FLY ASH AS BINDER FOR SOFT SOILS

ABSOILS SEMINAR 11.-12.9.2014

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LIFE09 ENV/FI/575 ABSOILS

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HOW MUCH CAN WE STABILISE WITH FLY ASHES ?

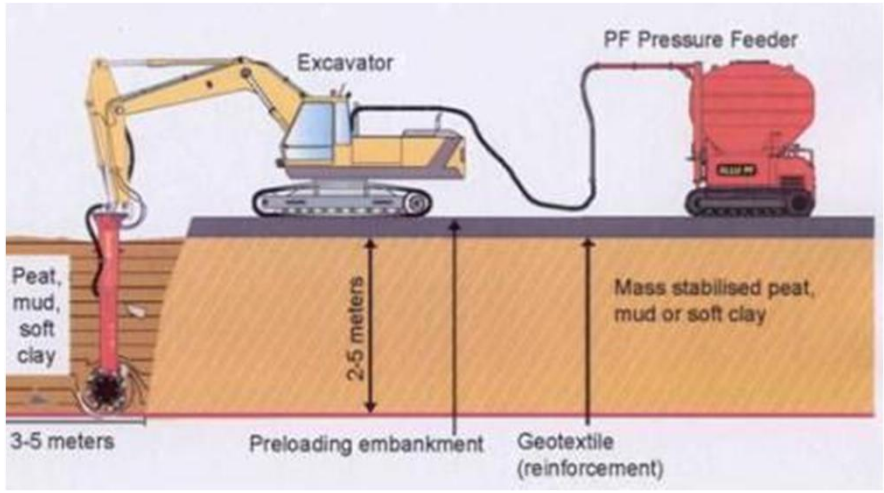
Helsinki Energy:

Fly ash	78 000 t/a
DSW	12 000 t/a
=	90 000 t/a

Stabilisation of clay:

Fly ash 100-200 kg/m³ -> about

0,5-1,0 million m³ (stabilised clay)



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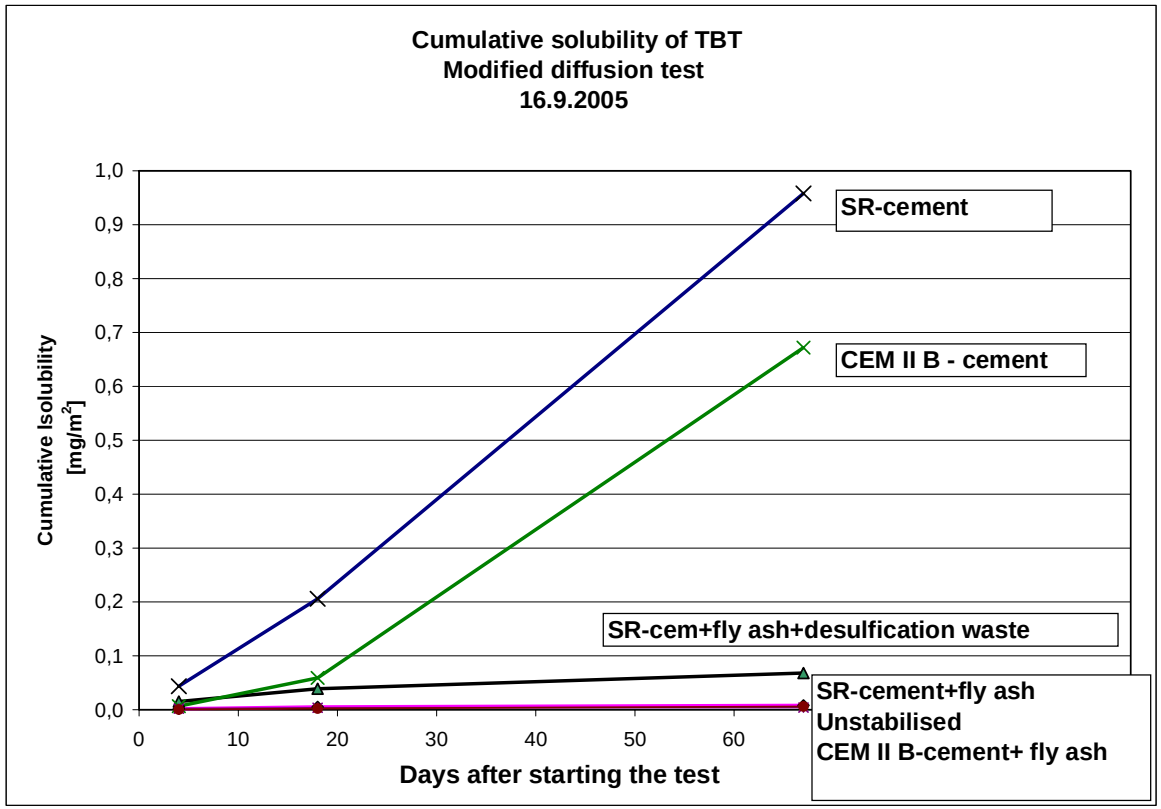
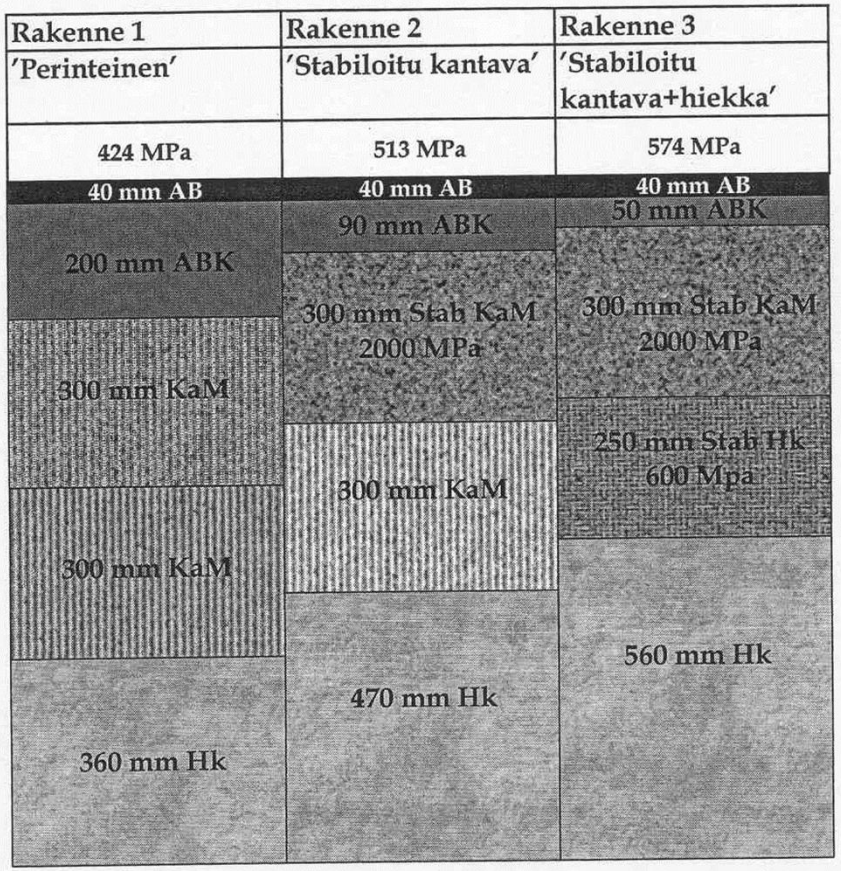
VUOSAARI HARBOUR, MASS STABILISATION OF TBT-SEDIMENT, 2005-2006

BINDER RECEPTATION

- Results of a leaching test



NEW HARBOUR IN VUOSAARI, HELSINKI 2008

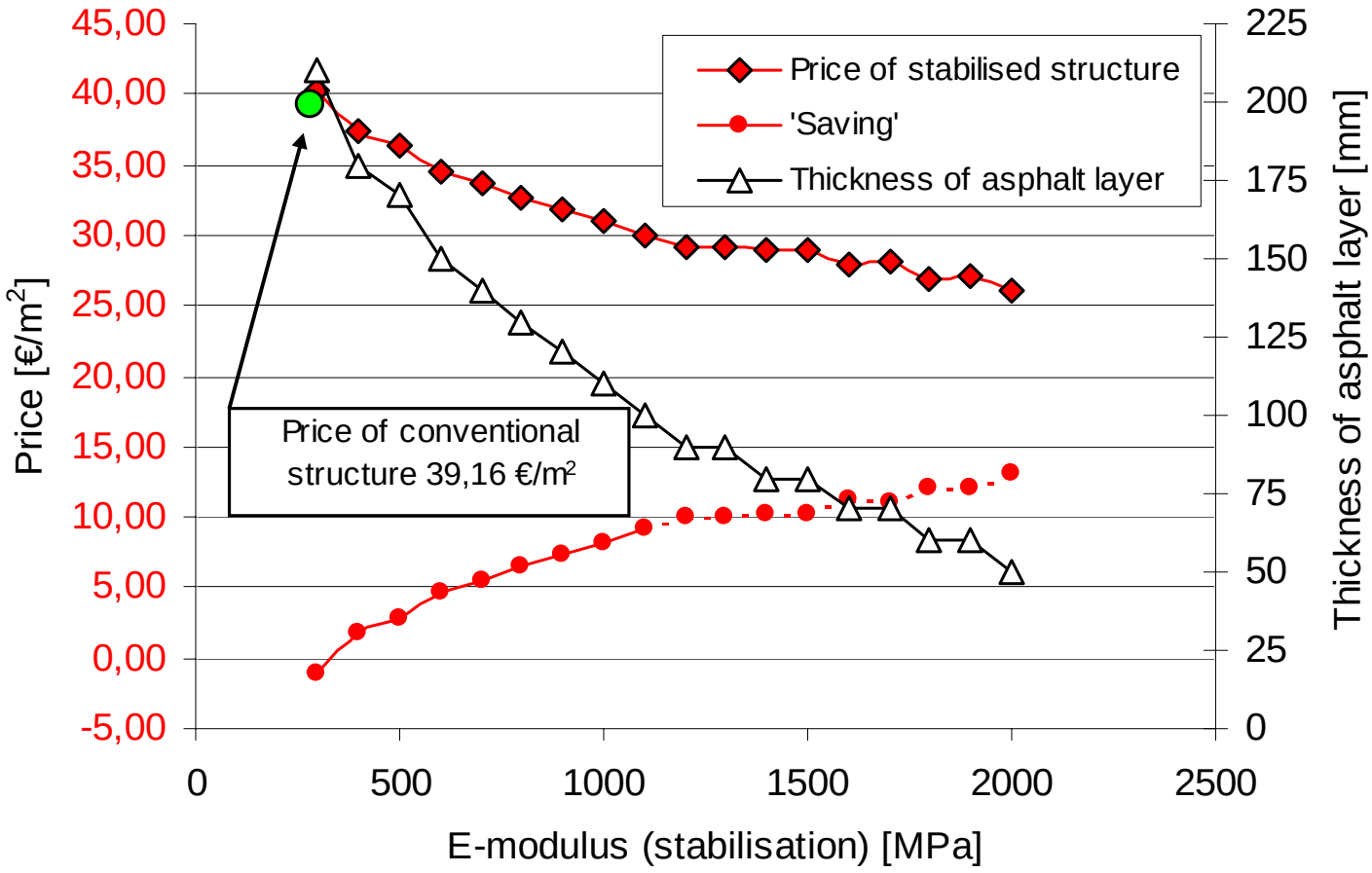


Kuva 4. Kulkuväylien rakenteet.

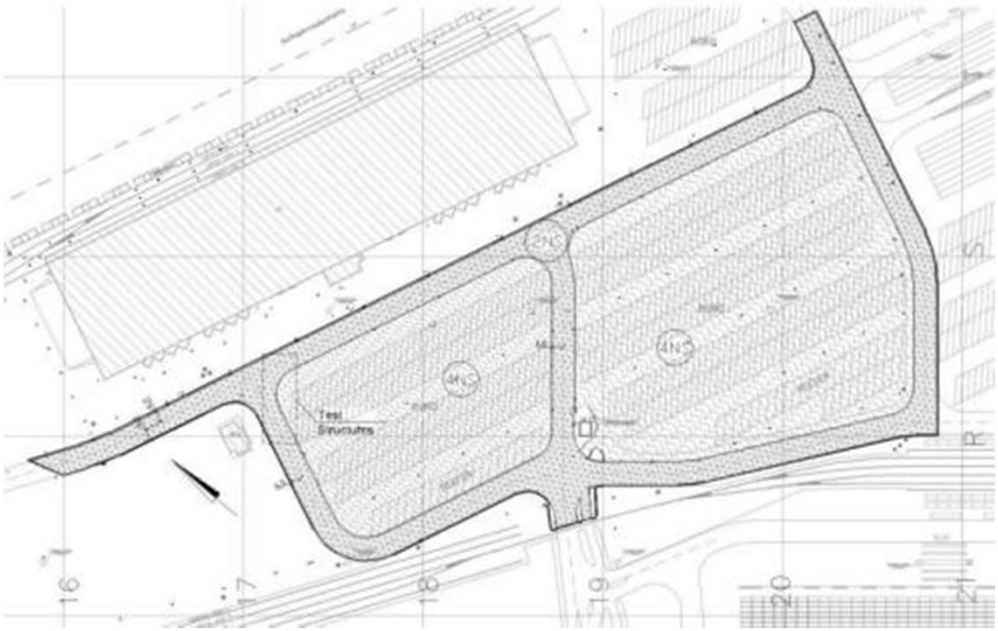
Taulukko 2. Kulkuväylien rakenteet ja kustannukset

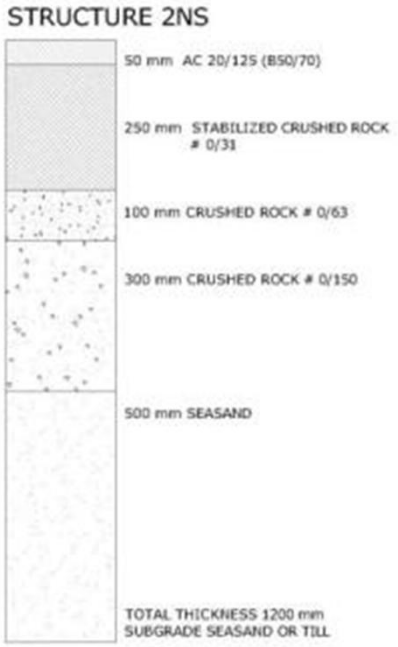
Rakenne 1			Rakenne 2			Rakenne 3		
	mm	€		mm	€		mm	€
AB	40	4,60	AB	40	4,60	AB	40	4,60
ABK	200	20,00	ABK	90	9,00	ABK	50	5,00
KaM	600	15,60	Stab.KaM	300	10,06	Stab.KaM	300	10,06
Hk	360	1,08	KaM	300	7,80	Stab.Hk	250	4,55
			Hk	470	1,41	Hk	560	1,68
Yhteensä	**1200**	**41,28**		**1200**	**32,87**		**1200**	**25,89**

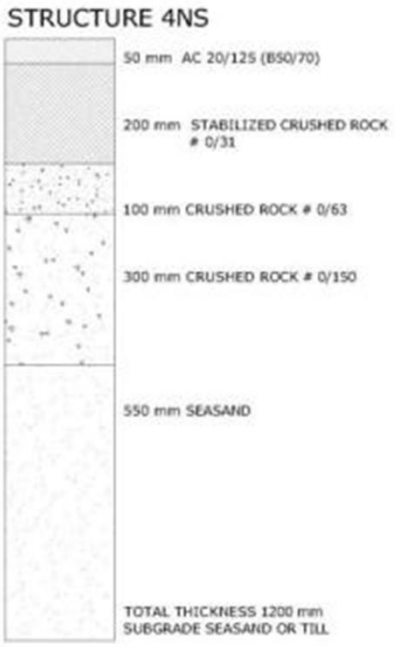
EFFECT OF THE E-MODULUS OF A STABILISED BASE COURSE TO THE THICKNESS OF THE COVERING COURSE AND THE COSTS.



THE SITEMAP OF THE PILOT STRUCTURES, 60000 M^2







CONSTRUCTION OF THE PILOT STRUCTURE

storage stacks

stationary multimode mixer

CONSTRUCTION OF THE PILOT STRUCTURE

asphalt spreading machine

stabilising cutter

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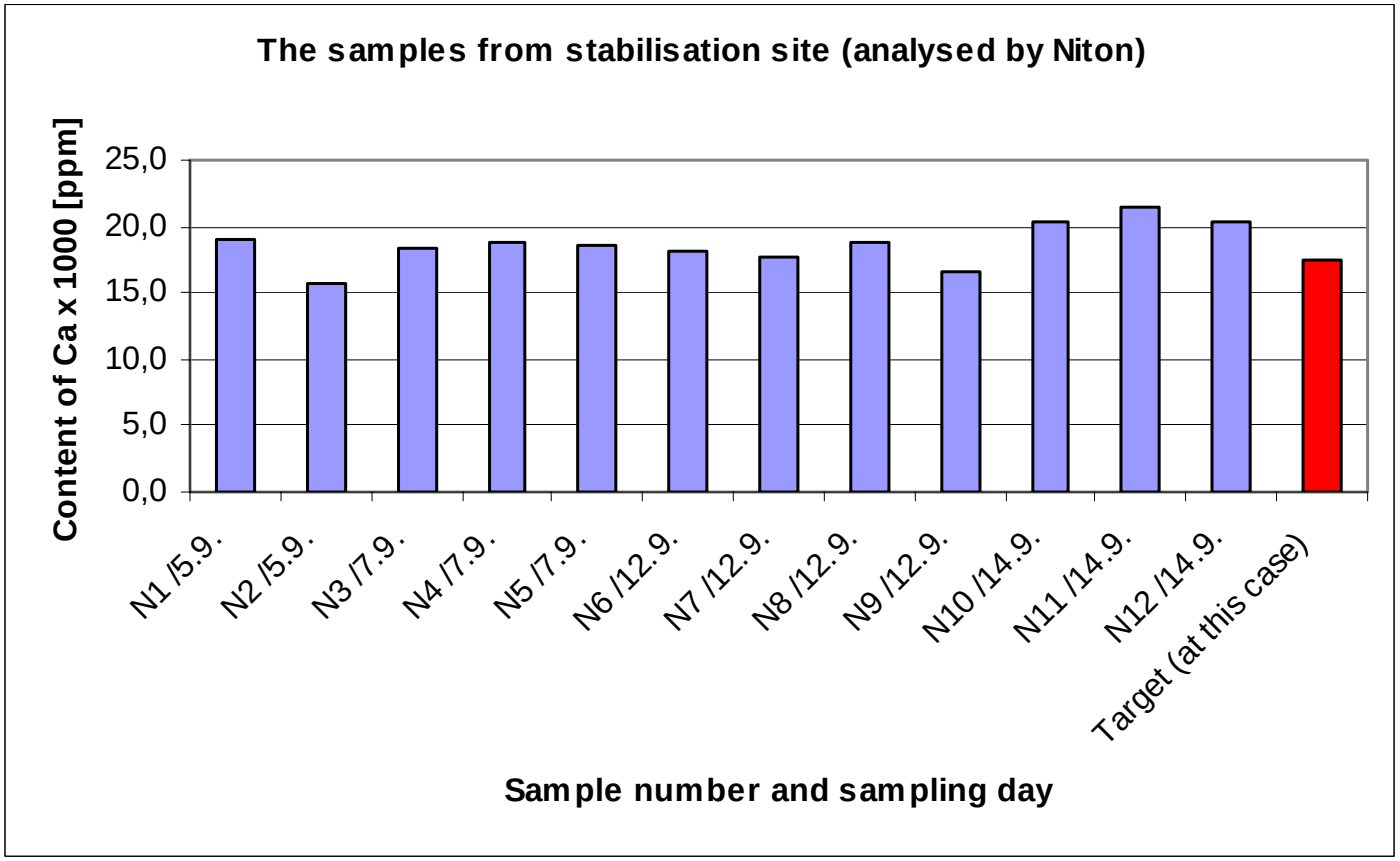
QUALITY CONTROL DURING CONSTRUCTION OF THE PILOT STRUCTURE



The content of calcium in samples taken and measured with Niton after stabilising cutter. The columns give an average value of five parallel measurements.

THE COMPLETED PILOT STRUCTURE (60 000 M^2) READY FOR USE, CONSTITUTING 4 % OF THE HARBOUR FIELD (150 HECTARES).

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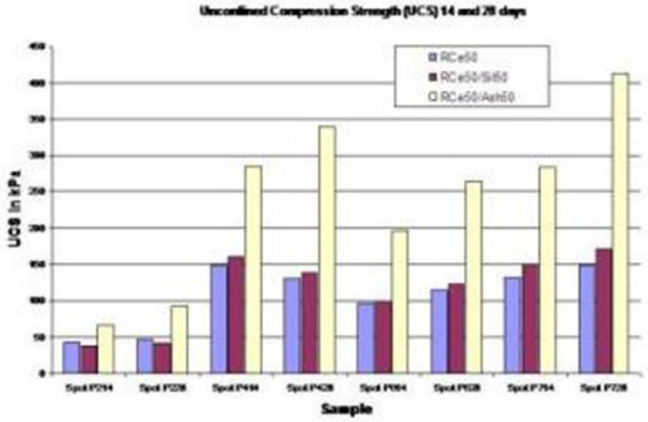
STABILISATION OF CONTAMINATED DREDGED MASSES WITH FLY ASH BINDER ADMIXTURE

The Pilotproject in Trondheim harbour

The Pilotproject in Trondheim harbour

Unconfined compression tests – stabilized sediments



Pilotprosjektet i Trondheim havn

Trondheim Havn SCC SELMER SKANSKA

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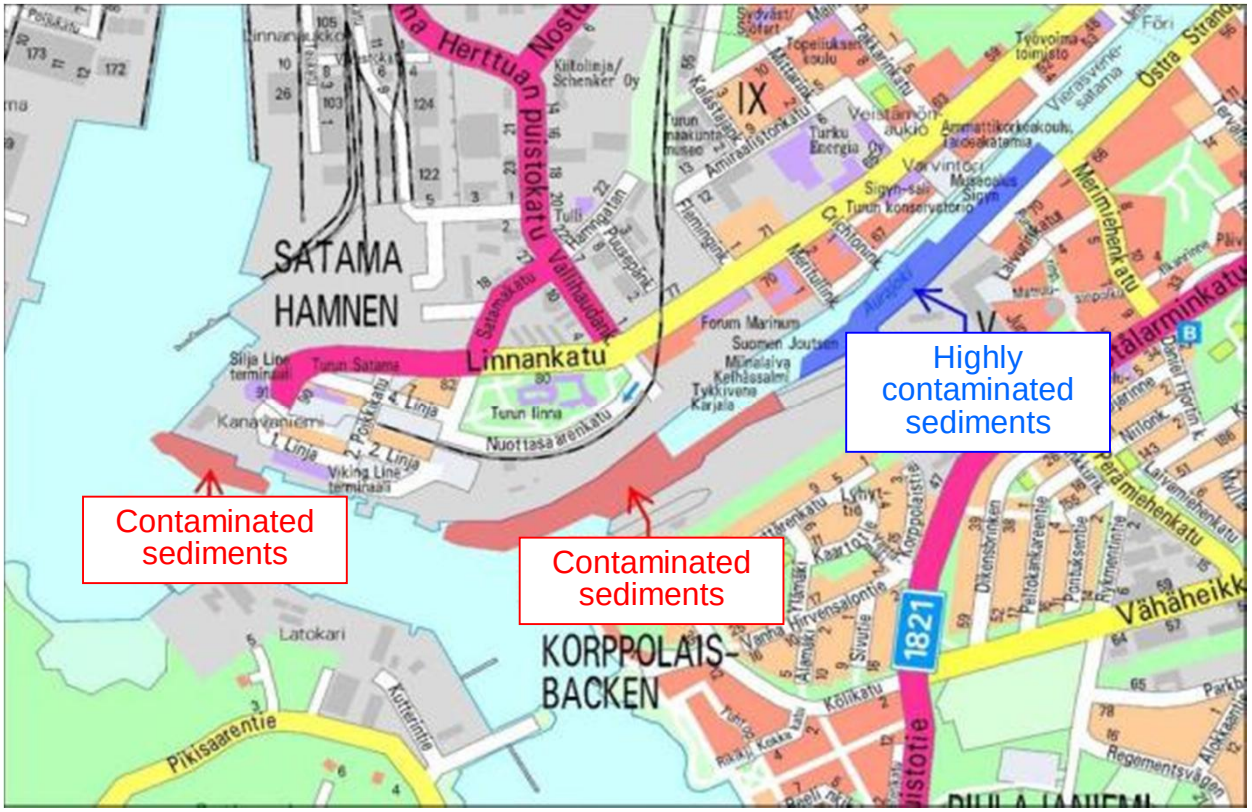
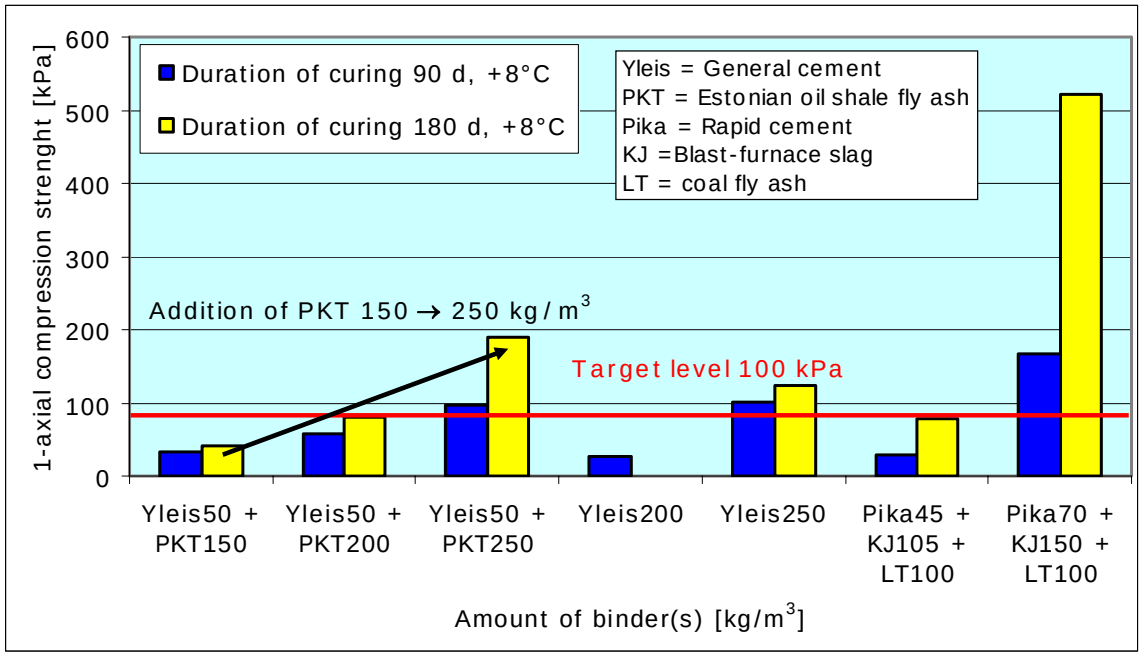
MAP OF THE CONTAMINATED AREAS IN THE RIVER AURA, TURKU

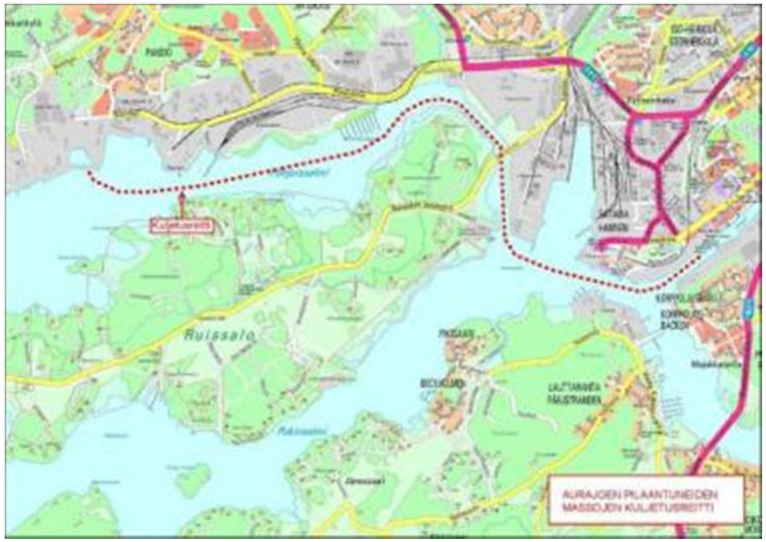


BINDER RECIPE MAKING

- It is very effective and economic to use industrial by-products. In the case of the Aura river, the most effective by-products combined with cement are coal fly ash, blast-furnace slag and oil shale ash.



TRANSPORTATION ROUTE OF THE SEDIMENTS, PANSIO LAGOON



PIANC AGA TECHNICAL SEMINAR 27.5.2009

IN-SITU STABILISATION OF CONTAMINATED SEDIMENTS IN FINLAND – CASE AURAJOKI

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SMOCS WORKSHOP, KOKKOLA 2011 SEPTEMBER 14TH

SUSTAINABLE MANAGEMENT OF CONTAMINATED SEDIMENTS,

CASE KOKKOLA

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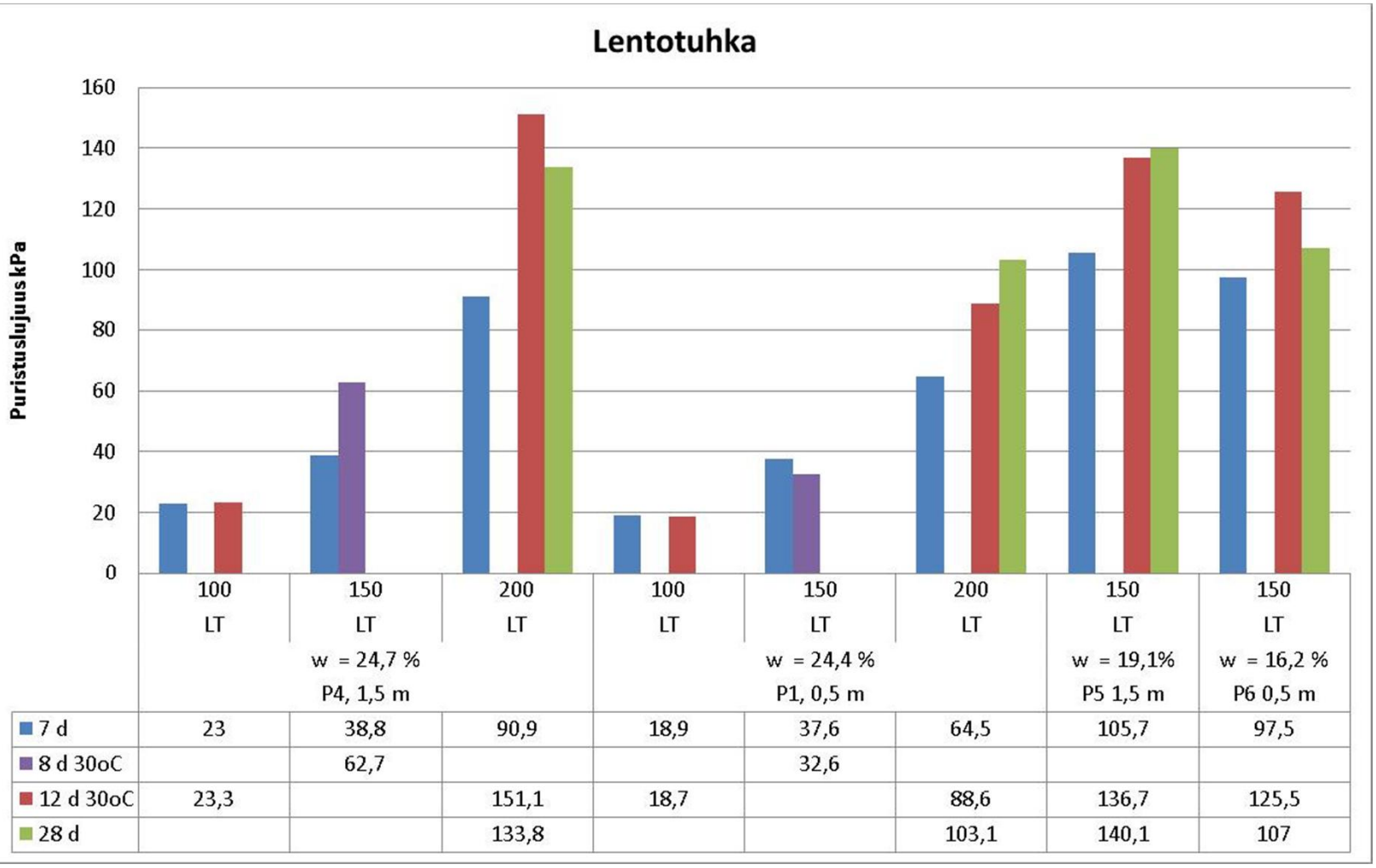
CASE KOKKOLA
DEEP PORT
RAILWAY YARD
SILVERSTONE PORT
PORT OF KOKKOLA, FINLAND
GENERAL PORT

DREDGING AND DUMPING

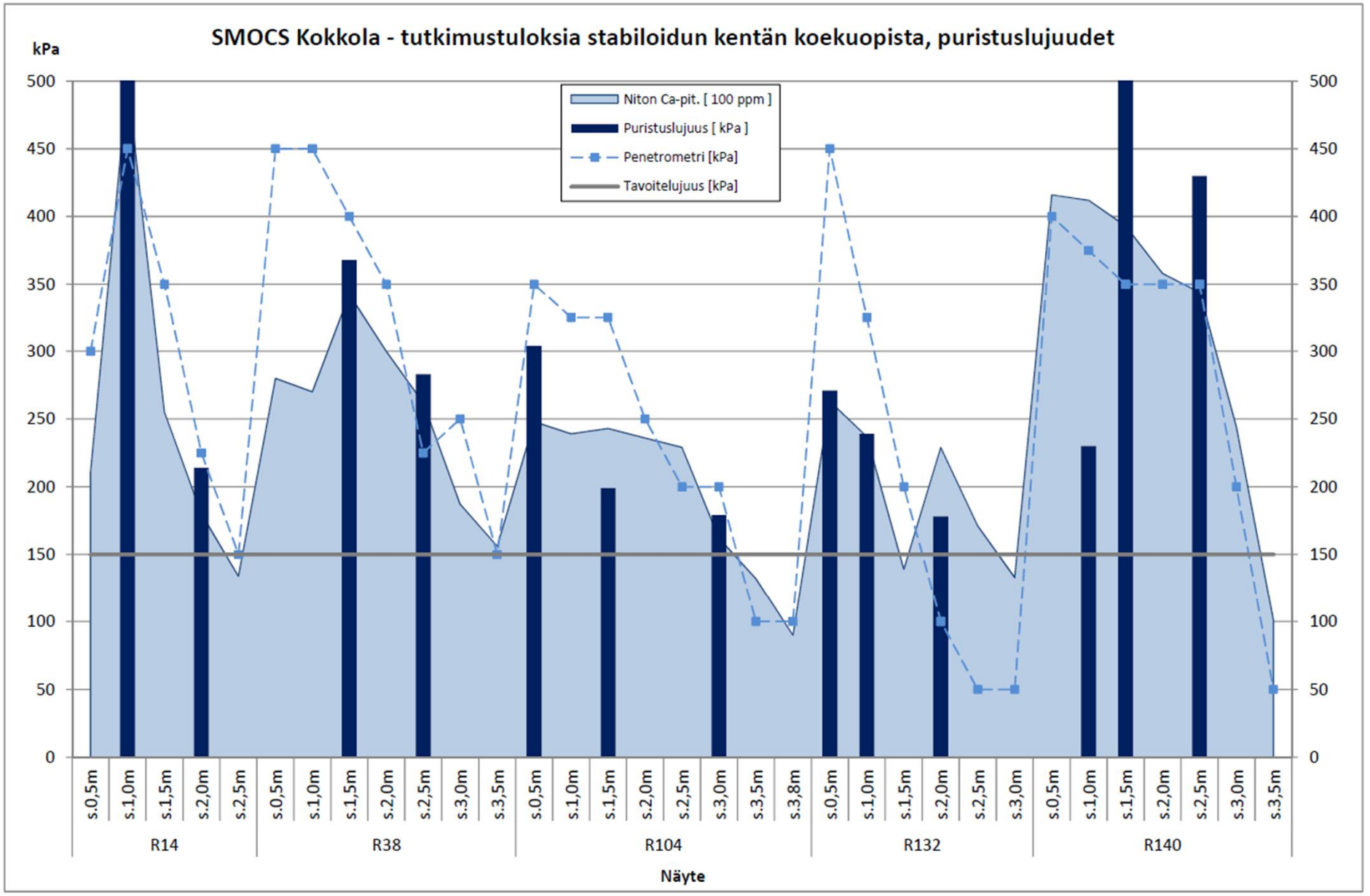
STABILISATION BASIN BEFORE STABILISATION

PRELIMINARY TEST RESULTS, FLY ASH



	100 LT	150 LT w = 24,7 % P4, 1,5 m	200 LT	100 LT	150 LT w = 24,4 % P1, 0,5 m	200 LT	150 LT w = 19,1% P5 1,5 m	150 LT w = 16,2 % P6 0,5 m
7 d	23	38,8	90,9	18,9	37,6	64,5	105,7	97,5
8 d 30oC		62,7			32,6			
12 d 30oC	23,3		151,1	18,7		88,6	136,7	125,5
28 d			133,8			103,1	140,1	107

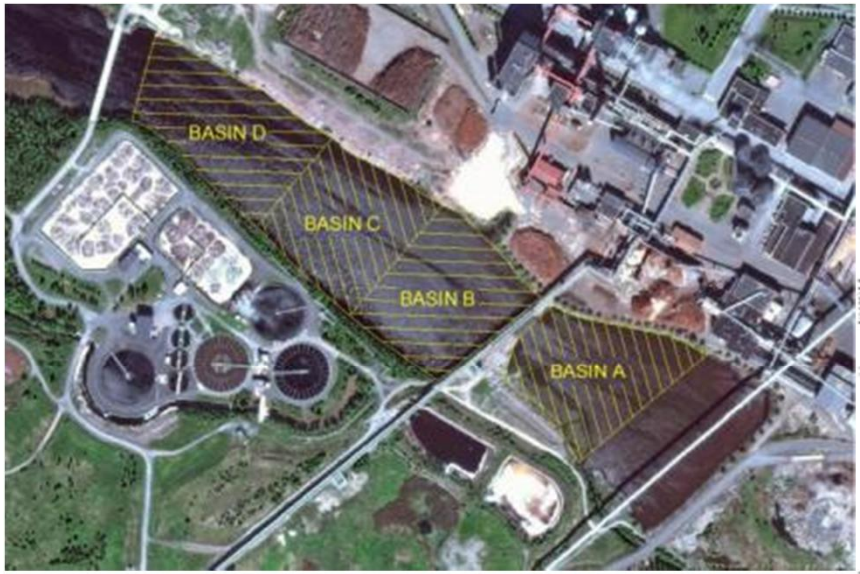
FIELD TEST RESULTS, ONE YEAR AFTER STABILISATION



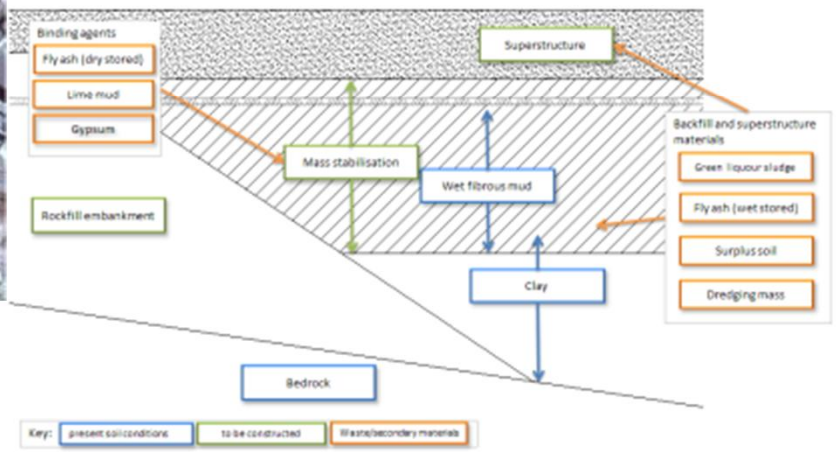
FINNISH RECYCLING MATERIAL PROGRAM
UUMA2

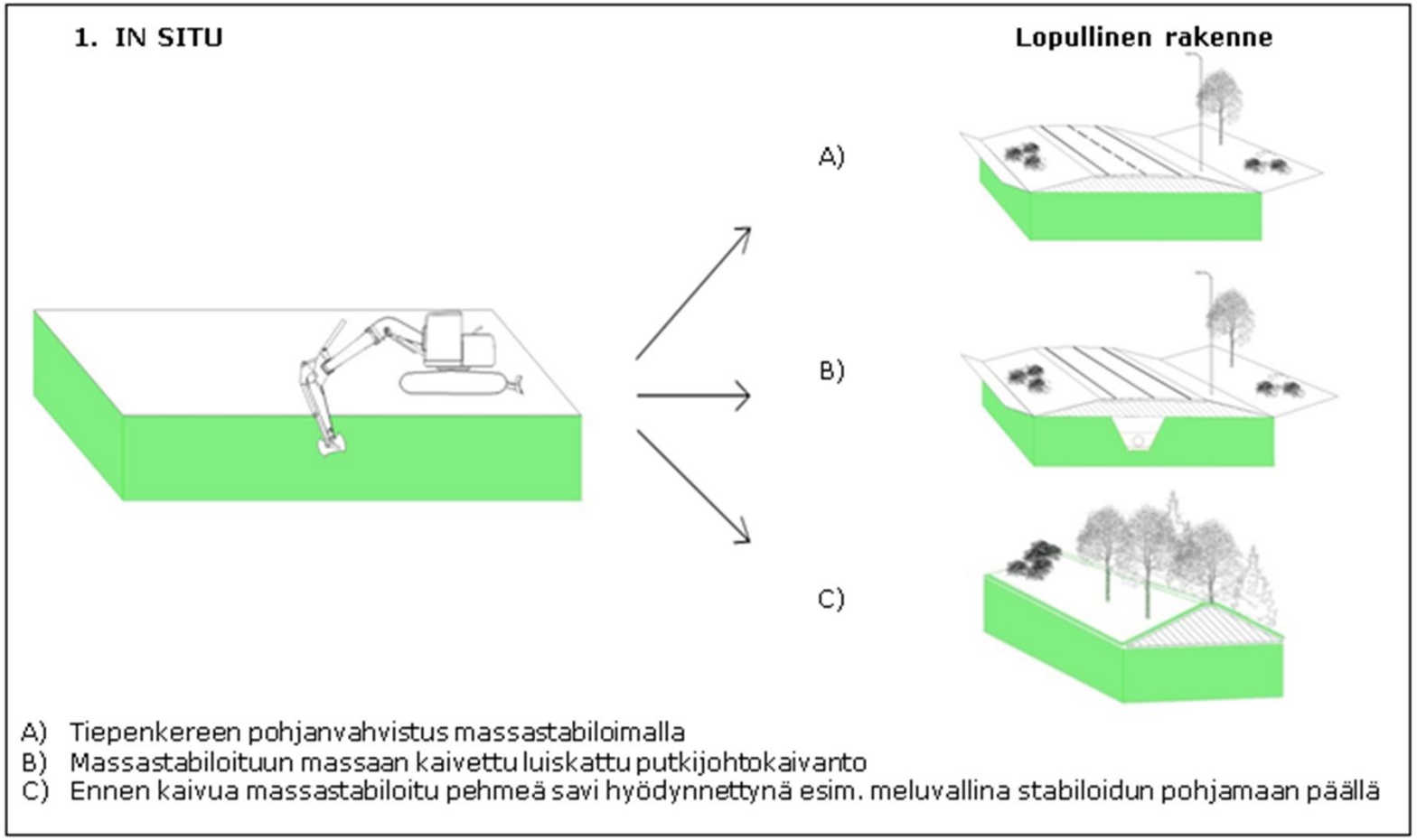
Demonstration projects

Roves

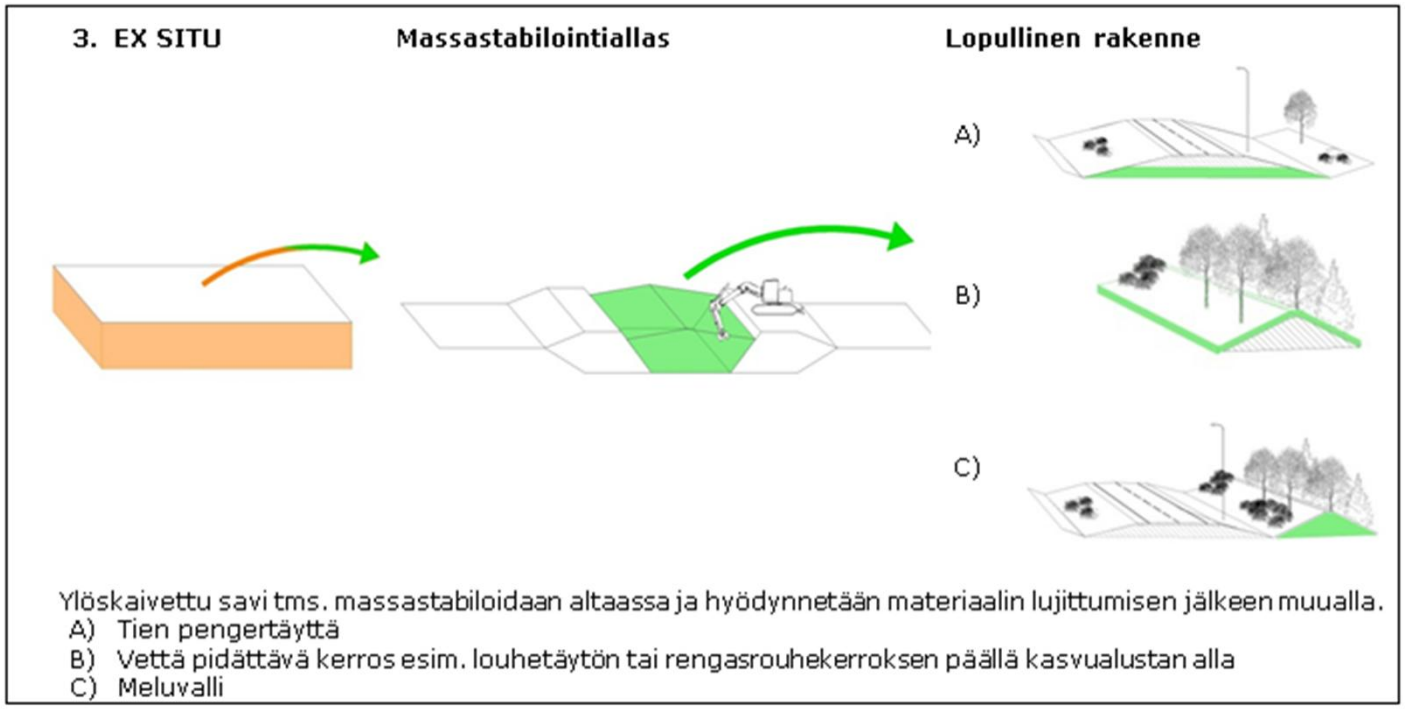


Sampaanalanlahti

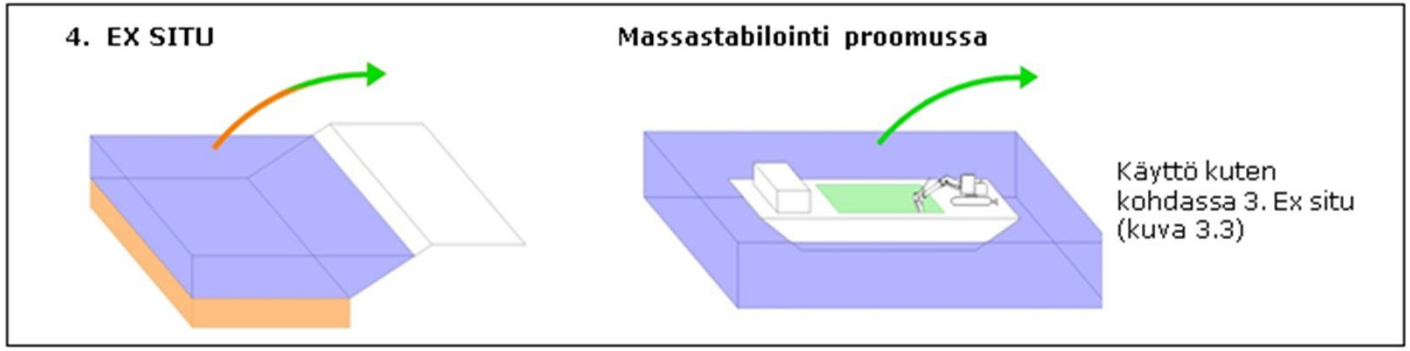




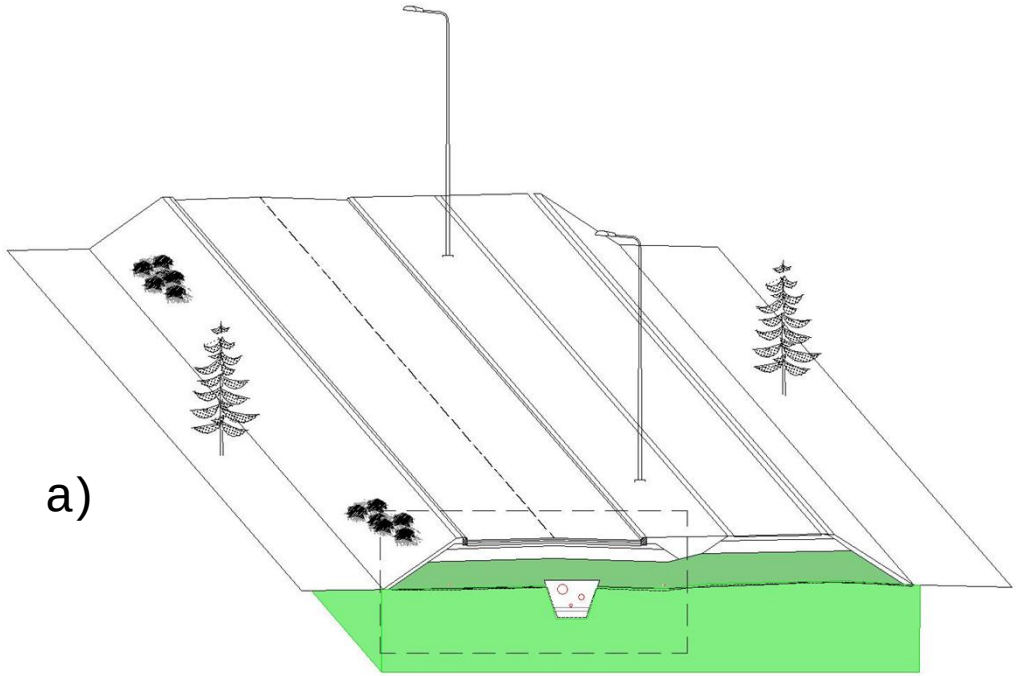
In-situ massastabilointi pohjavahvistuksena ja maarakennusmateriaalina

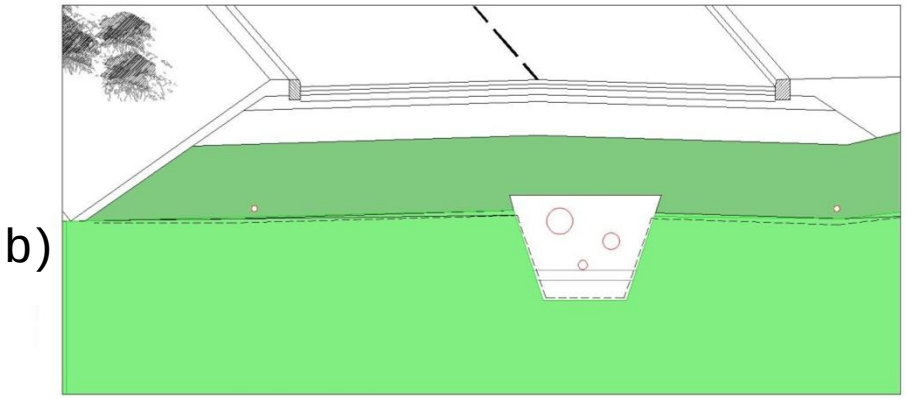


Ex-situ stabilointi, jossa stabilointialtaassa stabiloitu massa hyödynnetään muualla

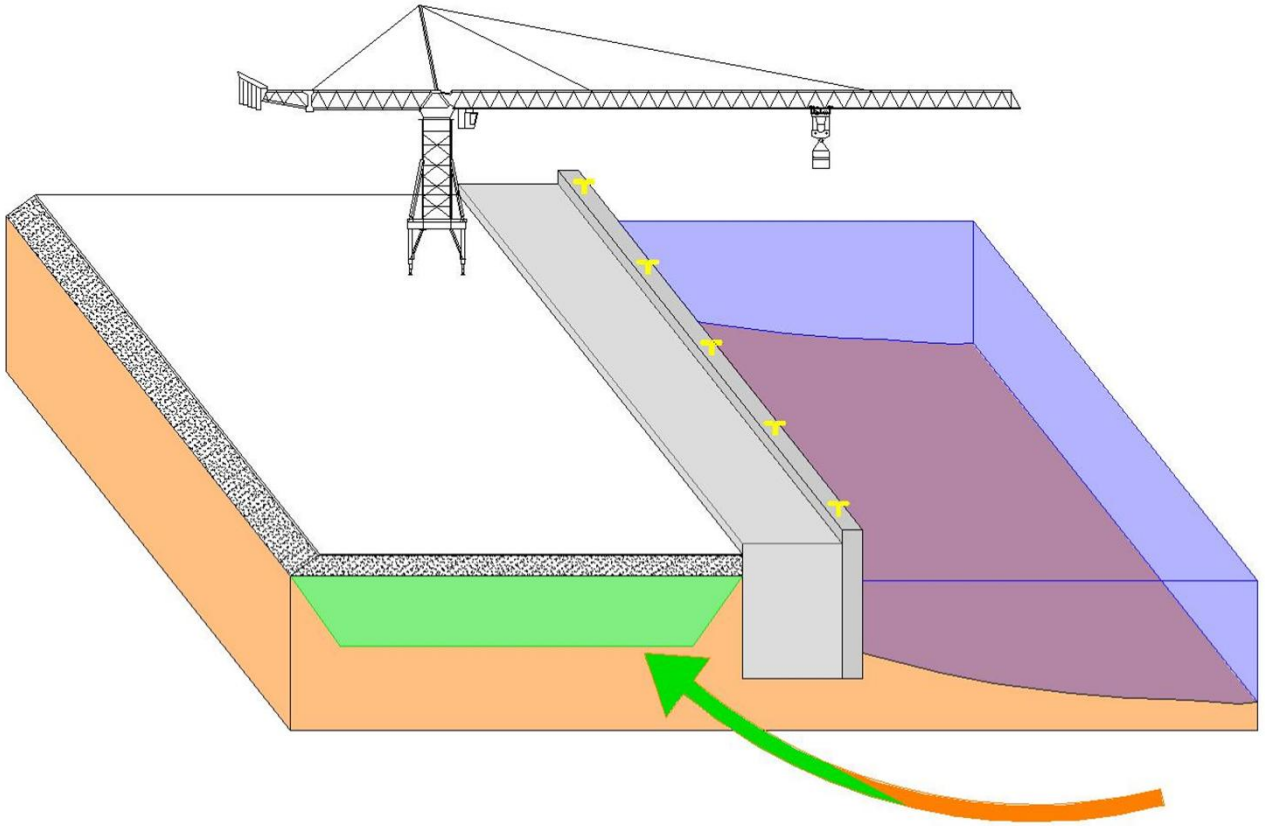


Ex-situ stabilointi, jossa stabilointialtaassa stabiloitu massa hyödynnetään muualla

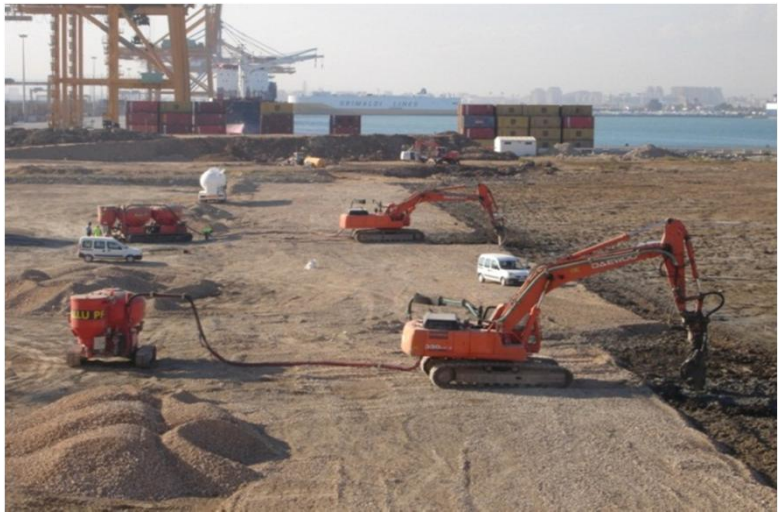




Massastabiloitu materiaali kadun pengertäytössä ja jakavassa kerroksessa (tumman vihreä, a). Massastabilointi pohjamaan lujittamisessa (vaalean vihreä, b) ja massastabilointiin kaivettu luiskattu kunnallistekniikan kaivanto.



Merestä ruopatut sedimentit on massastabiloitu ja hyödynnetty satamakentän täytössä ja päällysrakenteen alaosassa.



a) Massastabilointialtaat Vuosaaren satamassa (lähde: Vuosaaren satama), b) massastabilointi käynnissä Valencian satamassa (lähde: ALLU).

Viher- ja maisemarakentamisen täyttöjä massastabiloidusta heikkolaatuisesta ylijäämämaasta. Viherrakentamisessa 1. maisemointitäytöt, 2. raittien pengertäytöt, 3. maisemointikumpareet ja 4. raitin pohjanvahvistus.

Ida Aalbergin puisto. Syvästabiloitujen ylijäämäsavien hyödyntämistä Ida-Aalbergin puistossa (lähde: Aino-Kaisa Nuotio)

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a)

b)

Aluerakentamiskohde, jossa suoalue on muutettu kantavaksi ja rakentamiskelpoiseksi massastabilointia käyttäen a) ennen massastabilointia ja b) massastabiloinnin jälkeen (Lähde: Geoteknisen osaston julkaisu 92, 2007)


Aluerakentaminen
Viherrakentaminen
Kadut ja kunnallistekniikka
Meluvallit
Tulvavalli
Ympäristönsuojaus-rakenteet
Satamarakenteet
Satamakaari
Harbour Road in
Ropax Road
Provianttikatu
Diego Road
Harbour Road West
Cross Road
Trailer Road
Channel Road
Merenkulkijankatu
Ruusunlementie
Vuosaarenlahti
Nordsjöviken
Fotängen
Skatberget
Varissaari
Kråkholmen
Kalkkisaari
Kalkholmen
103
1
2
3

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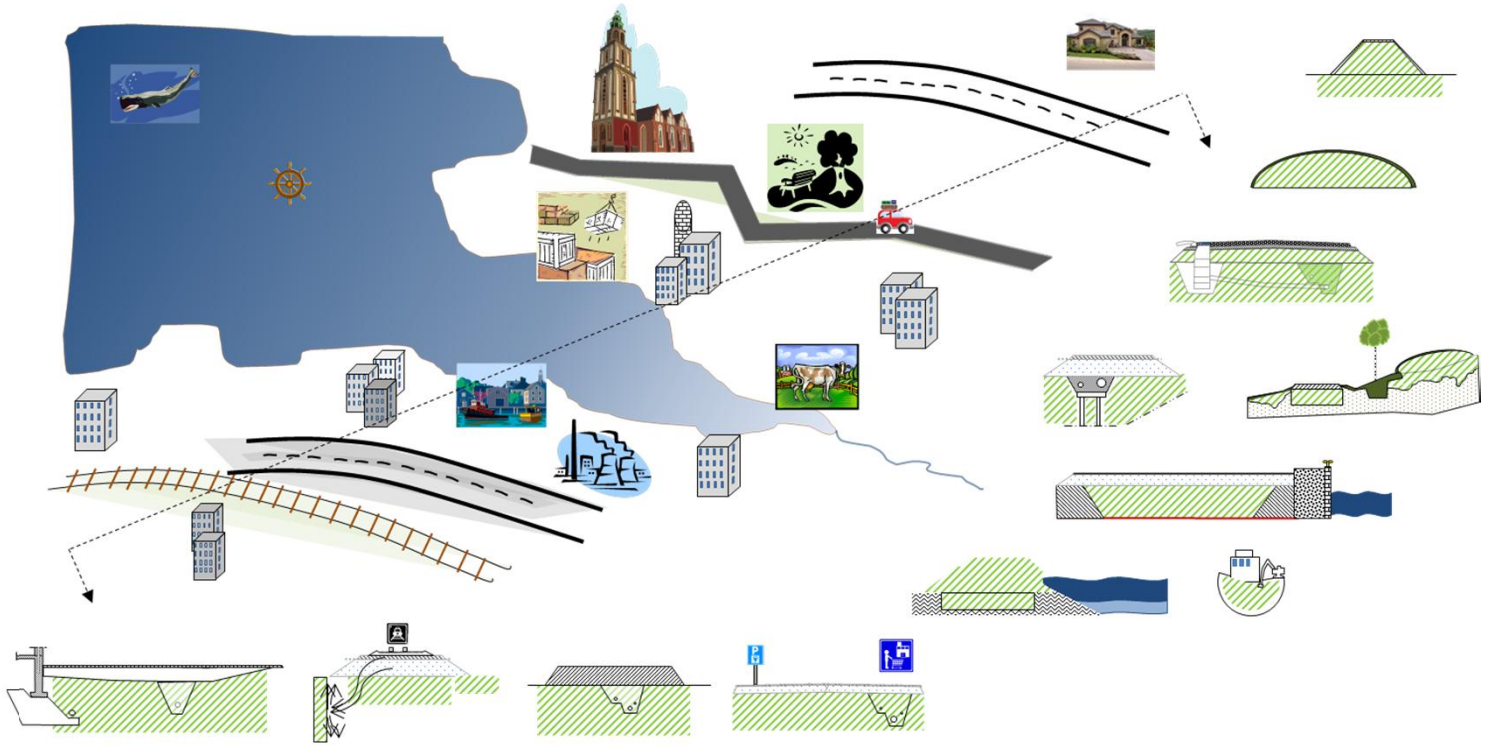
Aluerakentaminen ja sovellutukset

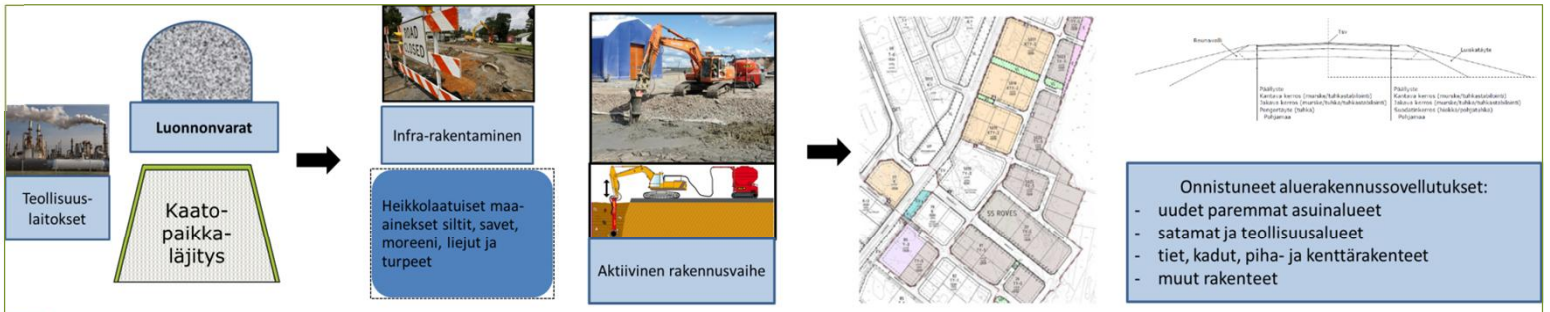
ALUESUUNNITTELU

- Kaavoitus
- Valtakunnalliset alueiden käyttö-tavoitteet
- Yleiskaava
- Asemakaava

ESIRAKENTAMINEN

- Rakentamisen prosessit
- Tarveselvitys ja hankesuunnittelu
- Rakennus-suunnittelu
- Rakentaminen
- Käyttöönotto





MASSA-STABILOINTI TEKNOLOGIA

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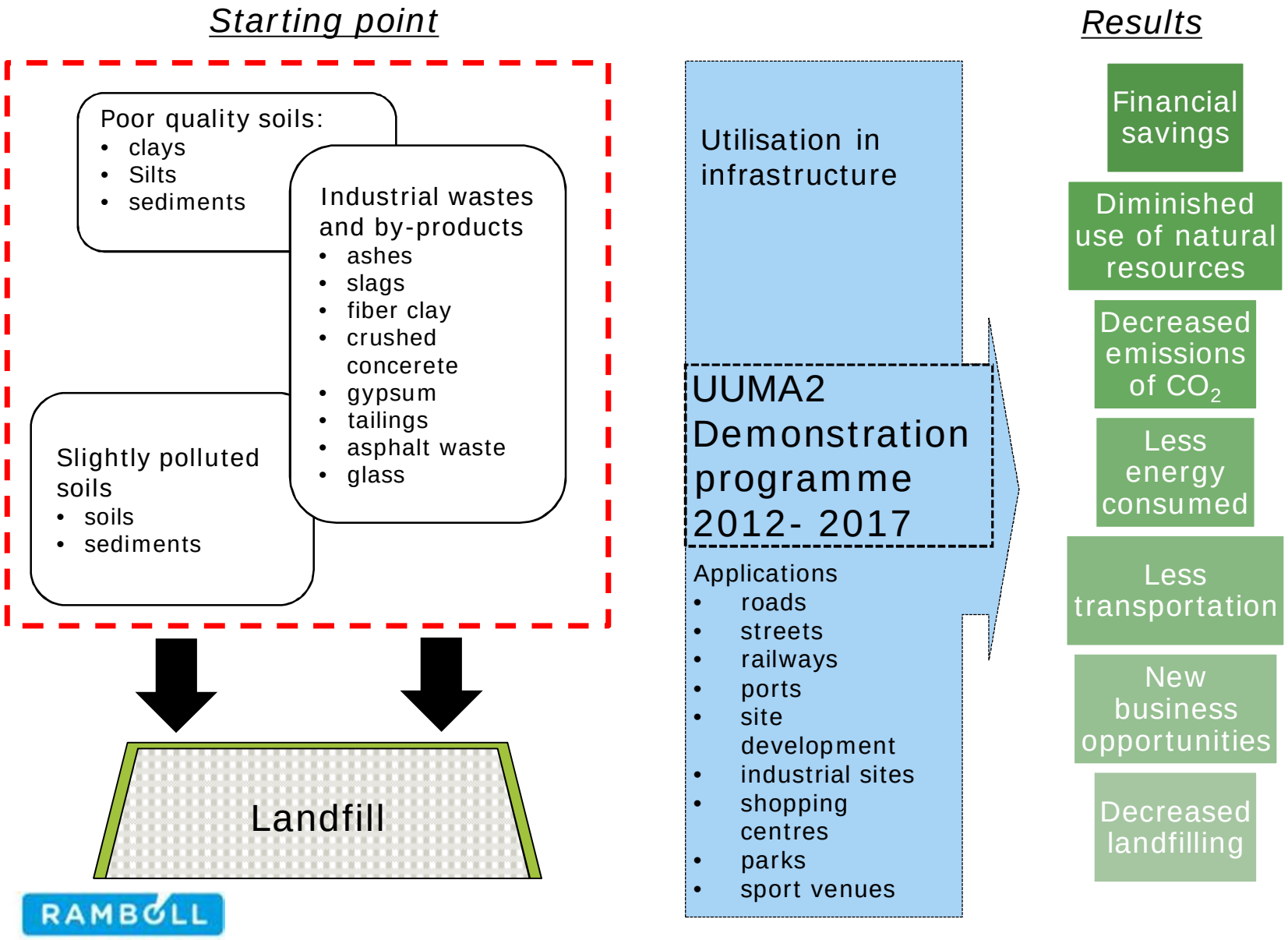
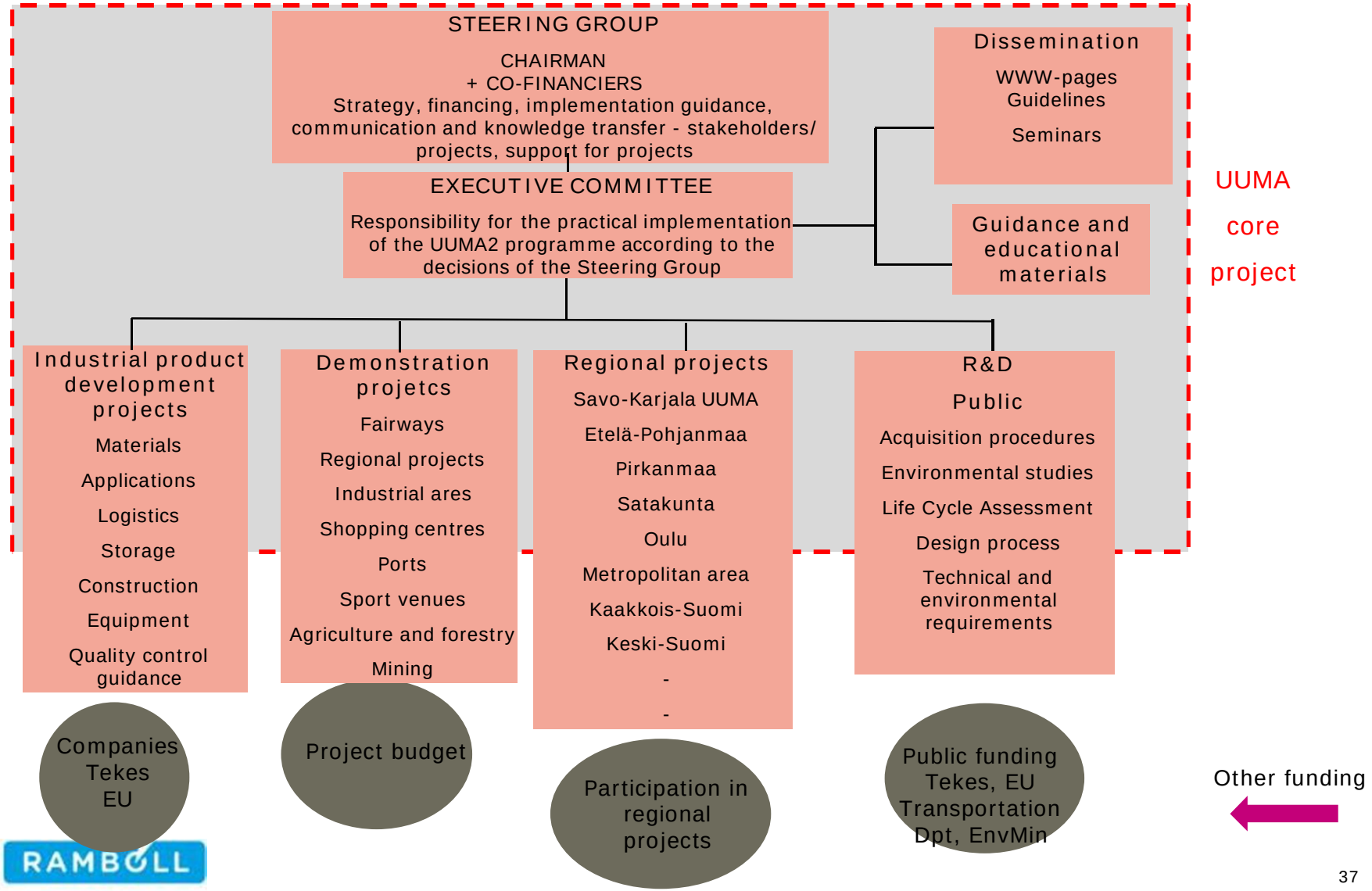
Finnish Recycling Material Program UUMA2 in nutshell



UUMA 2 –ORGANISATIONAL STRUCTURE

30.11.12



UUMA2 –DEVELOPMENT AREAS

1. Product development process for materials
    - -Technical eligibility
    - -Environmental suitability
    - -Production process: logistics, storage
    - -Applications
2. Development of construction technologies
3. Development of planning and design process
4. Development of acquisition methods
5. Development of environmental legislation

UUMA2 -IMPLEMENTATION

1. Product development
2. Demonstration projects
3. Regional projects
4. R&D (design processes, acquisition methods, research and development actions stipulated by environmental legislation)
5. Dissemination of information (instructions, web pages, seminars, knowledge transfer to educational institutions)

THANK YOU

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