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MARCH 14, 2012

DRAFT
TECHNICAL MEMORANDUM
LOCKHEED MARTIN CORPORATION

SUBJECT: Preliminary Remedial Action Objectives, ARARs, GRAs, and Remedial Technology Screening Tables, Potrero Canyon Unit (Beaumont Site 1)

The following technical memorandum presents the initial steps in the feasibility study (FS) process for the Lockheed Martin Corporation (LMC) Potrero Canyon Unit (Beaumont Site 1), located in Beaumont, California, and herein referred to as the Site. The purpose of this technical memorandum is to present the results of the initial FS tasks to the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) for review and approval prior to commencing the development and screening of Site remedial alternatives and preparation of the FS report. This work is being completed in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980

been used in the discussion of individual RAOs in lieu of the more detailed remedial cleanup goals that will be available following completion of the revised risk assessments.

1.1 SUMMARY OF SITE RISKS

Remedial investigations for the Site have been completed and the human health and ecological risk assessments are being finalized. Based on the preliminary results of the risk assessments, the following areas were identified as showing cancer risks greater than 1×10^{-6} or a non-cancer hazard index greater than 1 for human receptors, or potential hazards to ecological receptors with hazard quotients (HQ) greater than or equal to 1 (Tetra Tech, 2011a).

Human Receptors

Area B (Rocket Motor Production Area [RMPA]) – One sample with a single polynuclear aromatic hydrocarbon (PAH) in soil (0.5 feet deep) exceeds the risk criterion for a future industrial worker.

Groundwater – Select volatile organic compounds (VOCs), perchlorate, and 1,4-dioxane exceed drinking water criteria assuming use of groundwater as potable water.

Ecological Receptors

Areas B (RMPA), F (Lockheed Propulsion Company [LPC] Test Service Area) , and H (Sanitary Landfill) – perchlorate in shallow soils (0 to 2 feet deep)

Area H (Sanitary Landfill) – Polychlorinated biphenyls (PCBs) in shallow soils (0 to 5 feet deep)

2.0 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

2.1 SOIL REMEDIAL ACTION OBJECTIVES

RAO S1 - Protect human receptors from exposure to Site chemicals of concern (COCs) in soil through ingestion, inhalation, and dermal contact at concentrations exceeding protective levels.

The results of the human health risk assessment (HHRA) indicate that there is only a localized area in surface soil in Area B, where assumed exposure to a single detection of one PAH (7,12-dimethylbenz(a)anthracene) results in a risk estimate exceeding 1 x 10-eu1139 Tf8ET Q q BT f9.1(c)(e)-13.99

contact water recreation (REC2), warm freshwater habitat (WARM), and wildlife habitat (WILD). Water quality objectives for Potrero Creek listed in the Basin Plan are summarized in Table 2-1(RWQCB, 1995).

Table 2-1
Numeric Water Quality Objectives for Potrero Creek

Constituent	Water Quality Objective (mg/L)
Total Dissolved Solids[1]	150
Hardness[1]	70
Sodium[1]	10
Chloride[1]	12
Total Inorganic Nitrogen[1]	1
Sulfate[1]	15
Chemical Oxygen Demand[1]	5

observed at the groundwater discharge ponds, and decrease downstream to the southwestern property boundary beyond Massacre Canyon. Perchlorate concentrations in Potrero Creek surface water near the Site boundary have been <1 microgram per liter (µg/L), below the California MCL of 6 µg/L. Concentrations of 1,4-dioxane at the Site boundary have been <1 µg/L, with the exception of a single detection of 1.2 µg/L, which slightly exceeds the California drinking water notification level (DWNL) of 1 µg/L. Furthermore, groundwater samples collected from the guard well (MW-100), located south of the Site boundary where Potrero Creek discharges into the San Jacinto Basin, have had perchlorate and 1,4-dioxane concentrations below their respective MCL and DWNL. Thus, while COC concentrations in onsite surface water have exceeded drinking water criteria, there is no evidence for unacceptable risks to likely onsite receptors, and COC concentrations in offsite surface water have been generally in compliance with drinking water criteria. As a result, domestic and municipal water supply and groundwater recharge beneficial uses are not considered to be impaired by site COCs.

performance evaluation of this RAO will include development, implementation, and monitoring of property owner restrictions and land use covenants.

RAO GW2 - Protect groundwater resources outside the current groundwater plume by limiting the migration of Site COCs at concentrations exceeding levels that are protective of designated beneficial uses.

The Site is not located within a groundwater basin designated in the Basin Plan, but is tributary to the San Jacinto Upper groundwater management zone of the San Jacinto Groundwater Basin (RWQCB, 1995). Specific waters that are not listed in the Basin Plan have the same beneficial uses as the groundwater basins or sub-basins to which they are tributary or overlie. Designated beneficial uses of groundwater in the San Jacinto Upper Pressure groundwater management zone include: MUN, AGR, industrial service supply (IND), and industrial process supply (PROC). Water quality objectives for the San Jacinto Upper Groundwater Management Zone are summarized in Table 2-2 on the following page.

The Basin Plan narrative indicates that AGR beneficial uses may be impaired by excessive boron, chloride, sodium, and TDS concentrations. Similarly, IND and PROC beneficial uses may be primarily impacted by hardness and pH. None of these constituents wa74.1(w)4. se8 Tm [(c)-1.6(h390.72 Tmt)-4.6(o)-304,4

Table 2-2
Numeric Water Quality Objectives for the
San Jacinto Upper Groundwater Management Zone

Constituent	Water Quality Objective (mg/L)
Total Dissolved Solids[1]	320
Sodium[2]	SAR[3] < 9 units
Chloride[2]	500
Total Inorganic Nitrogen[1]	1.4
Sulfate[2]	500
pH[2]	6 – 9 units
Arsenic[2]	0.05
Lead[2]	0.05
Boron[2]	0.75

Notes
1.Water quality objective of the San Jacinto Upper groundwater management zone from Table 4.1 of Basin Plan
2. Basin Plan water quality objective for groundwater.
3. SAR – sodium absorption ratio
mg/L – milligrams per liter

COC concentrations outside of the current plume areas are below MCLs, which are protective of the MUN beneficial use. Contaminant transport modeling indicates that the groundwater plume at the Site appears to be in quasi-steady state conditions, where COCs are added to the plume in the Burn Pit Area (BPA) and RMPA at rates that are nearly equal to the COC removal rates from the plume by evapotranspiration and biodegradation in the riparian area (Tetra Tech, 2011b). The volume of COC mass in each of these areas that could potentially impact groundwater has been reduced by previous removal actions conducted in both the BPA (soil excavation, dual-phase extraction, and soil vapor extraction) and the RMPA (groundwater extraction and treatment). These actions have led to a reduction in COC mass of approximately 200 pounds from groundwater in the RMPA, 4,100 tons of impacted soil/waste from the former burn pits, and the mass removed from soils and groundwater during the four-year operational period of the BPA dual-phase/soil vapor extraction system. Due to these previous COC mass removal efforts, although onsite sources of COCs will continue to impact groundwater, concentrations in the main portion of the groundwater plume are stable and/or decreasing, and fate and transport modeling suggests that the period of peak mass flux and concentrations has passed (Tetra Tech, 2011b). Thus, further mitigation of COC sources in soil and groundwater may not be required to protect future beneficial uses of groundwater and surface water outside the currently impacted area.

potentially applicable technology types and process options were evaluated and screened for each GRA

Groundwater Extraction

Onsite and Offsite Disposa

The results of the technology scre

(surface water) in Attachment B.

5.0 REFERENCES

1. Environmental Security Tech [redacted] estcp.org/.
2. FRTR (Federal Remediation Technologies Roundtable) Website at http://www.frtr.gov/.
3. ITRC (Interstate Technology & Regulatory Council) Website at http://www.itrcweb.org/.
4.

7.0 ACRONYMS AND ABBREVIATIONS

AGR	agricultural water supply
ARARs	applicable or relevant and appropriate requirements
BPA	Burn Pit Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COCs	chemicals of concern
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
cis-1,2-DCE	*cis*-1,2-dichloroethene
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
ESTPC	Environmental Security Technology Certification Program
FRTR	Federal Remedial Technologies Roundtable
FS	feasibility study
GRAs	general response actions
GWR	groundwater recharge
HHRA	human health risk assessment
IND	industrial service supply
ITRC	Interstate Technology & Regulatory Council
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
MCL	maximum contaminant l4.6(r)-3.9(onq BT /F1i)-4.6((L)232.9(c)-1.6(ont)-11 11 Tf

PERA	predictive ecological risk assessment
PCE	tetrachloroethene
PROC	industrial process supply
RAOs	remedial action objectives
REC1	water contact recreation
REC2	non-contact water recreation
RMPA	Rocket Motor Production Area
SAR	sodium absorption ratio
SARA	Superfund Amendments and Reauthorization Act
SKR	Stephens' kangaroo rat
TBC	to be considered
1,1,2-TCA	1,1,2-trichloroethane
TCE	trichloroethene
TDS	total dissolved solids
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds
WARM	warm freshwater habitat

ATTACHMENT A
ARARS AND TBC CRITERIA

Table A-1
Potential Chemical-Specific ARARs and To Be Considered Criteria

Requirement, Standard, or Criterion		Description	ARAR or TBC Determination	Comments
State ARARs and TBCs				
California Safe Drinking		**ISC §116270 et seq.)**		
California Primary Drinking Water Standards (California MCLs)	1 -	Enforceable, chemical-specific drinking water standards. California MCLs that are more stringent than federal MCLs, or which apply to chemicals not addressed by federal MCLs, are considered to be potential ARARs.	Relevant and appropriate	Applicable at the tap for drinking water supply systems; relevant and appropriate for grou

Table A-1

Table A-2
Potential Location-Specific ARARs and To Be Considered Criteria

Requirement, Standard, or Criterion	Citation	Description	ARAR or TBC Determination	Comments
Federal ARARs and TBCs				
National Archaeological and Historical Preservation Act (16 USC §469)				
Protection of archeological resources	36 CFR Part 65	Requires actions to recover and preserve artifacts if activities threaten significant scientific, prehistoric, historic, or archaeological resources.	Potentially applicable	Previous surveys have not identified archeological resources in areas where actions are proposed. Additional surveys may need to be conducted prior to construction in areas that have not been surveyed.
National Historic Preservation Act (16 USC §470)				
Protection of historic resources	36 CFR Part 800	Requires actions to minimize harm to historic properties listed on or eligible for listing on the National Register of Historic Places.	Potentially applicable	The site has structures greater than 50 years old, and the former LPC facilities are greater than 50 years old and may have Cold War era significance. Applicable if these or other resources are listed or eligible for listing on the National Register of Historic Places, and actions could potentially cause damage.
Clean Water Act Section 404 (33 USC §1344)				
Water pollution prevention and control	33 USC §1344	Requires permits for discharge of dredged or fill material into waters of the United States. Applies to navigable waters and tributaries.	Potentially applicable	Applicable if actions involve construction (dredge and fill) within the stream channel.
Executive Order No. 11990, Protection of Wetlands				
Protection of wetlands	40 CFR §6.302(a)	Requires actions to minimize the destruction, loss, or degradation of wetlands.	Potentially applicable	Applicable if actions involve construction in wetlands areas, or which may impact groundwater elevations or quality in riparian areas.
Endangered Species Act (16 USC §1531 et seq.)				
Protection of federally-listed threatened and endangered species and their critical habitat	50 CFR Parts 200 and 402	Requires actions to conserve listed species and their habitat. Includes requirements for consultation with the USFWS.	Applicable	The site is habitat for the federally-endangered Stephens' kangaroo rat (SKR), as well as other threatened or endangered animals and plants. A Habitat Conservation Plan and Incidental Take Permit for SKR will be required by the USFWS for remediation activities in critical habitat.
Fish and Wildlife Coordination Act (16 USC §661 et seq.)				
Protection and conservation of wildlife	40 CFR §302	Restricts diversion, channeling, or other activity that modifies a stream or river and affects fish and wildlife.	Potentially applicable	Applicable if actions involve construction within the stream channel or which may impact groundwater elevations or quality in riparian areas.

Table A-3
Potential Action-Specific ARARs and To Be Considered Criteria

Requirement, Standard, or Criterion	Citation	Description	ARAR or TBC Determination	Comments

Table A-3
Potential Action-Specific ARARs and To Be Considered Criteria

Table A-3
Potential Action-Specific ARARs and To Be Considered Criteria

Requirement, Standard, or Criterion	Citation	Description	ARAR or TBC Determination	Comments
State ARARs and TBCs				
Porter-Cologne Water Quality Control Act (CWC §13000 et seq.)				
Statement of Policy With Respect to Maintaining High Quality of Waters in California ("Anti-Degradation Policy")	SWRCB Resolution 68-16	Establishes requirements for activities involving the discharge of contamination directly into surface water and groundwater. Specifically, "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the		

Table A-3
Potential Action-Specific ARARs and To Be Considered Criteria

Requirement, Standard, or Criterion	Citation	Description	ARAR or TBC Determination	Comments
Consolidated Regulations for Treatment, Storage, Processing or Disposal of Solid Waste (PRC §40000 et seq. and CWC §13000 et seq.)				

Table A-3
Potential Action-Specific ARARs and To Be Considered Criteria

Requirement, Standard, or Criterion	Citation	Description	ARAR or TBC Determination	Comments
South Coast Air Quality Management District Regulations				
Rule 401 (Visible Emissions)	SCAQMD Regulation IV (Prohibitions)	Limits visible emissions from any single source	Potentially applicable	Applicable to actions involving soil excavation
Rule 402 (Nuisance)	SCAQMD Regulation IV (Prohibitions)	Prohibits discharge of any material, including odorous compounds, that causes injury, detriment, nuisance, or annoyance to the public; endangers human health, comfort, repose, or safety; or has a natural tendency to cause injury or damage to business or property.	Potentially applicable	Applicable to actions involving soil excavation
Rule 403 (Fugitive Dust)	SCAQMD Regulation IV (Prohibitions)	Limits site activities or man-made conditions so that the concentrations of fugitive dust beyond the property line shall not be visible and the downwind particulate concentration shall not be more than 50 mg/m3 above upwind concentrations.	Potentially applicable	Applicable to actions involving soil excavation
Rule 404 (Particulate Matter)	SCAQMD Regulation IV (Prohibitions)	Limits particulate matter for volumetric gas flow.	Potentially applicable	Potentially applicable to actions involving certain onsite soil or groundwater treatment
Rule 466 (Pumps and Compressors)	SCAQMD Regulation IV (Prohibitions)	Limits liquid and gas leakage from pumps and compressors handling reactive organic compounds.	Potentially applicable	Potentially applicable to actions involving certain onsite soil or groundwater treatment
Rule 466.1 (Valves and Flanges)	SCAQMD Regulation IV (Prohibitions)	Limits liquid and gas leakage from valves and flanges.	Potentially applicable	Potentially applicable to actions involving certain onsite soil or groundwater treatment
Rule 467 (Pressure Relief Devices)	SCAQMD Regulation IV (Prohibitions)	Requires pressure relief valves to be vented to a vapor recovery or disposal system, or subject to inspection and maintenance requirements.	Potentially applicable	Potentially applicable to actions involving certain onsite soil or groundwater treatment
Rule 1150 (Excavation of Landfill)	SCAQMD Regulation XI (Source Specific Standards)	Requires preparation and implementation of an Excavation Management Plan, which shall include measures for mitigating public nuisance conditions.	Potentially applicable	Applicable to actions involving excavation or capping of the landfill
Rule 1166 (Volatile Organic Compound Emissions from Decontamination of Soil)	SCAQMD Regulation XI (Source Specific Standards)	Requires control of 03 Tf 1 0 0 1 307.2 120.84 Tm [(S)3.6(t)-5.6(a)--4.6(C)-C(l)-82(l)(w)20.4(h)S		Q

Table A-3

ATTACHMENT B
GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGY SCREENING

Table B-1
Soil General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

General Response Action	Technology Type	Process Option	Description	Effectiveness (Primary)			Implement-ability	Relative Cost	Retain or Reject	Screening Comments
				Effectiveness in Handling Volume of Impacted Media	Impacts During Implemen-tation	Reliability				
	Dust Control	Wind breaks	Tress, soil berms or fencing are installed to reduce ground-level wind speeds and minimize both wind erosion and the migration of surficial contaminants.	Low	Low	Low	Medium	Low	Reject	Dust control not anticipated to be necessary for protection of human and ecological receptors.
	Vapor Control	Vapor Barrier	An impermeable membrane, with or without a venting system, is placed below the ground surface to reduce upward migration of volatiles.	Medium	Medium	Medium	Medium	Low	Reject	Vapor control not anticipated to be necessary for protection of human and ecological receptors.
		Geomembrane Cap	A geomembrane is placed over impacted area or landfill to reduce leaching of contaminants by infiltrating water and prevent contact with contaminated soil or landfill waste.	High	Medium	High	High	Low	Retain	Implementablilty score assumes no permitting required by CIWMB or RWQCB.
		Earthen Cap	A clean compacted soil layer is placed over impacted area or landfill to prevent direct contact with contaminated soil or landfill waste.	High	Medium	High	High	Low	Retain	Implementablilty score assumes no permitting required by CIWMB or RWQCB.
		Landfill Cap	An engineered landfill cap is constructed over impacted area or landfill to reduce leaching of contaminants by infiltrating water and prevent contact with contaminated soil or landfill waste.	High	Medium	High	High	Low	Retain	Implementablilty score assumes no permitting required by CIWMB or RWQCB.
		Evapotranspiration Cap	An engineered evapotranspiration cap is constructed over impacted area or landfill to reduce leaching of contaminants by infiltrating water and prevent contact with contaminated soil or landfill waste.	High	Medium	High	High	Low	Retain	Implementablilty score assumes no permitting required by CIWMB or RWQCB.
	Grouting	Source Area Grouting	Conventional grout or chemical grout is injected into vadose zone and/or saturated zone source areas to reduce leaching of contaminants.	Low	Medium	Low	Low	High	Reject	Difficult to implement due to bedrock geology.
		Conventional Excavation	Shallow soils are retrieved to the surface with conventional construction equipment from unsloped, sloped or shored excavations.	High	Medium	High	High	Low	Retain	Must be combined with transportation/*ex situ* treatment/disposal options. Excavation options may increase schedule due to T&E species issues.
		Large-Diameter Auger Borings	Contaminated soils are retrieved to surface using overlapping large-diameter soil borings; borings are backfilled with slurry to allow for overlap.	Medium	Medium	Medium	Low	High	Reject	

Table B-1
Soil General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

General Response Action	Technology Type	Process Option	Description	Effectiveness (Primary)			Implement-ability	Relative Cost	Retain or Reject	Screening Comments
				Effectiveness in Handling Volume of Impacted Media	Impacts During Implemen-tation	Reliability				
	In Situ Biological Treatment	Phytoremediation								

Table B-1
Soil General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

Table B-1
Soil General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

General Response Action	Technology Type	Process Option	Description	Effectiveness (Primary)			Implement-ability	Relative Cost	Retain or Reject	Screening Comments
				Effectiveness in Handling Volume of Impacted Media	Impacts During Implemen-tation	Reliability				
	Onsite Disposal	Reuse of Treated Soil	Treated soil is reused onsite as excavation backfill or fill material.	High	Low	Medium	Medium	Low	Retain	Requires WDR permit from RWQCB. Must be combined with excavation, transportation, and *ex situ* treatment options.
	Offsite Disposal	Landfill	Excavated soil is transported offsite for treatment and/or disposal at an authorized facility.	High	Low	High	High	High	Retain	Permanently removes contaminants from site. Must be combined with excavation and transportation options.

Notes:
Shading indicates process option or technology screened out.

Scoring Notes (scores are listed in order from best to worst):
Effectiveness in handling volumes of impacted media

Implementability

Table B-2
Groundwater General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

General Response Action	Remedial Technology Type	Process Option	Process Option Description	Effectiveness (Primary)			Implement-ability	Relative Cost	Retain or Reject	Screening Comments
				Effectiveness in Handling Volumes of Impacted Media	Impacts During Implement-ation	Reliability				

Table B-2

Table B-3
Surface Water General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

				Effectiveness in Handling Volumes of Impacted Media	Impacts During Implement-ation	Reliability				
No Action	N/A	N/A	No action is taken for site contamination.	Low	Low	Low	High	Low	Retain	Baseline for comparison with other technologies.
Monitoring	Sampling and Analysis	Surface Water Monitoring								

Table B-3

Table B-3
Surface Water General Response Actions and Remedial Technology Screening
Potrero Canyon Unit, Beaumont, California

General Response Action	Remedial Technology Type	Process Option	Process Option Description	Effectiveness (Primary)			Implement-ability	Relative Cost	Retain or Reject	Screening Comments
				Effectiveness in Handling Volumes of Impacted Media	Impacts During Implement-ation	Reliability				
		Weirs	A V-notch weir is used to allow interception and diversion of surface water.	High	High	High	Low	Moderate	Reject	Complete interception requires ex situ treatment and disposal of large quantities of water.
		Sumps	A sump is used to collect water for diversion by pumping.	High	High	Medium	Low	High	Reject	Complete interception requires ex situ treatment and disposal of large quantities of water.
		Diversion Dams	Diversion dams are used to intercept and divert surface water.	High	High	High	Low	High	Reject	Complete interception requires ex situ treatment and disposal of large quantities of water.
		Surface Discharge	Treated surface water is disposed to the stream channel.	High	Low	High	Medium	Low	Reject	Effective and implementable for disposal of treated surface water; however, no treatment options are retained. Will require NPDES permit.
		Injection	Treated surface water is disposed onsite by injection into the contaminated aquifer.	Medium	Low	High	Low	Low	Reject	Not implementable for continuous stream flow. Treatment likely required before injection.
		Deep Well Injection	Treated or untreated water is disposed onsite by deep well injection.	Low	Low	High	Low	High	Reject	Not implementable for continuous stream flow. Deep well must be installed at site. Unlikely to obtain required discharge permits. High cost for installation.
		Sewer Discharge	Treated or untreated water is disposed to the sanitary sewer.	Low	Low	High	Low	Moderate	Reject	Not implementable for continuous stream flow. No sewers is vicinity of site.
		Infiltration	Treated water is disposed by infiltration outside of the stream channel.	Medium	Low	High	Medium	Low	Reject	Treatment likely required before infiltration.
		Off-Site Treatment	Extracted surface water or treatment residual is transported offsite to an authorized facility for treatment.	Low	High	High	Low	High	Reject	Not implementable for continuous stream flow. Onsite treatment and disposal options are implementable at lower cost.
		Off-Site Disposal	Extracted surface water or treatment residual is transported offsite to an authorized facility for disposal.	Low	High	High	Low	High	Reject	Not implementable for continuous stream flow. Onsite treatment and disposal options are implementable at lower cost.

Notes:
Shading indicates process option or technology screened out.

Scoring Notes:
Effectiveness in handling volumes of impacted media
High: Process option can readily handle both anticipated volumes of media and anticipated contaminant concentrations.
Medium: Process option can readily handle either anticipated volumes of media or anticipated contaminant concentrations.

Implementability
High: Simple and straightforward to construct; administrative approvals readily obtained.
Medium: Construction feasibleium: Construction feasa(h)]83stream fidis.21 2 anint4(d)-7(v.)]TET /eET d3(tm)25e.)]TJ4(d)-7(v.)]TJET BT(al)14(s)4( )4(r)-4(ea)-3(d)-7(l)16(y)3(3)4(o)6(b)(tain)-7(ed)