphalt c es.



No Secrets!!!

When was QIS 126 Published?

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Energy Efficient Asphalt Production

- Many Opportunities
- Examples
  - Conveying vs. Tramming
  - Controlling Moisture
  - Burner Fuels
  - Maintenance
  - Minimizing Waste
  - …
  - Renewable Energy
  - 10 -1-1 Plan

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Controlling Moisture

- Aggregates
  - Washed
  - Marinated
- RAP
- RAS

- Moisture = Energy

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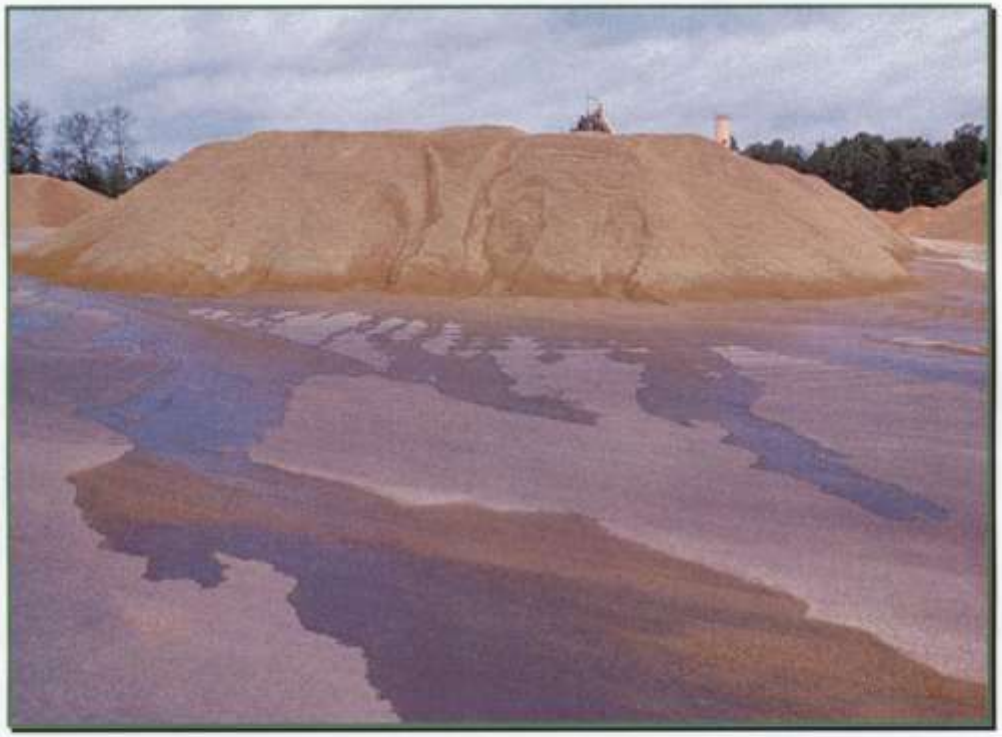
Paved Sloped Stockpile Areas Save Costs



Granite Construction Incorporated
Best Practice
BP-05

Engineering Services Group

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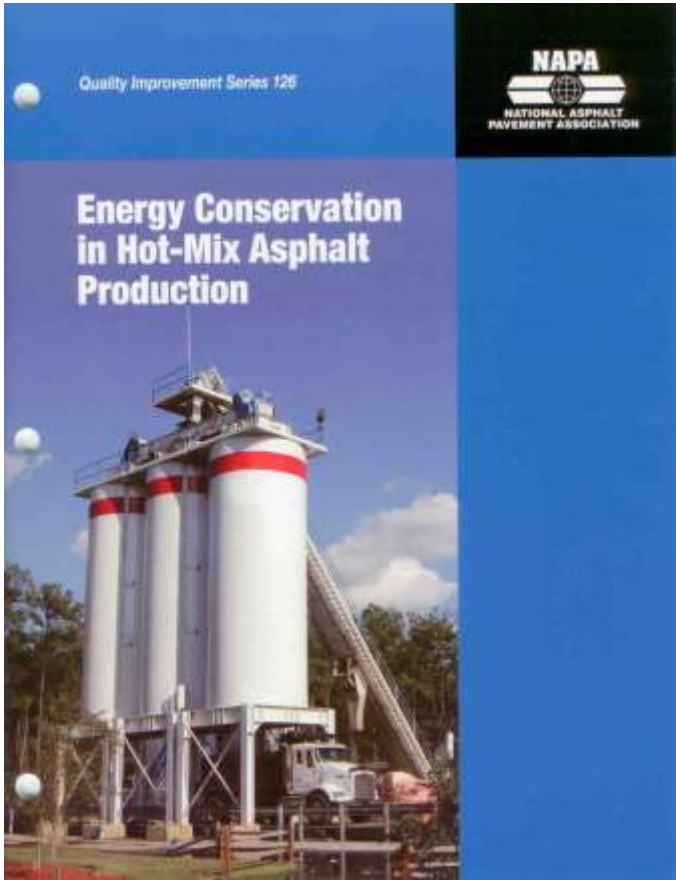
Controlling Moisture

- Rule of Thumb:
  - Every ↕ 1% MC, ↕ 10% Energy or Fuel Demand
  - RAP p200, RAS p200, Washed Fines
  - RAP + RAS + Washed Fines MC



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Agg/RAP/RAS Moisture

- Impacts:
  - % RAP &/or RAS Usable
  - Production Rate
  - Drying Cost
  - Mix Quality?
- Reduce Moisture By:
  - Tall Stockpiles
  - Paving Under Stockpiles
  - Covering Stockpiles

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Burner Fuels

- Options:
  - Nat Gas
  - Propane
  - Diesel (heating oil)
  - Heavy fuel oil (bunker fuel)
  - Recycled waste oil
  - Coal
- Considerations
  - Burner capability
  - Preheater requirement
  - Availability of fuel (location, fixed/portable)
  - Cost and efficiency ($/MBTU)
  - Emissions standards and company goals
  - Sustainability

<u>Equivalent BTUs</u>

180 gal Diesel ≈ 300 gal Propane

$?/gal Diesel ≈ $?/gal Propane

Optimizing investment, operating cost, compliance, and citizenship

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Renewable Energy

- Wind and Solar
  - Geography Affords
- Solar
  - 180kW to 1.2mW Arrays
  - Plant Power
  - Feed Grids

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California Agg and Hot Plants Solar Array

So Calif Agg and Hot Plants

Solar Array

Competing Industry

- Cement Plant
  - So Cal
  - Others

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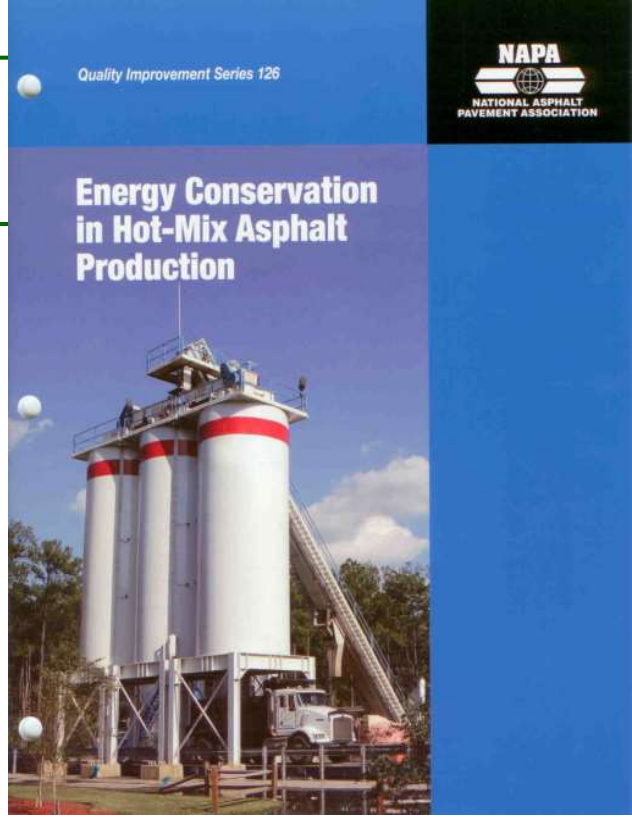
10-1-1 Plan



- 10 Hot Plants
- $1M Investment
- $1M ROI/year

- Insulate Drums and Hot Oil Piping
  - Reduce losses, energy consumption, energy costs

- VFD on BH Fans
  - Reduce losses, Energy consumption, Peak demands

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Drum Plant Insulation

FC Insulation

VFD on BH Fans

- Fan speed vs. damper air flow
- NASCAR
  - PD (50% of cost, single 15min max consumption)
  - Power company recognition/rebates

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Responsible Increase of Recycled Materials and Other Sustainable Technologies

- RAP
- WMA
- CRM & TB
- Modifiers

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How is Sustainability Publicly Measured?

U.S. Department of Transportation
Federal Highway Administration

About Programs Resources Briefing Room Contact Search FHWA

Pavements

Design/Analysis | Materials/Quality Assurance | **Environmental Stewardship** | Management | Materials/Construction Technology | Surface Characteristics | Preservation

Recycling | **Sustainability** | WMA

References | Technology Transfer | TWG

Home / Programs / Pavements / Environmental Stewardship / Sustainability

Sustainable Pavements Program

Concrete Pavement Construction

Pause Previous Next

1 2 3 4 5 6 7 8

The FHWA launched the Sustainable Pavements Program in 2010 to advance the knowledge and practice of sustainability related to pavements. The overall objective is to establish a program that considers asphalt, concrete, granular, and other materials in pavement systems including new and emerging materials. A critical outcome of the program is to increase the awareness, visibility, and the body of knowledge of sustainability considerations in all the life cycle phases of pavement systems.

Reference Center

This section provides access to the sustainable pavements reference document and other stand-alone articles from the document that cover key topics and core ideas.

- Technical Articles
- Resources
- Sustainable Pavements Reference Document

Technology Transfer

This section provides access to the Tech Briefs discussing the key concepts related to key pavement sustainability topics. Information and presentation materials on past and upcoming webinars on sustainable pavements are also provided.

- Technical Briefs
- Webinars

Technical Working Group

The FHWA established a Sustainable Pavements Technical Working Group (SP TWG) comprised of diverse stakeholders in the pavement and materials community including individuals from State Departments of Transportation and other public agencies, industries, and academia. The focus of the SP TWG is to provide technical input on sustainability specific to pavement systems and pavement materials.

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Rise of Rating Systems

Greenroads

Sustainable SITES Initiative™

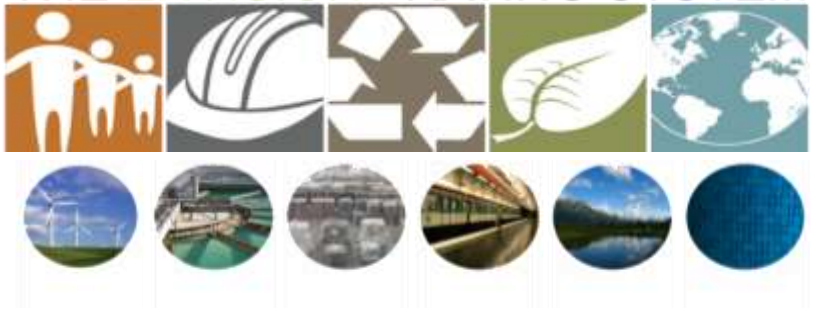
GreenLITES Certified

Green Streets

GreenPave

INVEST
ECONOMIC • SOCIAL • ENVIRONMENTAL

THE ENVISION RATING SYSTEM



ENERGY WATER WASTE TRANSPORT LANDSCAPE INFORMATION

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Implementation of Rating Systems

- Analogy to LEED
- Any Different
  - Timing
  - Cost
- Show of Hands
- What is True Commitment?
- Actions Speak
- Low Bid vs. Best Value vs. Design/Build

System Planning Criteria by Sustainability Principle

Criterion Number and Title	Triple Bottom Line Principles		
	Social	Environmental	Economic
SP-1: Integrated Planning: Economic Development and Land Use			x
SP-2: Integrated Planning: Natural Environment		x	
SP-3: Integrated Planning: Social	x		
SP-4: Integrated Planning: Bonus	x	x	x
SP-5: Access & Affordability	x	x	x
SP-6: Safety Planning	x		x
SP-7: Multimodal Transportation and Public Health	x		x
SP-8: Freight and Goods Movement	x	x	x
SP-9: Travel Demand Management	x	x	x
SP-10: Air Quality	x	x	
SP-11: Energy and Fuels	x	x	x
SP-12: Financial Sustainability			x
SP-13: Analysis Methods	x	x	x
SP-14: Transportation Systems Management & Operations	x	x	x
SP-15: Linking Asset Management and Planning		x	x
SP-16: Infrastructure Resiliency	x	x	x
SP-17: Linking Planning and NEPA	x	x	x

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Sustainability Rating Systems

- Greenroads
  - https://www.greenroads.org/
- INVEST
  - https://www.sustainablehighways.org/
- Envision
  - http://www.sustainableinfrastructure.org/
- What about STARS, Complete Streets, …

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What is Greenroads?

An independent 3rd party sustainability rating system for transportation design and construction. It awards points for more sustainable practices and can help quantify and communicate the sustainable attributes of a transport project.

It is like LEED® for roads.

Greenroads Categories: Version 2

Category	Description	Points
Project Requirements	12 minimum requirements for a Greenroad	0
Core Credits		
Environment & Water	Habitat, vegetation, soil, water, stormwater	30
Construction Activities	Construction equipment, processes, quality	20
Materials & Design	Material processing, transport, design	24
Utilities & Controls	Operational systems, mobility, maintenance	20
Access & Livability	Modal access, culture, aesthetics, safety	21
	Total Voluntary Credit Points	**115**
Creativity & Effort	Local values, integrated teams, write your own	15
	Total Points	**130**

Greenroads Certification Levels

Greenroads BRONZE CERTIFIED

40-49 points

Greenroads SILVER CERTIFIED

50-59 points

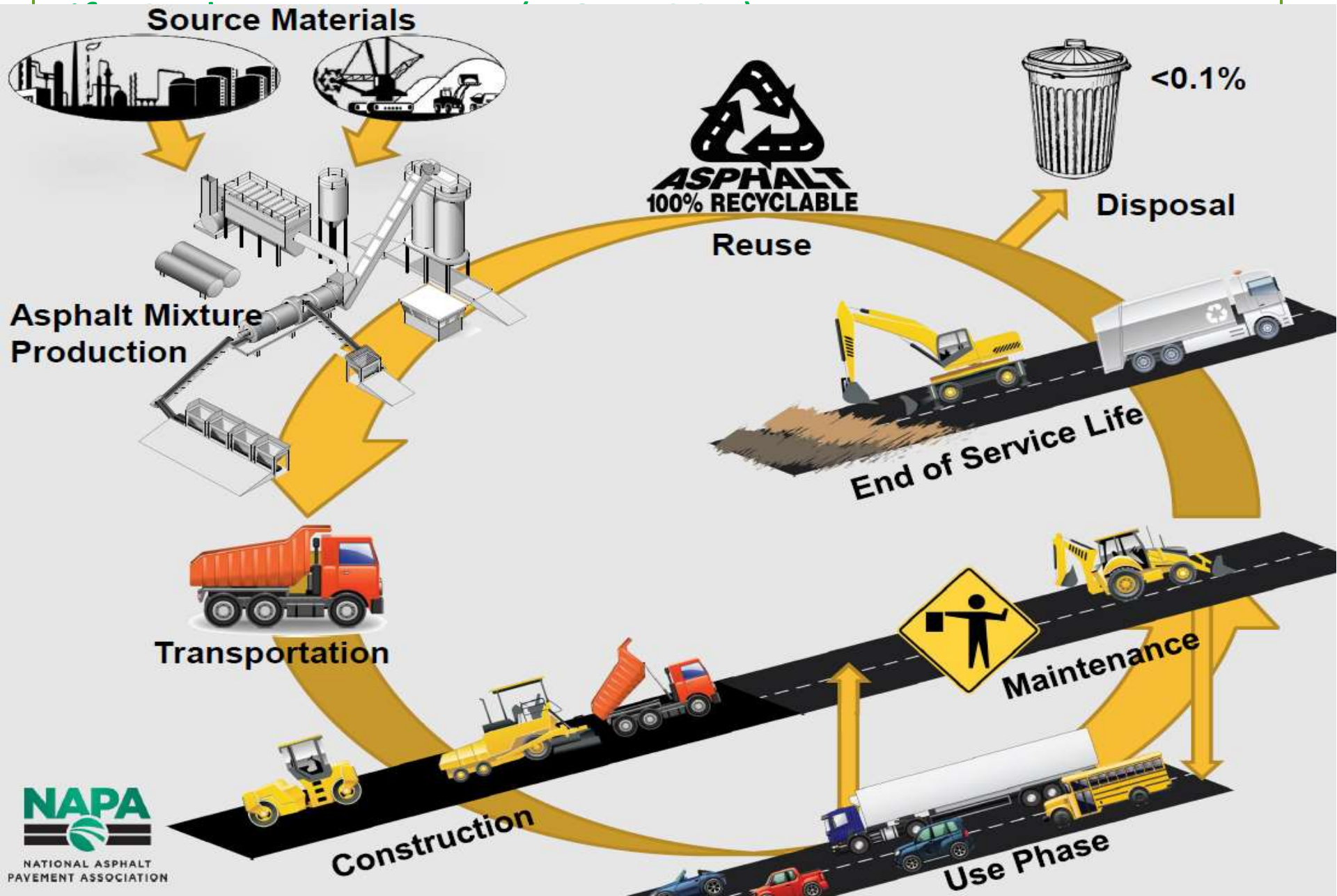
Greenroads GOLD CERTIFIED

60-79 points

Greenroads EVERGREEN CERTIFIED

80+ points

What is LCA?


Source Materials
ASPHALT
100% RECYCLABLE
Reuse
<0.1%
Disposal
Asphalt Mixture Production
End of Service Life
Transportation
Maintenance
Construction
Use Phase
NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

What is an EPD?

Environmental Product Declaration

Definition

Quantified environmental data for a product using predetermined standard parameters.

EPDs are LCAs for a particular product (or set of products)

Nutrition Facts

Serving Size 1/2 cup (115g)
Servings Per Container About 4

Amount Per Serving	
Calories 250	**Calories from Fat** 130
	% Daily Value*
Total Fat 14g	**22%**
Saturated Fat 9g	**45%**
Cholesterol 55mg	**18%**
Sodium 75mg	**3%**
Total Carbohydrate 26g	**9%**
Dietary Fiber 0g	**0%**
Sugars 26g	
Protein 4g	
Vitamin A 10%	Vitamin C 0%
Calcium 10%	Iron 0%

* Percent Daily Values are based on a 2,000 calorie diet.

Table 4b. Summary of ekkomaxx LCIA Results per Cubic Yard of Concrete* (IP units)

Impact category	Unit	Total
Climate change	kg CO_2 eq	6.33E+01
Ozone depletion	kg CFC-11 eq	3.40E-06
Acidification	kg SO_2 eq	4.29E-01
Eutrophication	kg N eq	1.53E-01
Smog	kg O_3 eq	6.77E+00

*The notation in the table is a modified scientific notation, for example 1.234E-02 means 1.234×10^{-2} which is equal to 0.01234.

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PCC EPD Example

Results Categories	Unit	Mix Code 10014375 (4000 psi)	Mix Code 10019170 (8000 psi)
Inventory Metric			
Total primary energy consumption	MJ	2646	3678
Concrete batching water consumption	m^3	0.161	0.104
Concrete washing water consumption	m^3	0.061	0.064
Total water consumption	m^3	21	17.4
Depletion of non-renewable energy resources	MJ	2612	3628
Depletion of non-renewable material resources	kg	2448	2494
Use of renewable material resources	kg	0.764	1.030
Use of renewable primary energy	MJ	33.9	50.4
Hazardous waste	kg	3.38E-04	1.05E-01
Non-hazardous waste	kg	0.731	0.726
Impact Assessment Metrics			
Climate change	kg CO_2 eq	432	633
Ozone depletion	kg CFC-11 eq	5.61E-06	8.27E-06
Acidification	kg SO_2 eq	2.29	3.34
Eutrophication	kg N eq	0.068	0.094
Photochemical ozone creation/Smog	kg O_3 eq	32.9	45.8

Company: Argos

Product: 4000 and 8000 psi concrete

Country: Panama

Length: 11 pages

Valid: 2014-2019

EPD for Concrete

An EPD we can All Understand

EPD for Beer

Company: Carlsberg

Product: Beer

Country: Italy

Length: 14 pages

Valid: 2014-2017

Functional unit: 100 L of beer

	Glass Bottle	DM M20 Keg	Aluminium Can	DM M20 Keg
Resources Consumed (In kg)	45,73	6,56	11,98	6,56
		-596,90%		-82,57%
Water Consumption (litres)	1 163,60	589,42	711,63	589,42
		-97,40%		-20,74%
Energy Consumption (In MJ)	2 000,88	641,8	993,12	641,8
		-211,80%		-54,74%
Global Warming Potential (Gwp100) (Kg CO_2 Eq)	124,77	34,95	59,96	34,95
		-257,00%		-71,56%
Total Waste (Kg)	28,73	4,54	10,71	4,54
		-532,30%		-135,58%

Sustainability Is In OUR Hands!

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THE ROAD AHEAD

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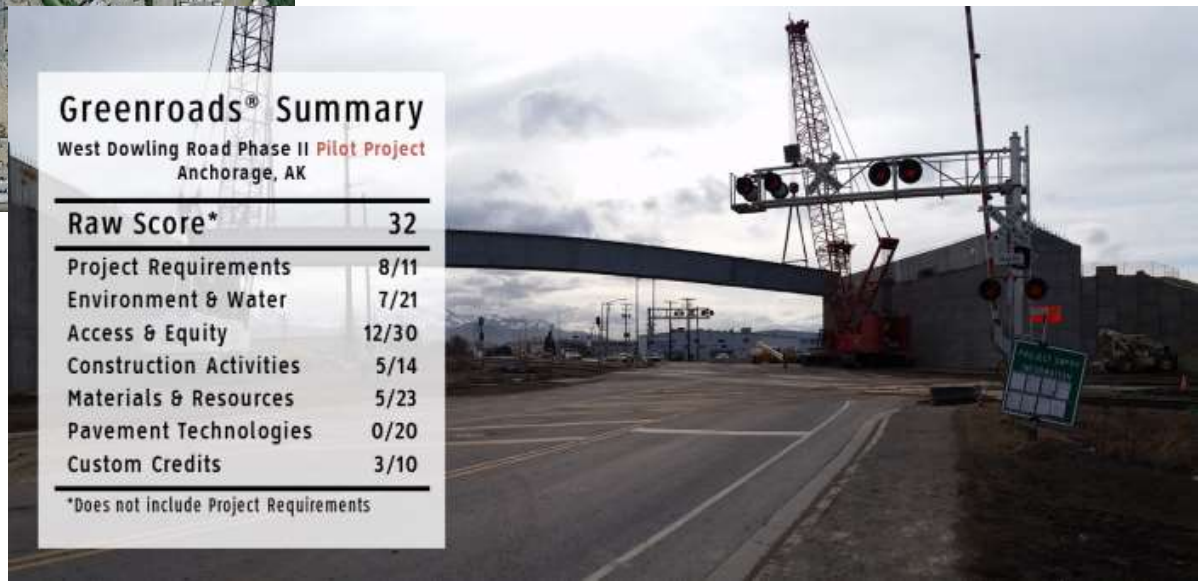
Alaska Department of Transportation & Public Facilities

Greenroads

Robert DeVassie, PE, STP

West Dowling Road Phase II



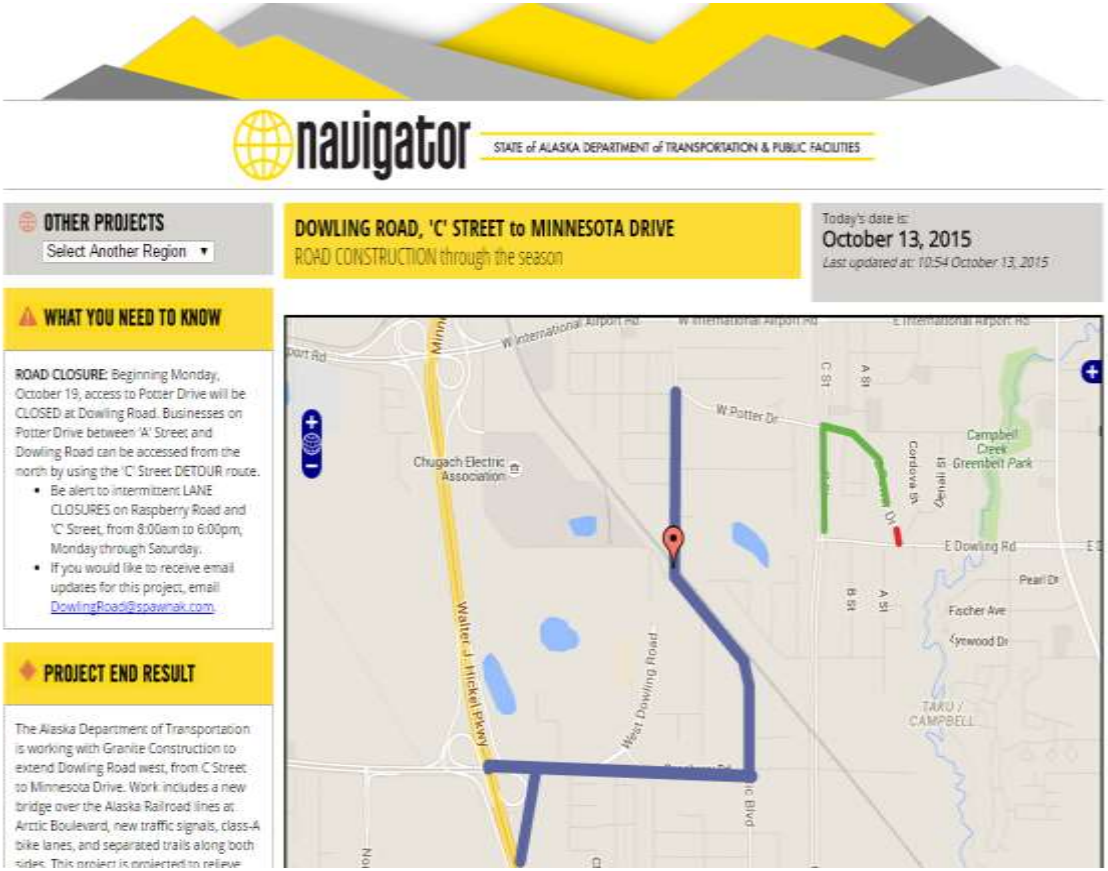
Greenroads® Summary

West Dowling Road Phase II Pilot Project
Anchorage, AK

Raw Score*	32
Project Requirements	8/11
Environment & Water	7/21
Access & Equity	12/30
Construction Activities	5/14
Materials & Resources	5/23
Pavement Technologies	0/20
Custom Credits	3/10

*Does not include Project Requirements

In the News



Project Website

Navigator

http://www.alaskanavigator.org/projects/dowling-road-c-street-to-minnesota-drive

What's Next?

DOWLING ROAD

- Register for Certification
- Submit additional information for Certification
- Display and Publicize Greenroads Rating-System

Other Projects

- Add Greenroads Rating-System to Request for Proposals (RFPs)
- Educate
- Build Support