UCL Migration Research Unit

This paper may be downloaded for personal research purposes. However any additional reproduction for other purposes, in hard copy or electronically, requires the consent of the author(s). If cited or quoted, reference should be made to the full name of the author(s), the title, the working paper series, the year and the UCL Migration Research Unit as publisher.

This paper was originally submitted as a dissertation in completion of the requirements for the degree Masters in Global Migration. The views expressed in this paper are those of the author(s) and do not necessarily reflect the views of UCL's Migration Research Unit.

© 2019 Elena Damiano

UCL Migration Research Unit
UCL Department of Geography
University College London
26 Bedford Way
London WC1H 0AP

www.geog.ucl.ac.uk/mru

LONDON'S GLOBAL UNIVERSITY

UCL Migration Research Unit

Working Papers

No. 2019/2

An explorative ethnography in the super-diverse Wilmslow Road

Urban sociality and the recontextualization of shisha and food

Elena Damiano

Migration Research Unit

Image © UCL Digital Media

!
!
"#!$%&'()*+,-$!$+.#(/)*&.0!,#!+.$!!
12&$)34,-$)1$!5,'61'(7!8(*4!

!

9):*#!1(;,*',+0!*#4!+.$!)$;(#+$%+2*',<*+,(#!!
(=!1.,1.*!*#4!=((4!

!

!

!

!

>'$#*!?*6,*#(!

!

!

@2&$)-,1$4!:0!?)!A$#!B*/$!!

!

";*4$6,;!0$*)C!DEFGHDEFI!

!

!

!

!

J.,1!)1*);.!4,11$)+*+,(#!,1!12:6,++$4!=()!+.$!!
K@;!,#!L'(:*'!K,/)*+,(#!*+!9#,-$)1,+0!M("$/$!N(#4(#!

" : 1+)* ; +!

!

@$-$)*'!*;*4$6,;1!;),+,;,1$4!+.$!;(66(4,=,;*+,(#!(=!;2'+2)*'!4,-$)1,+0!=()!)$&)(42;,#/! $%(+,;,16!*#4!#$(3;('(#,*'!)$'*+,(#1!0$P/P!Q((R1!DEFST!A2$++#$)!DEEGT!K*0!FIIUVP!J.,1! $%&'()*+,-$!$+.#(/)*&.0!(#!+.$!;(66(4,=,;*+,(#!(=!=((4!*#4!1.,1.*!7,"!1.(7!+.*+!+.,1! +.$()$+,;*'!&(1,+,(#!,1!,))$'$-*#+!=()!4$1;),:,#/!+.$!)$*',+0!(=!+.$!12&$)34,-$)1$!5,'61'(7! 8(*4P!W#!+.,1!2):*#!*)$*X!'(;*+$4!,#!K*#;.$1+$)!09YVX!4,-$)1,+0!)$*;.$1!:$0(#4!+.$! 62'+,&'$!$+.#,;,+,$1!*#4!'((R1!(=!,+1!,#.*:,+*#+1X!7()R$)1!*#4!-,1,+()1X!:0!*)+,;2'*+,#/! +.)(2/.!4,==$)$#+!,#+$)&)$+*+,(#1!(=!)$',/,(#X!.$*'+.X!/$#4$)!)('$1!*#4!/$#$)*+,(#*'! #$$41P!J.1!4,==$)$#;$1!*)$!1(6$!(=!+.$!R$0!*1&$;+1!1.*&,#/!*!4,-,1,-$!4$:*+$! *)(2#4!+.$!;(66(4,=,;*+,(#!(=!1.,1.*!3!*!6*)R$+,<$4!*#;,$#+!*)+$=*;+!=()!*!#$7! 12:;2'+2)$!(=!0(2#/!A),+,1.!K21',61P!@.,1.*!16(R$)1!4(!#(+!;(#1,4$)!1.,1.*!*1!$%(+,;X! .0:),4!()!*2+.$#+,;X!:2+!)*+.$)!*1!*#!(:Z$;+!+.*+!1*+,1=,$1!+.$,)!1(;,*'!#$$41P! @2:1$[2$#+'0X!1.,1.*!:*)1!*;[2,)$!*!&*)*4(%,;*'!2):*#!42*',+0X!+.$0!&)(6(+$!2):*#! 1(;,*',+0!*#4!;(.$1,(#!*1!7$"!*1!;*21$!4,1)2&+,(#!*#4!1(;,*'!4,-,1,(#1!,#!+.$!)(*4P! \((4X!(#!+.$!;(#+)*)0X!,1!*!12:1+*#;$!:),#/,#/!+.$!;(662#,+0!+(/$+.$)!*#4!;)$*+,#/! 2):*#!1(;,*',+0!=()!$-$)0(#$!42$!+(!,+1!*11(;,*+,(#!7,+.!=*6,'0!*#4!R,#1.,&!6*R,#/P!"! ;*1$!1+240!(#!*#!*&&*)$#+!.0:),4!A),+,1.!"1,*#!N*1*/#$!7,"!)$-$*'!+.$! ,#*&&)(&),*+$#$11!(=!+.$!;(#;$&+1!(=!.0:),4,+0!*#4!*2+.$#+,;,+0P!J.,1!7()R!*)/2$1!+.*+! =((4!*#4!1.,1.*!(#!5,'61'(7!8(*4!621+!:$!4$1;),:$4!+.)(2/.!+.$!'$#1!(=!])$;(#+$%+2*',<*+,(#^!0J.(6*1!FIIFC!DGVP!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

5()4!;(2#+C!FFU_G!

" ;R#(7'$4/$6$#+1!

!

W! 7(2'4!',R$!+(!(==$)! 60!1&$;,*'!+.*#R1!+(!?)!A$#!B*/$!=()!12&$)-,1,#/!+.$!)$1$*);.!&)(Z$;+! 7,+.!$#+.21,*16!*#4!/,-,#/!,#1,/.+=2'!;(6 6$#+1!*#4!-*'2*:'$!*4-,;$!42),#/!&'*##,#/!*#4!)$*',1*+,(#P!

!

K0!1&$;,*'!+.*#R1!*)$!$%+$#4$4!+(!*''!+.$!'$;+2)$)1!*#4!1+*==!7.(6!W!$#;(2#+$)$4!42),#/!+.$!K@;!L'(:*'!K,/)*+,(#!DEFGHFI!*+!9#,-$)1,+0!M(''$/$!N(#4(#P!J.$!R#(7'$4/$!*#4!

J * : '$! (=!M (#+$#+1!

Abstract **1**
Acknowledgements **2**
Table of Contents **1**
Acwm3mmc□1p□□wdlddml□TlTc□Ta1fwdldmmw□TldCk□ml Incsawguwgck1wmc□s1c□a1cw13

+(&,;1!(=!62'+,;2'+2)*',16X!;(66(4,=,;*+,(#!*#4!=((4P!

J.,1! 7()R! 7,''!$#/*/$! 7,+.!1(6$! R$0! 4$:*+$1! ,#! +.1! =,$'41! :0! *,6,#/!+(! 2#4$)1+*#4! .(7! +.$! ;(66(4,=,;*+,(#! (=! ;2'+2)*'! 4,-$)1,+0! ,1! ;(#;$&+2*',1$4! *#4! $%&$),$#;$4!+.)(2/.!$-$)04*0!4,1;(2)1$1!*#4!&)*;+,;$1!,#!+.$!62'+,;2'+2)*'!2):*#!*)$*! (=! 5,'61'(7!8(*4P!J.$!-*1+!6*Z(),+0!(=!*;*4$6,;1!;),+,;,1$4!+.$!;(66(4,=,;*+,(#!(=! ;2'+2)*'!4,-$)1,+0!:$;*21$!(=!,+1!+$#4$#;0!+(!)$&)(42;$!$%(+,;,16!*#4!&(7$)!,#$[2*',+,$1! 0$P/P! K*0! FIIUT! A2$++#$)! DEEGT! Q((R1! DEFSVP! @(6$! 1+24,$1! 1.(7$4! +.*+! +.$! ;(66(4,=,;*+,(#! (=! 4,-$)1,+0! ,1! #(+! (#'0!)$'*+$4! +(! &)(42;!-4(!)1;8040Tc*!

*1&$;+1X!621+!:$!+*R$#!,#+(!;(#1,4$)*+,(#P!\()!+.*+!)$*1(#X!+.,1!&)(Z$;+!*'1(!1$+1!(2+!+(!
2#4$)1+*#4!+.$! .,1+()0!*#4!&(',;,$1!+.*+!1.*&$4!+.$!;.*)*;+$)!(=!5,'61'(7!8(*4C!

!

5.*+!=()6!4($1! 62'+,;2'+2)*',16!+*R$! (#! 5,'61'(7! 8(*4g! Q(7! ,1!

FPIJ . $! ; (6 6 (4,=, ; *+, (#! (=! ; 2'+2)*'!4, -$)1,+0!

!

FPF! M2'+2)*'!4, -$)1,+0!,#!&(', ; 0!*#4!+ . $()0C! : $+7$$#!$6&,), ; *'!

FPD! K *+$),*'! ; 2'+2)$! *#4! 6 , /) *+, (#C!+ . $ ( )$+, ; *'!4$: *+$1! *) (2#4! ; (6 6 (4,=, ; *+, (#X! *2+ . $#+, ; ,+0! *#4! . 0 :),4,+0!

!

5 ,' 6 1' (7! 8 (*4^1! 6 2'+, ; 2'+2) *',1 6 ! 7,''! : $! $%&' ( )$4! *#4! 4$1 ;), : $4! + .) (2 / . ! + . $! *#*'01,1! (=! + . $! ; (6 6 (4,=, ; *+, (#! (=!2) : *#! 1&* ; $X! 1 . ,1 . *! *#4! =((4P! \ ( )! + . *+!)$*1 (#X! ,#! + . ,1! 1$; +, (#X! + . $! =(; 21! ,1! (#! + . $!)$'*+, (#1 . ,&! : $+7$$#! 6 , /) *+, (#X! 6 *+$),*'! ; 2'+2)$! *#4! 4$: *+$1! *) (2#4! + . $! ; (6 6 (4,=, ; *+, (#! (=! (: Z$; +1! ,#! / ' (: *',1$4! 1$++,# / 1P!

W#! + . $! '*1+! 4$; *4$1X! *!

6 , /) *#+1^! $%&$),$# ; $! 1 . (2'4! : $! 1+24,$4! : 0! ; (#1,4$),# / ! + . $! 6 *+$),*'1! 6 (-,# / ! 7,+ . ! 6 , /) *#+1!*#4!+ . $! 6 *+$),*'! ; (#+$%+!,#! 7 . , ; . !+ . $! 6 , /) *+, (#!$%&$),$# ; $!+*R$1!&'* ; $!0A*12!

&(()X! ;'$*#! -1P!4,)+0!0K *0!F l lUVP!

b#! +.$! (+.$)! .*#4X! 1(6$! *;*4$6,;1! 4$1;),:$4! 6,/)*#+1^! ;(6 6 (4,+,$1! *1!

FP`! 9):*#!1&*;$X!1.,1.*!*#4!=((4!

!

J.,1!7()R!;(#1,4$)1!+.$!+.$()$+,;*'!4$:*+$1!4$1;),:$4!,#!+.$!&)$-,(21!1$;+,(#!:0!,#-$1+,/*+,#/!+.)$$!+0&$1!(=!6*+$),*'!;(66(4,+,$1C!2):*#!1&*;$X!=((4!*#4!1.,1.*P!W#!+.,1!1$;+,(#X!)$'$-*#+!+.$()$+,;*'!*#4!$6&,),;*'!7()R1!)$'*+$4!+(!+.1!;(66(4,+,$1!7,"!:$!&)1#+$4P!

9):*#!1&*;$!,1!+.$!;(#+$%+!,#!7.,;.!62'+,;2'+2)*',16!+*R$1!,+1!$-$)04*0!=()6X!()!,#!(+.$)!7()41X!7.$)$!;2'+2)*'!4,-$)1,+0!,1!&$);$,-$4X!;(#1+)2;+$4X!6*#*/$4!*#4!$%&$),$#;$4!0Y$,+.!DEEST!\(#$)!DEEaVP!J.$!=(;21!(=!+.,1!4,11$)+*+,(#!7,"!:$!(#!*#!2):*#!*)$*!7.$)$!;(66(4,=,;*+,(#!(=!4,-$)1,+0!+*R$1!&'*;$X!()!7.*+!K,;.$*'!Y$*+!7(2'4!4$=,#$!*1!*!];2'+2)*'![2*)+$)^!0DEESC!FFDVP!J.,1!6$*#1!2):*#!*)$*1!7,+.!*!.,/.!#26:$)!(=!$+.#,;!:21,#$11$1!4$4,;*+$4!+(!+.$!;(66(4,=,;*+,(#!(=!$+.#,;!&)(42;+1!0Y$,+.!DEESVP!M.,#*+(7#!,#!N(#4(#^1!5$1+!>#4!,1!*#!$%*6&'$!0@*'$1!$+! DEE!VP!J.$!5,'61'(7!8(*4!;*#!:$!*'1(!4$1;),:$4!*1!*!;2'+2)*'![2*)+$)P!\()!,#1+*#;$X!L,'$1!"P!A*))$++!*#4!?*-,4!K;>-(0!4$=,#$!5,'61'(7!8(*4!*1!*#!]$+.#,;!4$1+,#*+,(#^!0DEEUC!FI`V!*=+$)!;(#42;+,#/!=,$'4!(:1$)-*+,(#1!*,6,#/!*+!4,1;(-$),#/!+.$!4$-$'(&6$#+!(=!$+.#,;!:21,#$11$1!(-$)!+.$!&$),(4!(=!FIUE13DEEE1P!J.,1!4,11$)+*+,(#!7,"!*'1(!,#-$1+,/*+$!+.$!.,1+()0!(=!5,'61'(7!8(*4X!.(7$-$)X!,+!7,"!$1&$;,*"0!=(;21!(#!)$;$#+!4$-$'(&6$#+1X!=)(6!+.$!&$),(4!DEEE1!(#7*)41P–!

W#!*#0!;*1$X!6*#0!1+24,$1!*:(2+!;2'+2)*'![2*)+$)1!$%,1+P!\()!,#1+*#;$X!@+$&.$#!@.*7X!@21*#!A*/7$"!*#4!h(*##*!Y*)6(71R*!0DEE_V!*#*'01$4!+.$!'(;*'!*2+.(),+0^1!&(',;0!)*+,(#*'$!:$.,#4!+.$!+)*#1=()6*+,(#!*#4!6*)R$+,<*+,(#!(=!A*#/'*+(7#!,#!>*1+!N(#4(#!*#4!.,/.',/.+$4!+.$!#$/*+,-$!;(#1$[2$#;$1!*)(2#4!,+1!;(66(4,=,;*+,(#!0$P/P!;(66$);,*'!/$#+),=,;*+,(#X!4,1&'*;$6$#+!(=!)$1,4$#+1X!;)$*+,(#!(=!$%(+,;!,4$#+,+,$1V!01$$!*'1(!?,#$1!DEE!T!Q2'6$!DEFGVP!W#!=*;+X!'(;*'!*2+.(),+,$1!*)$!$;(#(6,;*"0!&(7$)'$11!:2+!.*-$!+.$!,#='2$#;$!+(!1+$$)!2):*#!&'*##,#/!)$/$#$)*+,(#!&)(Z$;+1!,#+$#4$4!+(!:)*#4!2):*#!1&*;$!+.)(2/.!+.$!,#-$#+,(#!(=!$%(+,;!$+.#,;!,4$#+,+,$1!0Y$,+.!DEEST!K,+;.$"!FII`T!5$"1!DEEaVP!J.,1!,1!4(#$!=()!*;.,$-,#/!#$(3',:$)*'!:21,#$11!,6&$)*+,-$1!*,6,#/!*+!,#;)$*1,#/!,#+$)#*+,(#*'!+(2),16!*#4!$;(#(6,;!/)(7+.!0,:,4PT!?*6,*#(!DEF!*VP!

J.,1!;),+,[2$!,1!;.*"$#/$4!:0!7()R!(=!(+.$)!*;*4$6,;1X!7.(!,#1+$*4!(=!4$1;),:,#/!;2'+2)*'![2*)+$)1!*1!*!)$12'+!(=!*!#$(',:$)*'X!;*';2'*+,-$!*#4!,#1+)26$#+*'!

–!@$$!*'1(!?*6,*#(!0DEF!*V!=()!*!1,6,'*)!(-$)-,$7P!

;(66(4,=,;*+,(#!(=!4,-$)1,+0X!1$$!+.$6!*1!1&*;$1!(=!.(1&,+*',+0!*#4!;(.$1,(#P!\()! ,#1+*#;$X!?*-,4!A$"!*)/2$1!+.*+!]0 pV!+.$!7*01!(=!)$'*+,#/!+.*+!*)$!&)*;+,1$4!,#!:*)1X! ;*=q1X!)$1+*2)*#+1X!;'2:1!*#4!&2:1!1.(2'4!:$!1$$#!*1!&(+$#+,*"0!&)(42;+,-$!(=!*#!$+.,;1! (=!;(#-,-,*',+0!+.*+!)$-,+*',<$1!2):*#!',-,#/P^!0A$"!DEEaC!FDVP!J.,1!*;;(2#+!=("(71!+.$! &(1,+,(#!(=!"'*#!N*+.*6!0DEE`V!7.(!*)/2$4!+.*+!*!6$+.(4('(/,;*'!*&&)(*;.!=(;21,#/! (#!$-$)04*0!&)*;+,;$1!)$-$*'1!.(7!2):*#!;.*#/$!;*#!*"(7!+.$!;)$*+,(#!(=!#$7!&2:',;! ;2'+2)$1!*#4!+)$#41!0,:,4PVP!\()!,#1+*#;$X!+.$!,#12)/$#;$!(=!;*=q1!*#4!:*)1!,#!*!/$#+),=,$4! #$,/.:(2).((4!,#!"2;R'*#4X!*"(7$4!7(6$#!+(!*;;$11!&2:',;!1&*;$!1,#;$!=$6*'$!)$1,4$#+1!=(2#4!+.$1$!:*)1!6()$!*++)*;+,-$!+.*#!&2:1!0,:,4PVP!J.,1!2):*#!;.*#/$! =*-(2)$4!1(;,*'!*#4!/$#4$)!6,%,#/!*1!7$"!*1!+.$!;)$*+,(#!(=!*!]1$%2*"0!&('06()&.(21! ;2'+2)$^!0N*+.*6!DEE`C!FaFEVP!W+!+)*#1=()6$4!*!#$,/.:(2).((4!,#+(!*!1&*;$!(=! ;$'$:)*+,(#!(=!4,-$)1,+0X!+('$)*#;$!*#4!=)$$4(6!0N*+.*6!DEE`VP!

J.$!1$;(#4!;(66(4,+0!;(#1,4$)$4!,1!1.,1.*X!*'1(!R#(7#!*1!7*+$)&,&$X!#*)/2,'q! ()!.(*RP!K*Z(),+0!(=!*;*4$6,;!1+24,$1!(#!1.,1.*!;(6$1!=)(6!6$4,;*'!4,1;,&',#$1!*#4! =(;21!(#!+.$!.$*'+.!),1R1!)$'*+$4!+(!16(R,#/P!J.$!',+$)*+2)$!)1*);.!;(#42;+$4!:0! 5*<,)0!$+! 0DEFaV!1.(71!+.*+!1.,1.*!16(R,#/!,1!*11(;,*+$4!7,+.!-*),(21!4,1$*1$1X! 12;.!*1!)$1&,)*+()0!4,1$*1$1X!4,==$)$#+!=()61!(=!;*#;$)!*#4!6$#+*'!.$*'+.!&)(:'$61P! 8$1$*);.!,#!+.$!&2:',;!.$*'+.!1$;+()!=(;21$1!(#!1.,1.*!16(R$)^1!&$)1&$;+,-$1X! R#(7'$4/$!*#4!*++,+24$1!*#4!;(#1,4$)1!.(7!+(!,6&'6#+!&(',;,$1!+(!)$42;$!1.,1.*! ;(#126&+,(#!0?*)3b4$.!*#4!":23Q*66*4!DEFFX!c*RR*1.!$+! DEFFX!h*7*4!$+! DEF`X!")1.*4!$+! DEFIT!"-$0*)4!*#4!h*;R1(#!DEEGVP!

@(;,(3;2'+2)*'!)1*);.!(#!,#+(%,;*#+1!,1!*!#$7!=,$'4!$%&*#4,#/!*;)(11!-*),(21! 4,1;,&',#$1X! ,#;'24,#/! .,1+()0! *#4! /$(/)*&.0! 0K;@.*#$! *#4! Y#$*'$! DEFFVP! c$-$)+.$'$11X!1(;,(3;2'+2)*'!)1*);.!(#!1.,1.*!,1!*'6(1+!,#$%,1+$#+P!J.$!&2:',;*+,(#1! (=!+.$!\)$#;.!*#+.)(&('(/,1+!Y*6*'!M.*(2*;.,!0FIIaX!DEEUX!DEEaV!(#!1.,1.*!*)$!&*)+!

DP!K$+.(4('(/0!

!

!6&!(=!K*#;.$1+$)!0b==,;$!=()!c*+,(#*'!@+*+,1+,;1!*#4!b)4#*#;$!@2)-$0!DEFSVP!J.$! 4*+*1$+!

7*1!21$4!=()!;)$*+,#/!*!6*&!(=!+.$!9Y!0b==,;$!=()!c*+,(#*'!@+*+,1+,;1!*#4!b)4#*#;$! @2)-$0!DEFaVP!J.$!/$(/)*&.,;*'!4*+*!7$)$!*#*'01$4!*#4!-,12*',1$4!7,+.!+.$!1(=+7*)$! 8@+24,(P!!

!

!

Table 1. K$+.(4('(/0!,#!)$'*+,(#!+(!+.$!)$1$*);.!(:Z$;+,-$1!

!(!(

Objectives	Data collection
J(!2#4$)1+*#4!+.$! .,1+()0!*#4!&(',;,$1! +.*+!1.*&$4!+.$! &)$1$#+!;.*)*;+$)! (=!+.$!5,'61'(7! 8(*4!0=(;21!(#! 62'+,;2'+2)*',16! *#4!2):*#!1&*;$V!	**Interviews** 3! F!1$6,31+)2;+2)$4!,#+$)-,$7!7,+.!*!:21,#$11!1+*==H(7#$)!! 3! F!1$6,31+)2;+2)$4!,#+$)-,$7!7,+.!:21,#$11!1+*==H(7#$)! 3! _!,#=()6*'!,#+$)-,$71!7,+.!:21,#$11!1+*==H(7#$)1! 3! F!7*'R,#/!*'(#/!,#+$)-,$7!7,+.!;21+(6$)H)$1,4$#+! 3! F!7*'R,#/!*'(#/!,#+$)-,$7!7,+.!;21+(6$)H)$1,4$#+! 3! F!1$6,31+)2;+2)$4!,#+$)-,$7!7,+.!*!)$&)1#+*+,-$!=)(6!M(2#;,'! 3! F!1$6,31+)2;+2)$4!,#+$)-,$7!7,+.!M(2#;,'^1!=)(#+',#$!1+*==! ! **Collection of secondary sources** ! 3! #$71&*&$)1!*);.,-$1!*#4!'(;*'!.,1+()0!:((R1! 3! 1+*+,1+,;*'!4*+*! 3! &(',;,$1! !

DPDP!>#+)*#;$!,#+(!+.$!=,$'4!

!

@+*)+,#/!+.$!=,$'47()R!*#4!=,#4,#/!,#+$)'(;2+()1!.*1!:$$#!*!;.*''$#/,#/!&.*1$!(=! +.,1!)1*);.P!W!.*4!=*6,',*),+0!7,+.!+.$!5,'61'(7!8(*4X!.(7$-$)X!W!4,4!#(+!&$)1(#*''0! R#(7!*#0(#$!7()R,#/!()!',-,#/!(#!+.,1!)(*4P!W!&'*##$4!+(!*&&)(*;.!&$(&'$!7()R,#/!,#! 1.(&1!*#4!)$1+*2)*#+1!()!)$1,4$#+1!(#!+.$!1+)$$+!*#4!*1R,#/!+.$6!,=!+.$0!7(2'4!',R$!+(! &*)+,;,&*+$!,#!60!)1*);.P!M(#1,4$),#/!+.*+!*1R,#/!1+)*#/$)1!+)21+!*#4!.$'&!,1!1(;,*''0! *7R7*)4X!W!+.(2/.+!+.*+!*1R,#/!42),#/!*!=*;$3+(3=*;$!$#;(2#+$)!7*1!6()$!+)*#1&*)$#+! +.$#!1$#4,#/!*#!$6*,'!()!6*R,#/!*!+$'$&.(#$!;*''P!Q(7$-$)X!+.,1!*&&)(*;.!)$[2,)$4!*!)$='$;+,(#!(#!60!&(1,+,(#*',+0X!,P$P!]+.$!=,$'41!(=!&(7$)!+.*+!;(##$;+!+.$!=,$'4!)$1$*);.$)! *#4!&*)+,;,&*#+1!0 p V^!0Y*+<!F I I _C!U I VP!!

J.$!=,)1+!&)(:'$6!7*1!+.$!=()6*',+0!*#4!+$6&()*',+0!(=!60!*&&)(*;.P!"))*#/,#/!

1!#!(2+1,4$)!*#4!#(#316(R$)X!W!4,4!#(+!R#(7!*#0+.,#/!*:(2+!1.,1.*!*#4!,+1!,6&*;+! (#!5,'61'(7!8(*4P!!

J.$!#$7!+(&,;!(=!1.,1.*!*#4!1(6$!,#=()6*+,(#!/*+.$)$4!*)(2#4!/$#4$)!)('$1! ,#+)(42;$4!*!#$7!6$+.(4('(/,;*'!;.*''$#/$!)$'*+$4!+(!&(1,+,(#*',+0P!"+!+.$!:$/,##,#/!(=! +.$!)$1$*);.X!*1!*!=$6*'$!$+.#(/)*&.$)X!W!7*1!*7*)$!+.*+!W!;(2'4!.*-$!.*4!1(6$! &)(:'$61!(=!*;;$11!42$!+(!60!/$#4$)!*#4!1$%X!:2+!W!7*1!#(+!=2"0!*7*)$!(=!+.$! 5,'61'(7!8(*4^1!/$#4$)!;(#;$&+2*',1*+,(#1P!"=+$)!1(6$!,#,+,*'!,#+$)-,$71X!.(7$-$)X!W! 1+*)+$4!+(!2#4$)1+*#4!+.*+!&2:',;!1&*;$X!$1&$;,*''0!*)(2#4!1.,1.*!:*)1X!7*1!6*'$3 4(6,#*+$4!*#4!+.,1!6*4$!1(6$!7(6$#!=$$'!2#;(6=()+*:'$P!"+!+.$!&$)1(#*'!'$-$'X!W!7*1! #(+!=$$',#/!2#1*=$X!W!(:1$)-$4!K21',6!*#4!#(#3K21',6!7(6$#!7*'R,#/!(#!+.$!)(*4! *'(#$P!Q(7$-$)X!W!2#4$)1+((4!+.*+!=()!1(6$!,#4,-,42*'1!*#4!,#!;$)+*,#!1&*;$1!+.$! &)1#;$!(=!*!7(6*#!*'(#$!;(2'4!.*-$!:$$#!(44P!\()!+.*+!)$*1(#X!,#!42:,(21! 1,+2*+,(#1X!60!6*'$!&*)+#$)!:$;*6$!60!(;;*1,(#*'!=,$'4!*#4!=((4,$!;(6&*#,(#P!W#!*! 1,6,'*)!=*1.,(#X!N,'*!":23N2/.(4!7*1!.$'&$4!:0!+.$!&)$1$#;$!(=!.$)!=*+.$)!7.$#! *;;$11,#/!*6(#/!A$4(2,#1!,#!>/0&+!0DEFUC!FD3F`VP!

@.,1.*!*'1(!&21.$4!6$!+(!6(-$!=)(6!+.$!+(&,;!(=!&)(42;+,(#!+(!;(#126&+,(#X! :$;*21$!W!.*4!*;;$11!+(!1.,1.*!;(#126$)1!)*+.$)!+.*#!&)(42;$)1P!c$7!,#+$)-,$71!*'1(! &21.$4!6$!+(!;(#1,4$)!+.$!+.$()$+,;*'!+(&,;1!(=!2):*#!1(;,*',+0!,#!)$'*+,(#!+(!;(662#,+0! ;(.$1,(#!*#4!0(2+.P!\()!+.*+!)$*1(#X!W!4$;,4$4!+(!;(#+*;+!*#(+.$)!&$)1(#!7()R,#/!7,+.! 0(2#/!&$(&'$!,#!+.$!*)$*X!7.(!;(2'4!:$!;(#1,4$)$4!*!]&*)*3$+.#(/)*&.$)1^!0Q('6$1! *#4!K*);21!DEEGC!D`Ufa X!,#!A$)/!*#4!c(7,;R*!DEFIC!SVP!W#!*!-$)0!$%&'()*+,-$!6*##$)X! W!7*1!=("(7,#/!*#!,#+$#+,(#*'!]+.$()$+,;*'!1*6&',#/^!0L'*1$)!*#4!@+)*211!FIIIC!_SV!*#4! *;R#(7'$4/,#/!]+.$!4,*'(/,;*'!#*+2)$!(=!)$1$*);.^!0>#/'*#4!FII_C!G_VP!

!

DP`P!W#+$)-,$71!*#4!$+.,;1!

!

"1!J*:'$!F!1.(71X!+.$!)1*);.!7*1!;(#42;+$4!:0!21,#/!+.)$$!+0&$1!(=!,#+$)-,$7! +$;.#,[2$1P!\,)1+'0X!1$6,31+)2;+2)$4!,#+$)-,$71!7$)$!:*1$4!(#!*!',1+!(=![2$1+,(#1P! Q(7$-$)X!+.$1$![2$1+,(#1!;.*#/$4!4$&$#4,#/!(#!+.$!&$)1(#!,#+$)-,$7$4P!\()! ,#1+*#;$X!W!*1R$4!+(!*''!)$1+*2)*#+!6*#*/$)1![2$1+,(#1!)$'*+$4!+(!+.$,)!)$1+*2)*#+^1! 1+()0X!+.$!=((4!(==$)$4X!+.$!)(*4!*#4!+.$!;(662#,+0X!:2+!,#!$*;.!;*1$X!W!.*4!+(! 2#4$)1+*#4!4,==$)$#+!*1&$;+1!)$'*+$4!+(!+.$,)!;2,1,#$1X!$P/P!W!*1R$4![2$1+,(#1!*:(2+! .2662!+(!*!K,44'$!>*1+$)#!6*#*/$)!*#4![2$1+,(#1!*:(2+!N*.()$^1!=((4!+(!*!

B*R,1+*#,!(#$P!

@$;(#4'0X!7*'R,#/!,#+$)-,$71!7$)$!;(#42;+$4!7,+.!+7(!;21+(6$)1H)$1,4$#+1P!W! +.(2/.+!+(!21$!+.,1!6$+.(4!*1!+.$!#*+2)*'!$#-,)(#6$#+!(=!+.$!;21+(6$)1!,1!+.$!)(*4! ,+1$'=P!?2),#/!+.1!,#+$)-,$71!W!'$+!+.$!&$)1(#1!1&$*R!=)$$'0X!+.$!4,1;211,(#!7*1! 1+,62'*+$4!:0!+.$!$#-,)(#6$#+!*#4!+.$,)!6$6(),$1!)*+.$)!+.*#!60![2$1+,(#1!01$$! b^c$,'!$+! DEFIVP!J.,1!6$+.(4!*''(7$4!+.$!,#+$)'(;2+()1!+(!$*1,'0!+*'R!*:(2+!+.$!.,1+()0! (=!+.$!)(*4!*#4!+.$!:21,#$11$1P!

J.,)4'0X!+.$!,#=()6*'!,#+$)-,$71!7$)$!#(+!)$;()4$4X!:2+!W!+((R!#(+$1!7.,'$!+.$! ,#+$)'(;2+()1!7$)$!+*'R,#/X!+.$#!W!$%&*#4$4!+.$!#(+$1!*1!1((#!*1!&(11,:'$!*=+$)!+.$! $#;(2#+$)P!W!=(''(7$4!1&$;,=,;!+(&,;1!*#4![2$1+,(#1!+.*+!W!.*4!,#!6,#4!()!:),$='0!#(+$4!,#! 60!#(+$:((RP!Q(7$-$)X!+.$!6*Z(),+0!(=!+.$!;(#-$)1*+,(#1!7$)$!2#1+)2;+2)$4P!W!=$'+!+.*+! &$(&'$!7$)$!62;.!6()$!*+!$*1$!7,+.!+.,1!+0&$!(=!6$+.(4P!

J.$!)$;()4$4!,#+$)-,$71!7$)$!+)*#1;),:$4!7,+.!+.$!\S!&)(/)*66$X!*#4!+.$#! *#*'01$4!*#4!;(4$4!7,+.!cd,-(!B)(!FDP!J.$!,#=()6*'!,#+$)-,$71!7$)$!*'1(!;(4$4!7,+.! cd,-(X!7.$)$*1!#(+$1!*#4!&.(+(/)*&.1X!)$12'+,#/!=)(6!(:1$)-*+,(#1!(#!5,'61'(7! 8(*4!*#4!42),#/!+.$!$-$#+! 7$)$!*#*'01$4!:0!.*#4P!

"''!+.$!,#+$)-,$71!7$)$!;(#42;+$4!7,+.!,#=()6$4!;(#1$#+P!W!7*1!*7*)$!+.*+!W!.*4! +(!*-(,4!*1R,#/!1$#1,+,-$![2$1+,(#1X!=()!$%*6&'$X!(#!$+.#,;,+0!*#4!)*;$X!''$/*',+0!*#4! 1$#1,+,-$!4$+*,'1!*:(2+!&$)1(#*'!1+(),$1P!W!7*1!*'1(!)$6,#4,#/!+.$!&*)+,;,&*#+1!+(!1+(&! +.$!4,1;211,(#!,=!+.$0!=$'+!2#;(6=()+*:'$P!?2),#/!1(6$!,#+$)-,$71X!,#+$)'(;2+()1!+(2;.$4!

`P!K*#;.$1+$)^1!]M2))0!K,'$^!

!

`PFP!J.$!;,+0^1!&*1+!*#4!&)$1$#+!

!

J.$!,6&(1,#/!'(;(6(+,-$1!'(;*+$4!,#!+.$!@;,$#;$!*#4!W#421+)0!K21$26!(=! K*#;.$1+$)!)$6,#41!-,1,+()1!(=!+.$!;,+0^1!&*1+!,#421+),*'!4$-$'(&6$#+!0@;,$#;$!*#4! W#421+)0!K21$26X!Q0'+(#!DEFUX!,%VP!K*#;.$1+$)X!*!;,+0!,#!+.$!c()+.7$1+!(=!>#/'*#4! 0\,/2)$!FVX!.*1!:$$#!=*6(21!=()!+.$!&)(42;+,(#!(=!+$%+,'$!1,#;$!+.$!F_+·3FU+·!;$#+2)0!*#4! ,#!+.$!FI+·!;$#+2)0!:$;*6$!+.$!/'(:*'!*#4!,6&$),*'!;*&,+*'!(=!;(++(#!+)*4$!0K$''()!FIG_C! F3DE!,#!5$):#$)!FIIE*X!@;,$#;$!*#4!W#421+)0!K21$26X!Q0'+(#!DEFUC!,%3%!*#4!DaVP! ?2),#/!+.,1!.,1+(),;*'!&.*1$!(=!,#421+),*'!*#4!$;(#(6,;!4$-$'(&6$#+X!
$(8(!)-162(*F1()-4.7)-4(6)-7(,)2(;!)-41.716T)-4(+)16(!**7(')')'

Figure 1. K*#; .$1+$)!,#!+ .$!9#,+$4!Y,#/4(6!0DEFaV!

!
!

M(#+*,#1! b@!4*+*! *#4! c*+,(#*'!@+*+,1+,;1!4*+*! r!M)(7#! ; (&0),/ .+! *#4!4*+*: *1$!),/ .+!iDEFajX!1$$!

!

Figure 2. e ! (=! 5 . ,+$!A),+,1 . !)$1,4$#+1!,#! K *# ; . $1+$)!0 K@ b " 1X!DEFFV!

`PDP!J .$!]W#4,*#^!$%(+,;!b+.$)!

!

@(2+.! "1,*#! ,6 6,/)*#+1X! 6 *,#'0! =)(6! B*R,1+*#X! 1+*)+$4! +(! &(&2'*+$! *#4! (&$#! :21,#$11$1!,#! 5,'61'(7!8(*4!42),#/!+.$!FISE13UE1!0A*))$++!*#4!K;>-(0!DEEUVP!K*#0! (=!+.$!,#+$)'(;2+()1!:$',$-$4!+.*+!@(2+.!"1,*#!:21,#$11$1!(&$#$4!=()!+.$!#$$41!(=!+.$! ;(6 62#,+0! *#4! +.$! ,6 6,/)*#+! &(&2'*+,(#P! W#! +.$! GE3IE1X! .(7$-$)X! +.$!)(*4!

)$1+*2)*#+1!(#! 5 ,'6 1'(7!8 (*4!*)$!)2#! : 0!B*R,1+*#,X! 7 . (6 !4 (!# (+!4),#R! *' ; (. ('!,=!+ . $0! =(''(7! W1'* 6P! J . $! 7 ()4!]W#4,*#^! ',R$!]M2))0^! ,1! &*)+! (=! *#! $%(+, ; ! :)*#4,# / ! 1+)*+$ / 0!)$&)$1$#+,# / ! * ! =*'1$! *2+ . $#+, ; ,+0P! J . ,1! +0&$! (=! (),$#+*',1+!)$&)1#+*+,(#! (=! 5 ,'6 1'(7! 8 (*4!,1!)$ 6 ,#,1 ; $#+!(=!+ . $! ; ('(#,*'!$)*P! \ ()!,#1+*# ; $X!>',<* : $+ . !A2$++#$)!0DEEGV!*) / 2$4! + . *+!+ . $! ; (#12 6 &+,(#!(=!]W#4,*#^!=((4!)$&) (42 ; $1X!)*+ . $)!+ . *#!$)*1$1X!)* ; ,*'!*#4!=() 6 $)! ; ('(#,*'! 2#$[2*'! &(7$)!)$'*+,(#1 . ,&1P! ?$1&,+$! + . ,1X!]W#4,*#^!)$1+*2)*#+1! 7$)$! 1+,''! 12 ; ; $11=2'X!*#4!+(!+ . ,1!4*0!1(6 $!(=!+ . $!=,)1+!]W#4,*#^!)$1+*2)*#+1!(=!]M2))0!K,'$^!1+,''!$%,1+! *#4!10 6 : (',1$!+ . $! . 0&$!(=!]W#4,*#^!=((4!,#!A),+*,#P'!

!

`P`P! ''!#$7!$)*X!#$7!6,/)*+,(#!='(71X!#$7!:21,#$11$1!!

!

''+ . (2/ . !*!1,/#!*+!+ . $!$#+)*# ; $!(=! 5 ,'6 1'(7!8 (*4!1+*+$1!] 5 $' ; (6 $!+(!+ . $!M2))0! K,'$^X!]W#4,*#^!)$1+*2)*#+1! *)$! #(7! *! 6 ,#(),+0! * 6 (# / ! + . $! : 21,#$11$1! (#! + . $!)(*4P! '' ; ; ()4,# / ! +(! 6 0! ,#+$)'(; 2+()1X! 1(6 $! (=! + . $!)$1+*2)*#+1! ; '(1$4! 4(7#! =()! 4,==$)$#+!)$*1(#1X!,# ; '24,# / C!+ . $!2#7,'',# / #$11!(=!0(2# / !A),+,1 . !B*R,1+*#,!+(! ; (#+,#2$!+ . $!=* 6 ,'0! : 21,#$11X!+ . $!,#* : ,',+0! (=!+ . $!)$1+*2)*#+1!+(!)$#$7!+ . $,)! (==$)X!+ . $!,# ;)$*1,# / ! * : ,',+0! (=! ; 21+(6 $)1!+(! ; ((R!*+! . (6 $X!*! ; 0 ; ',# / !'*#$! ; (#1+)2 ; +$4! : 0!+ . $!M(2# ; ,'!+ . *+!)$42 ; $4!+ . $! &*)R,# / !1&* ; $X!'* ; R!(=!*! : 21,#$11!*11(; ,*+,(#!+ . *+! ; (2'4!2#,+$!+ . $!)(*4X!*#4!,# ;)$*1$4! ; (6 &$+,+,(#!*#4! ; (1+1!$1&$; ,*''0!42$!+(!)$#+!,# ;)$*1$X!*!&

((: ($)-4(1,)2(#)-4($)-4(11X)-4(11X)P(!)

_P! @ . ,1 . * !

!

_PF!] 5 $!4 (#^+!',R$!1 . ,1 . *^C! 6 $4,* ! *#4!$-$)04*0!4,1 ; (2)1$1! (#! 1 . ,1 . * !

!

@ . ,1 . * ! : *)1! *)$! (#$! (=! + . $! 6 (1+! ; (#+) (-$)1,*'! ; . *# /$1! (=! 5 ,' 6 1' (7! 8 (*4P! "#! ,#+$#1$!4,1 ; 211, (#! 7 ,+ . ! K , ; . *$'X! 7 . (! /)$7!2&! (#!+ . ,1!) (*4X! *#4!# (7! . $!,1!1+)2 / /',# /!+ (! R$$&! *', -$! . ,1!=* 6 ,'0! : 21,#$11X! 6 *4$! 6 $!2#4$)1+*#4!+ . *+!W! ; (2'4!# (+!, /# ()$!+ . $!+ (&, ; P! Q$! 7 *1!$*+,# / ! *#! *&&'$! : $. ,#4! . ,1! ; (2#+$)! 7 . ,'$!$%&)$11,# / ! . ,1!4,1 ; (#+$#+! 7 ,+ . !+ . $! 1+*+21! (=!+ . $!) (*4P!Q$!& (,#+$4!+ (! *! ; (&0! (=!+ . $! K *# ; . $1+$)!>-$#,# / ! c $ 7 1P!W!' ((R$4! *+! + . $!+,+'$X!,+! 7 * 1! * : (2+!1 . ,1 . *P!Q$!1*,4C!]J . *+!,1!1 (6 $+ . ,# / !+ . *+!W!4 (!# (+!',R$! (=!+ . ,1!) (*4C! + . $! 1 . ,1 . * ! : *)1P^! N*+$)! (#X! W! *1R$4! . , 6 ! ,=! + . $)$! ,1! *! 1$#1$! (=! ; (6 6 2#,+0! *#4! . $! *#1 7 $)$4!]0PPPV! J . $)$! *)$! 6 *#0! =, / . +1X! *#+,31 (; ,*'! : $. * -, (2)! 0PPPV! 4,4! 0 (2! 1$$! + . ,1g^! 0FUPEUPF I V! *#4! . $! & (,#+$4! + (! + . $! *)+, ; '$! * / *,#! *1! ,=! . $! 7 *#+$4! + (! 7 *R$! 6 $! 2&P! W!)$3 ' ((R$4! *+! + . $! #$ 7 1&*&$)! *#4! 1+*)+$4! + (!)$*4! ,+! &) (&$)'0P! J . $! *)+, ; '$! 4$1 ;), : $4! + . $! ; ' (12)$! (=! *! 1&$; ,=, ; ! 1 . ,1 . * ! : *)! 42$! + (! + . $! :)$* ; . ! (=! + . $! 1 6 (R,# / ! : *#X! *#+,31 (; ,*'! : $. * -, (2)! *#4! ;), 6 $! 0@ ; . $$) . (2+! DEF I VP! c $ / *+, -$! ; (6 6 $#+1! * : (2+! 1 . ,1 . * ! : $; * 6 $! ; (6 6 (#!42),# /!+ . $!$#+,)$!=,$'4 7 ()RP! \ ()!,#1+*# ; $X! *=+$)!$*+,# / ! *!+*1+0! 6 $* 'X!W! *1R$4!+ . $!)$1+*2)*#+! 6 *#* /$)! + (! 4,1 ; 211! * : (2+! + . $!) (*4X! = ((4! *#4! + . $!)$1+*2)*#+P! Q,1! *#1 7 $)! 7 *1C!] 5 $!4 (!# (+!',R$!1 . ,1 . *^!0EGPEaPF I VX! . $! 7 $#+!1+)*, / . +!+ (!+ . $!& (,#+P!!

@ . ,1 . * ! 1 6 (R,# / ! ,1! *#! * ; +, -,+0! + . *+! : $; * 6 $! & (&2'*)! (-$)! + . $! '*1+! 0$*)1! (#! 5 ,' 6 1' (7! 8 (*4X! *1! ,#! + . $!)$1+! (=! >2) (&$P! " ! 1 . ,1 . * ! 1 6 (R$)! + ('4! 6 $! + . *+!)$; $#+! ,6 6 , /)*+, (#!=) (6 !+ . $!K,44'$!>*1+!&'*0$4!*!) ('$!,#!,# ;)$*1,# /!+ . $!& (&2'*),+0! (=!+ . $! (: Z$; +P! >-$)0+ . ,# / !1+*)+$4!=) (6 != * 6 ,'0! : 21,#$11$1X! : 2+!# (7! 5 ,' 6 1' (7!8 (*4!,1!R# (7#!*1!]1 . ,1 . * !

; (6 6 (4,=, ; *+,(#! (=!1 . ,1 . *! *#4!1 . ,1 . *! : *)1! (#! 5 ,'6 1'(7 ! 8 (*4P!@ . ,1 . *!,1!4,-,4,# / !+ . $!

12 : 1+*# ; $X! : 2+!+$#4!+ (!& (,#+! (2+!+ . *+!1 . ,1 . *!,1!# (+!+ . $! (#'0!2# . $*'+ . 0!12 : 1+*# ; $!,#! (2)! 1 (; ,$+0P! 8 * - ,!+ ('4! 6 $C!

!

]o$* . X!W!+ . ,#R!,+!,1!2# . $*'+ . 0X! : 2+!,+!4$&$#41! (#! . (7! (#$!4$=,#$1!2# . $*'+ . 0P! o (2! ; (2'4!$*+!+ ((! 6 2 ; . ! ; ,##* 6 (#! *#4!4,$P! "#0 (#$!#$$41! * ; +,-,+,$1!+ (! ; . ,"! (2+X! + . ,1! ,1! . $'&,# / ! 6 $! + (! /) (2#4! 6 01$'=X! W! * 6 ! . $)$! *' (#$X! *#4! W! ; *#! . * -$! 1 (6 $!

1(6$!&$(&'$!1*0!+.*+!0(2!;*#^+!4(!,+!0PPPV^!0FGPEUPF I VP!

!

h*;R!.$'&$4!6$!+(!;'*),=0!+.,1!&(,#+!=2)+.$)C!

!

]0 p V!,#,+,*''0!+.$!,4$*!(=!',R$!16(R,#/X!7.$#!+.$!1;.('*)1!=,)1+!4,1;211$4!+.,1X! '(#/!+,6$!*/(X!+.$0!4,4!#(+!2#4$)1+*#4!+.$!,6&',;*+,(#!(=!16(R,#/X!+.$!)$*1(#!,+!7*1! X!+.*+!,+!,1!]4,1',R$4^X!,+!,1!:$;*21$!(=!+.$!16$''P!J.$)$!,1! *!&)*0X!(#!*!\),4*0X!7.$#!7$!/(!+(!;(#/)$/*+,(#*'!&)*0X!+.*+!7$!1.(2'4!#(+! $*+!',R$!1+)(#/!=((4X!',R$!(#,(#!*#4!/*)',;!:$;*21$!+.$!16$''!;(2'4!&2+!&$(&'$! (==P!0 p V!@(!+.$0!&2+!,+!,#+(!+.,1!;*+$/()0X!:2+!#(7!:$;*21$!(=!*''!+.$!)1*);.! *:(2+X!:$+7$$#!16(R,#/X!'2#/!4,1$*1$1!*#4!;*#;$)1X!6(1+!1;.('*)1!(=!+.$! 7()'4!1*0!+.*+!,+!,1! ^P^!0FGPEaPF I VP!

!

W#!*#0!;*1$X! !7.,;.!)$&)1#+1 *!/)$0!*)$*!:$+7$$#! !*#4 X!,1!1+,''! 21$4!:0!+.$!K21',6!1.,1.*!16(R$)1!7.(6!W!$#;(2#+$)$4P!

!

_P`P! J.$!6*)R$+,<*+,(#!(=!1.,1.*!

!

@.,1.*! 16(R$)1! $%&'*,#$4! +.*+! 7,+.! +,6$! 1.,1.*! 16(R,#/! :$;*6$! -$)0! ;(66$);,*',1$4!*#4!+.,1!,6&',$4!*!6*+$),*'!+)*#1=()6*+,(#!(=!1.,1.*!*#4!1.,1.*!:*)1P! W#1+*/)*6!&'*0$4!*#!,6&()+*#+!)('$!,#!+.,1!&)(;$11!01$$!*'1(!J*'$:!$+! DEFGVX!=()! ,#1+*#;$X!''7*,1.*!+('4!6$C!

!

]0 p V!7.$#!W!1+*)+$4!+(!16(R$!,#!N(#4(#X!,+!7*1!#(+!',R$!+.*+X!+.$)$!7$)$!1(6$! 1,6&'$!&'*;$1X!',R$!1$6,3(2+4(()!7,+.!&'*1+,;!+$#+1P!J.$#X!,+!1+*)+$4!+(! 4$-$'(&!*#4!:$;(6$!1(6$+.,#/!6()$^X!*#4!'*+$)!1.$!*44$4!]0(2!;*#!1$$! +.*+!+.1!&'*;$1!*)$!)$*''0!&)$++0X!+.$0!6*R$!+.$6!k,#1+*/)*66*:'$I!0PPPV^! 0D I PEUPF I VP!

!

@.,1.*! :*)1! *)$! 4$1,/#$4! =()! *&&$*',#/! +(! ;21+(6$)1X! =()! ,#1+*#;$C! 1(6$! .*-$! '2%2),(21!'*)/$!*#4!1.,#0!1(=*1!*#4!*)6;.*,)1X!*#4!1(6$!1$)-$!4),#R1!,#!*'+$)#*+,-$! .,&1+$)!6*1(#!Z*)1P!K()$(-$)X!1.,1.*1!.*-$!4,==$)$#+!'((R1!*#4!*)$!4(#$!7,+.!4,==$)$#+!

6 *+$),*'1X! :2+! 6 (1+! ,6&()+*#+'0! +(:*;;(! ;*#! .*-$! 4,==$)$#+! ,#+$#1,+,$1! *#4! =)2,+0! ='*-(2)1P! 8*-,! $%&'*,#$4!]0(2! ;*#! .*-$! $-$)0+.,#/X!)*1&:$))OX! *&&'$X! ;(;R+*,'! 6,%^! ODDPEUPF I VX! *#4!'*+$)!1.(7$4!6$!*!7.('$!=)$1.!&,#$*&&'$!(#!+.$!.$*4!(=!*!1.,1.*X!],+! ,1!*''!*:(2+!6*)R$+,#/X!*#4!,+!,1!*!7*0!(=!,#+),/2,#/!&$(&'$^!ODDPEUPF I VP!J.,1!,1!*!&)(;$11! (=!6*)R$+,<*+,(#!*#4!+)*#1=()6*+,(#!+.*+!.*1!*'1(!:$$#!4(;26$#+$4!:0!c*RR*1.!$+! ODEFFV!,#!N$:*#(#P!

Q(7$-$)X!1.,1.*!*;[2,)$1!4,==$)$#+!=()61!,#!4,==$)$#+!&'*;$1P!8*-,!*'1(!*44$4C!

!

]W!+.,#R!+.$)$!,1!*!:,/![2$1+,(#!6*)R!=()!K21',61P!@.,1.*!,1!1+,''!*!=()6!(=! ,#+(%,;*+,(#!*#4!;(#+*,#1!#,;(+,#$P!@(X!W!;*#!:$',$-$!+.*+!1(6$!&)*;+,+,(#$)1! 7(2'4!#(+!',R$!,+P!J.*+!,1!+.$!)$*1(#!7.0!,#!+.$!K,44'$!>*1+!+.$)$!*)$!'$11! ='*-(2)1X!*#4!,+!,1!'$11!;(66$);,*',1$4X!+.$0!4(!#(+!7*#+!+.*+!0(2#/!&$(&'$! /$+!,#+(%,;*+$4!*#4!/$+!(==P!W+!:$;*6$!;(66$);,*',1$4!*#4!+.$!='*-(2)1! $%&*#4$4!,#!(+.$)!&*)+1!(=!+.$!7()'4P!W!7*1!(#;$!,#!?2:*,!*#4!,+!,1!#(+! &(11,:'$!+(!=,#4!=)2,+1!(#!+.$!1.,1.*P^!ODDPEUPF I VP!

!

J.,1! 1$#+$#;$! 1.(71! .(7! 1.,1.*! (#! 5,'61'(7! 8(*4! ,1! *! +)*#1=()6$4! 6*+$),*'! ;(66(4,+0X!*!-$)0!*#;,$#+!(:Z$;+!:2+!)$,#-$#+$4!01$$!M.*(2*;.,!DEEaC!F`G3FS`VP!8*-,! *#4!"7*,1.*!*)$!*7*)$!(=!+.,1!&)(;$11X!*#4!=()!+.*+!)$*1(#!4(!#(+!;(#1+)2;+!+.$!1.,1.*! *#4!1.,1.*!:*)1!*1!*2+.$#+,;!()!.0:),4P!

!

_P_P! "!#$7!12:3;2'+2)$!

!

J.)(2/.!6(-6#+X!1.,1.*!4,4!#(+!(#'0!2#4$)/(!6*+$),*'!6(4,=,;*+,(#1!:2+!*'1(!

! `D

_PSP!@ . ,1 . *X! / $#4$)! *#4! / $#$) *+, (#*'!4, - ,1, (#1!

!

@ . ,1 . *!1 6 (R,# / !12)$'0!,#;)$*1$1!1 (; , * : ,',+0X! : 2+! ;),+, ; 1! (=!1 . ,1 . *!1 6 (R,# / !7 (2'4!
*) / 2$! + . *+! 1 . ,1 . *! 4 ($1! # (+! ,#;)$*1$! + . $! 1 (; , * : ,',+0! (=! $-$)0 (#$P! W#! =* ; +X! 1 . ,1 . *! ,1!
1 6 (R$4! 6 * ,#'0! : 0!0 (2# / ! 6 $#! *#4!=()!+ . *+!)$*1 (#X!1 . ,1 . *! : *)1! *#4!+ . $!) (*4! : $; * 6 $!
6 $#34 (6 ,#*+$4! 1&* ; $1P! \ ()! ,#1+*#; $X! "<)*X! 1+)$11$4! + . $! ,#* : ,',+0! (=! =$ 6 *'$1! *#4!
=* 6 ,',$1!+(! * ; ;$11!+ . $!) (*4! 7 ,+ . ! ; (#=,4$# ; $C!] : $; *21$! (=!+ . $! 1 . ,1 . *! : *)1! ,+! : $; (6 $1!
R,#4! (=! *! +(! : $! . $)$! *+! ; $)+* ,#!+, 6 $1X!+ . *+!1 . (2'4!# (+! : $^! 0FEPEUPF I VP!

5 (6 $#! *)$! *'1 (! & ()+)*0$4! *1! - , ; +, 6 1! (=! & (+$#+, *'! 1 . ,1 . *! 1 6 (R$)1^! ,#*&&) (&),*+$!
: $. * - , (2)1P! Y* : ,)X! *! 0 (2# / !2#, - $)1,+0! 1+24$#+X! $%&'*,#$4! + . *+! 1 (6 $+, 6 $1! 6 $#!=(" (7!
7 (6 $#! *#4! . $! : $',$ - $1!+ . *+!+ . $!1 (2) ; $! (=!,#*&&) (&),*+$! ; (2)+1 . ,&!&) * ; +, ; $1!,1!+ . *+C!

!

] : *1, ; *"0!,#!+ . $! " 1, *#! ; 2'+2)$X! *#4!+ . ,1! . *&&$#1!,#!' (+1! (=! ; 2'+2)$1!+ . (2 / . X!',R$!
6 $#! *#4! 7 (6 $#! *)$!+('4!+(X!',R$!# (+!1 ()+! (=!1+*0!+(/ $+ . $)X!1 (! 7 . *+! . *&&$#1!,1X!
7 . $#! $* ; . ! (#$! / $+1! ('4$)X!+ . $! 6 $#! *)$!',R$X!+ . $! 6 $#! *)$!+('4! : 0!+ . $,)!=* 6 ,'0C!
k / (! *#4!=,#4! *! / ,)'!! *#4!+ . $0!4 (!# (+!R# (7! . (7!+(!4 (!+ . *+X! : $; *21$!=()! *"!+ . $,)!
',=$!+ . $0! 7 $)$!+('4!# (+!+(! / (! *=+$)! / ,)'1P^!0FGPEUPF I VP!

!

J . $!1 . ,1 . *! : *)1X! ,#!=* ; +X! *)$!# (+! ; (#1,4$)$4!1&* ; $1!=()! 7 (6 $#! : 0!1 (6 $! (=!+ . $! ;),+, ; 1!
*#4! *'1 (! : 0!1 (6 $! (=!+ . $! 6 $#!1 6 (R,# / P!@ (; , *'! 6 ,%,# / ! : $+7$$#! (&& (1,+$! / $#4$)1!,1!# (+!
$# ; (2) * / $4! : 0!2'+) *3 ()+ . (4 (%!=() 6 1! (=!W1' * 6 P!

c$-$)+ . $'$11X! 7 . ,'$!W! 7 *1! ; (#42 ; +,# / !=,$'4 7 ()RX!W! 7 *1! (: 1$) - ,# / ! /) (2&1! (=! 7 (6 $#X!
; (2&'$1! *#4! 6 ,%$4! /) (2&1! (=!&$ (&'$! ; (6 ,# / ! (#!+ . $!) (*4!=()!1 6 (R,# / !1 . ,1 . *P! 5 (6 $#!
(#! 5 ,' 6 1' (7! 8 (*4! 7$)$!=(" (7,# / !4,==$)$#+! *#4! ; (#+)*1+,# / !) ('$1P! 5 (6 $#! *)$!$,+ . $)!
& ()+)*0$4! *#4!=$$'! - 2'#$) * : '$! ()X! *1!,#!+ . $! ; *1 [. d [("#) - 4!!

+(!$%&$),6$#+! 7,+.!*#4!=()/$!,4$#+,+,$1! (2+1,4$!+.$!;(#=,#$1! (=!$1+*:',1.$4! /$#4$)! #()61P!"#4X!,#!1(!4(,#/X!,+!,1!/$#$)*+,#/!1(6$+.,#/!+.*+!,1!/$#2,#$'0!)*4,;*'^!0N*+.*6! DEE`C! FaFDVP! @(6$!1.,1.*!:*)1!(#!5,'61'(7!8(*4!*)$!,#!*!7*0!)*4,;*'X!+.$0!*)$! 2#4$)/(,#/!*!1,6,'*)!;.*#/$X!.(7$-$)X!7(6$#!16(R,#/!1.,1.*!(#!5,'61'(7!8(*4!,1! 1+,"!*!#$7!&)*;+,;$!*#4!1.,1.*!:*)1!*)$!.$+$)(/$#(21P!!

W=!1.,1.*!(==$)1!*!1&*;$!=()!+.$!1(;,*',+0!(=!0(2#/!1.,1.*!16(R$)1X!,+!)$42;$1!+.$! 1&*;$!=()!+.$!1(;,*',+0!(=!=*6,',$1!*#4!6,#()1X!7.(!*)$!212*"0!;21+(6$)1!(=!)$1+*2)*#+1P! W#!=*;+X!1(6$!;),+,;1!(=!1.,1.*!&)(6(+$!*!=*6,'0!;2'+2)$!*#4!7(2'4!',R$!+(!.*-$!*!]=*6,'03 (),$#+$4^!)(*4P!J.$)$!,1!#(+!$#(2/.!1&*;$!=()!4,==$)$#+!/$#$)*+,(#*'!#$$41P!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

`_

SP! \ ((4!

!

SPFP! " !]=* 6 ,'03 (),$#+$4^!) (*4!

!

W=! 1 . ,1 . *! 4,-,4$1! + . $! ; (6 6 2#,+0! (=! 5 ,' 6 1' (7 ! 8 (*4X! =((4! 2#,+$1! ,+P! b =! ; (2)1$X! + . $)$!,1! ; (6 &$+,+, (#! : $+7$$#! *''!+ . $! : 21,#$11$1X!,# ; '24,# / !+ . $! ('4!$1+* : ',1 . $4!]W#4,*#^!)$1+*2)*#+1X! . (7$-$)X! # (#$! 1&$*R1! #$ / *+,-$'0! * : (2+!)$1+*2)*#+1! *#4! =((4P! W#! =* ; +X! $*+,# / !=((4! (#! 5 ,' 6 1' (7 ! 8 (*4!,1!'$ / *'X!,1! !*#4!,1!* ; ;$11, : '$!+ (!&$ (&'$! (=! *''! * / $1X! *''! 1$%$1X! / $#4$)1X! $+ . #, ; ,+,$1X! 1 . ,1 . *! 1 6 (R$)1! *#4! # (#31 6 (R$)1P! \ ()! + . *+!)$*1 (#X!)$1+*2)*#+1! *)$! 1&* ;$1! 7 . $)$! *! 6 ()$! -, :)*#+! *#4! $1&$; ,*''0! 2# [2$1+, (#$4! *#4! =)$$! 6 ,%,# / ! (=! 6 2'+,&'$!4,-$)1$!&$ (&'$!+*R$!&'* ; $P!

J . $!)$*1 (#! 7 . 0! #$ 7 !)$1+*2)*#+1! (&$#$4! (#! + . $! 5 ,' 6 1' (7 ! 8 (*4! ,1! *#! ,#,+,*'! 4$1,)$! (=! ; *+$),# / ! 6 $ 6 : $)1! (=!+ . $66(,!/)*#+1^! ; (6 6 2#,+0C! *#! " * / 9 (,)2 (1!)-2 (*)-4 (; ;)0!

!=$7!7$$R1!:$=()$X!Y:,)!$%&'*,#$4!+(!6$C!

!

]5 .,'$!/)(7,#/!2&X!,=!7$!.*4!1&*/.$++,!:('(/#$1$!,+!7*1#^+!Z21+!&*1+*!1*2;$X! .$):1X!()!7.*+$-$)!7*1!,+P!K0!6(6!7(2'4!&2+!;.,'',X!/)$$#!;.,'',X!+2)6$),;X!)$4!;.,'',!&(74$)X!;2))0!&(74$)X!+(!6*R$!,+!)$*''0!"1,*#0!0 p VP!"#4!,=!W!6*4$! ,+X!W!7(2'4^-$!6*4$!,+!0PPPV!',R$!)$/2'*)!7*0X!*#4!60!6(6!7(2'4!:$!',R$C!kY*:,)t! W+!,1!-$)0!:'*#4X!#(!='*-(2)tI^!0FGPEUPF I VP!

!

J.$!7()41!(=!Y*:,)X!*'1(!)$6,#4$4!6$!(=!*!&)$-,(21!6$$+,#/!7,+.!"<)*X!42),#/!7.,;.! 1.$!+('4!6$!*:(2+!.$)!4$',;,(21!]M2))0!N*1*/#$^P!J.$!/$#$)*'!4,$+!(=!+.$!A),+,1.!"1,*#1! 7.(6!W!6$+!,1!-*),(21X!6,%$4!*#4!.0:),4X!1,6,'*)!+(!+.$!)$1+*2)*#+^1!(==$)P!

J.$!)$1+*2)*#+!.*4!(#$!(=!+.$!6(1+!4,-$)1$!;',$#+$'$!(#!+.$!)(*4X!:2+!,+!7*1! /$#$)*''0!&(&2'*)!*6(#/!A),+,1.!"1,*#1X!7.,'$!+.$!',;$#1$4!]W#4,*#^!)$1+*2)*#+1!+.*+! (&$#$4!,#!+.$!GE13DEEE1!*)$!6()$!&(&2'*)!*6(#/!A),+,1.!5.,+$!;21+(6$)1P!W=!+.$!]W#4,*#^!)$1+*2)*#+1!*4*&+$4!B*R,1+*#,!*#4!W#4,*#!=((4!=()!*!A),+,1.!&*'*+$X!#(7!+.$! A),+,1.!"1,*#!)$1+*2)*#+!+)*#1=()61!,#+$)#*+,(#*'!*#4!A),+,1.!=((4!,#+(!"1,*#P!W=!J,RR*! K*1*'*!,1!+.$!$%(+,;!=()!+.$!A),+,1.X!N*1*/#$!,1!+.$!$%(+,;!=()!+.$!"1,*#P!W+!&)$1$#+1!+.$!)$*'!.(6$!=((4!(=!+.$!+.,)4!/$#$)*+,(#!(=!A),+,1.!"1,*#1!',-,#/!,#!K*#;.$1+$)X!+.$! /)*#4;.,'4)$#!(=!+.$!=,)1+!B*R,1+*#,!*)),-$4!,#!+.$!;,+0P!\()!+.*+!)$*1(#X!+.$! ;(66(4,=,;*+,(#!(=!N*1*/#$!4($1!#(+!.,4$!*!=()6!(=!$%&'(,+*+,(#!(=!+.$!b+.$)!)$'*+$4! +(!=()6$)!;('(#,*'!)$'*+,(#1.,&1P!J.,1!,1!)*+.$)!*!/((4!$%*6&'$!(=!.(7!.0:),4,+0!;*#! ;(2#+$)3*;+!&(7$)!,#$[2*',+,$1!0A.*:.*!F I I_VP!

Q(7$-$)X!$-$#!,=!+.$!A),+,1.!"1,*#!,1!*!1$'=34$;'*)*+,(#!(=!.0:),4,+0!)$/*)4,#/! A),+,1.!*#4!"1,*#!,4$#+,+,$1!*#4!=((4X!+.$!6*+$),*'!.,1+()0!(=!+.$!A),+,1.!"1,*#!N*1*/#$! 1.(71!+.$!',6,+*+,(#1!*)(2#4!+.$1$!$11$#+,*',1+!'*:$'1P!N*1*/#$!,1!*!=((4!;((R$4! $-$)07.$)$X!:2+!,+!;(2'4!:$!;(#1,4$)$4!*#!W+*',*#!4,1.P!"#!W+*',*#!6,/)*#+!,#!=)(#+!(=!*! 4,1.!(=!A),+,1.!"1,*#!N*1*/#$!7(2'4!;(6&*)$!,+!7,+.!+.$!]*2+.$#+,;^!W+*',*#!N*1*/#$!(=! +.$,)!6(6X!6*4$!7,+.!&*1+*!'*0$)1X!)*/2X!:q;.*6$'!1*2;$!*#4!B*)6$1*#P!Q(7$-$)X! ,#/)$4,$#+1!(=!+.$!N*1*/#$!*)),-$4!,#!W+*'0!+.)(2/.!/'(:*'!&*1+!.,1+(),$1!(=!;(##$;+,(#1! +.*+!,#$-,+*:'0!4$1+)(0!+.$!$11$#+,*',1+!,4$*!(=!*#!]

&$)1(#*'!$%&$),$#;$X!:*;R/)(2#4!*#4!,4$#+,+0P!"1!*#!$%+$)#*'!(:1$)-$)X!W!;(2'4!4$=,#$! +.$! A),+,1.! "1,*#! N*1*/#$! *1! *2+.$#+,;! A),+,1.! "1,*#! .(6$!=((4X!$-$#! ,=! ,+! ,1! #(+! $%&',;,+'0!4$=,#$4!*1!12;.P!A2+!;*#!7$!4$=,#$!7.*+!*!N*1*/#$!,#!*:1('2+$!6*+$),*'!*#4! 1(;,*'!+$)61!,1g!J.$!*#17$)!,1!#(P!J.,1!,#+$)&)$+*+,(#!=(''(71!+.$!h$)R!:*/$'^1!*)/26$#+! *')$*40!*4-*#;$4!:0!"'$%!8.013J*0'()!0DEF`VP!J.$!N*1*/#$!;*#!:$!4$=,#$4!*1!.0:),4! ()!*2+.$#+,;!:2+!6()$!,6&()+*#+'0!*)$!,#!*#!$#4'$11!1(;,*'!62+*+,(#!08.013J*0'()!DEF`T! J.(6*1!F||FVP!J.$0!:)$*R!1&*+,*'!*#4!+$6&()*'!:(2#4*),$1!(=!(2)!&$)1(#*'!*#4!',6,+$4! -,1,(#1!(#!1(;,*'!)$*',+0!*#4!,+1!4,-$)1,+0P!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

!

M(#;'21,(#!

!

5,'61'(7!8(*4!2#4$)7$#+!1$-$)*'!;.*#/$1!(-$)!+.$!'*1+!0$*)1P!W#!+.$!F I I E1! *#4!DEEE1X!+.,1!)(*4!7*1!R#(7#!*1!+.$!]M2))0!K,'$^!:$;*21$!,+!(==$)$4!$%(+,;!]W#4,*#^! ;2)),$1!+(!>#/',1.!;21+(6$)1P!A2+!,#!*#!,#;)$*1,#/'0!;(6&$+,+,-$!$#-,)(#6$#+X!+.$! #26:$)!(=!]W#4,*#^!)$1+*2)*#+1!4$;',#$4P!J.,1!)(*4!,1!:$;(6,#/!=*6(21!=()!,+1!1.,1.*! :*)1P!J.1!;.*#/$1!;())$1&(#4!+(!+.$!*)),-*'!(=!#$7!6,/)*#+1!;(6,#/!=)(6!+.$!K,44'$! >*1+X! "1,*X! "=),;*! *#4! >2)(&$! +.*+! #(7! ',-$! +(/$+.$)! 7,+.! 6$6:$)1! (=! *! '(#/3 $1+*:',1.$4!B*R,1+*#,!;(662#,+0P!J.$!K*#;.$1+$)!M,+0!M(2#;,'!,1!&)(24!(=!,+1!4,-$)1,+0! *#4!*,61!+(!;$'$:)*+$!,+!7.$#$-$)!&(11,:'$P!J.$!&$(&'$!7()R,#/!*#4!',-,#/!(#!5,'61'(7! 8(*4!$6:(40!+.,1!*++,+24$P!!

W#!=*;+X!+.,1!)(*4!,1!#(+!1(;,*''0!4,-,4$4!:0!,112$1!)$'*+$4!+(!$+.#,;,+0!*#4!)*;$!:2+!)*+.$)!:0!+.$!;(66(4,=,;*+,(#!(=!1.,1.*P!J.$!1(;,(3;2'+2)*'!*#*'01,1!(=!+.$!$-$)04*0! 4,1;(2)1$1! *#4! &)*;+,;$1! *)(2#4! +.,1! *)+$=*;+!)$-$*'$4! .(7! ;2'+2)*'! 4,-$)1,+0! (#! 5,'61'(7!8(*4!+*R$1!=()6P!@.,1.*!4,-,4$1!+.$!;(662#,+0!:$;*21$!(=!4,==$)$#+!)$*1(#1! +.*+!;*#!*'1(!:$!;(#1,4$)$4!+.$!1(;,*'!4,6$#1,(#1!(=!+.$!4$:*+$C!$;(#(6,;!*#4!'$/*'! =*;+()1X! *1! 7$''! *1! ,#+$)&)$+*+,(#1! (=! ;(#126&+,(#! +*:((1X! /$#4$)!)('$1! *#4! /$#$)*+,(#*'!#$$41P! J.$!&(1,+,(#,#/!*'(#/!+.$1$!&(,#+1!,1!#(+!)$'*+$4!+(!+.$!$+.#,;! :*;R/)(2#4! (=! *! &$)1(#P! \()! +.*+!)$*1(#X! W! =,#4! ,+! 6()$! *&&)(&),*+$! +(! 4$1;),:$! 5,'61'(7!8(*4X!=(''(7,#/!@+$-$#!d$)+(-$;!0DEEa:VX!*1!*!12&$)34,-$)1$!)(*4!7.$)$! 4,==$)$#+!;2'+2)$1!4(!#(+!#$;$11*),'0!;())$1&(#4!+(!1&$;,=,;!6,/)*#+!/)(2&1P!J.,1!#$7! =()6!(=!4,-$)1,+0!*'1(!)$#4$)1!+.$!&(1+;('(#,*'!;),+,;,16!1X!7.,;.!;(#;$&+2*',1$!+.$! ;(66(4,=,;*+,(#!(=!;2'+2)*'!4,-$)1,+0!*1!*!=()6!(=!$%(+,;,16!)$&)(42;,#/!#$(3;('(#,*'!)$'*+,(#1X!,))$'$-*#+!0$P/P!.((R1!DEFST!A2$++#$)!DEEGT!K*0!F I I UVP!

J.$!,#+)(42;+,(#!(=!1.,1.*!1*7!+.$!;)$*+,(#!(=!*!#$7!12:;2'+2)$!(=!0(2#/!K21',6! 1.,1.*!16(R$)1!7.(!*++$#4!1.,1.*!:*)1!=()!1(;,*',1,#/X!=,#4,#/!*!&*)+#$)X!)$'*%,#/!*#4! ;(#126,#/!*!12:1+,+2+$!+(!*';(.('P!@.,1.*!;)$*+$1!*!1&*;$!(=!1(;,*',+0!*#4!;(#-,-,*',+0! 7.$)$!1.,1.*!16(R$)1!;*#!:$!],#+$/)*+$4^!,#!1(;,$+0!*1!#(#34),#R$)1!;(#126,#/!*! [2$1+,(#*:'$!12:1+*#;$P!K()$(-$)X!1.,1.*!16(R$)1!*)$!*7*)$!(=!+.$!6(-$6$#+1X! +)*#1=()6*+,(#1!*#4!+.$!6*)R$+,<*+,(#!(=!1.,1.*X!,#!=*;+X!+.$0!4(!#(+!;(#1+)2;+!+.$! (:Z$;+!*1!.0:),4X!*2+.$#+,;!()!$-$#!$%(+,;X!:2+!)*+.$)!*1!*!;(66(4,+0!+.*+!;*#!1*+,1=0! +.$,)! 1(;,*'! #$$41P! J.$! ;*1$! (=! 1.,1.*X! +.$)$=()$X! 1.(71! +.*+! +.$! ;(#;$&+! (=!

c$-$)+.$'$11X!W! :$',$-$X!+. *+!+.,1! 7 ()R! ; *#! ; (#+), : 2+$!+(! *! :) (*4$)! 4,1 ; 211, (#!)$'*+$4! +(! &(',;0! *#4! ; (6 6 2#,+0! ; (.$1, (#P! \ ()! ,#1+*# ; $X! +.$! ; (6 6 2#,+0! ; (.$1, (#! &(',;0! (=!+.$!Q (6 $! b==, ; $! *#4!

A,:',(/)*&.0!

!

":23N2/.(4X! NP! 0DEFUV! iFIGUj! C!
X!D#4!$4,+,(#X! b*R'*#4X!M*',=()#,*C! 9#,-$)1,+0!(=!M*',=()#,*!B)$11P!

!

"&&*42)*,X! "P! 0$4PV! 0FIGUV!
X!M*6:),4/$C!M*6:),4/$!9#,-$)1,+0!B)$11P!

!

")1.*4X! "PX! K*+.*)((X! hPX! ")1.*4X! >PX! @*4.)*X! @P@PX! c()+(#3 5*#/=()4X! 8PX! h*7*4X! KP!
0DEFIV!]Y#(7'$4/$X! *++,+24$1X! *#4!&$);$&+,(#1!+(7*)41!7*+$)&,&$!+(:*;;(!16(R,#/!
*6(#/1+!;("$/$!()!2#,-$)1,+0!1+24$#+1C! *!101+$6*+,;!)$-,$7^X! X!
FIX!_`IC!F3FDP!

!

"1.;)(=+X! 8PJP! *#4!A$-,)X! KP! 0DEFGV!]K2'+,;2'+2)*',16!,#!;(#+$6&()*)0!A),+*,#C!&(',;0X!
'*7!*#4!+.$()0^X! X!DFX!
FX!F3DFP!

!

"-$0*)4X!BP! *#4!h*;R1(#X! ?P! 0DEEGV!]5*+$)&,&$!16(R,#/!,#!1+24$#+1C!&)$-*'$#;$X!),1R!
=*;+()1X! 106&+(61! (=! *44,;+,(#! *#4! 16(R$! ,#+*R$C! $-,4$#;$! =)(6! (#$! A),+,1.!
2#,-$)1,+0^X! X!GX!FX!Fa_P!

!

A*))$++X! LP"P! *#4!K;>-(0X! ?P! 0DEEUV!]J.$!$-('2+,(#!(=!K*#;.$1+$)^1!M2))0!K,'$C!=)(6!
12:2):*#!1.(&&,#/!1+)$$+!+(!$+.#,;!4$1+,#*+,(#^X! ,#! ?PQP! Y*&'*#! *#4! 5P! N,! 0$41V!
X!N*#.*6C!8(76*#!*#4!N,++'$=,$'4X!FI`3DE_P!

!

A*))0X! AP! 0DEEFV! X!
M*6:),4/$C!B(',+0P!

!

A*12X! BP!

!

?*6,*#(X!>P!0DEFGV!]W1!],#+$/)*+,(#^!*!21$=2'!;(#;$&+!=()!+.$(),1,#/!+.$!,#;()&()*+,(#!(=! 6,/)*#+1g^X! 9#&2:',1.$4! >11*0X! ?$&*)+6$#+! (=! L$(/)*&.0X! 9#,-$)1,+0! M("$/$! N(#4(#P!

!

?*6,*#(X!>P!0DEFI*V!]]>*+,#/!+.$!b+.$)^g!M),+,;*"0!$%*6,#$!+.$!)$'*+,(#1.,&1!:$+7$$#! ;(#126&+,(#! *#4! 62'+,;2'+2)*',16! 4)*7,#/! (#! 1(6$! 1&$;,=,;! $%*6&'$1^X! 9#&2:',1.$4!>11*0X!9MN!?$&*)+6$#+!(=!L$(/)*&.0X!9#,-$)1,+0!M("$/$!N(#4(#P!

!

?*6,*#(X! >P! 0DEFI:V!]\((4! &)*;+,;$1! ,#! K*#;.$1+$)^1! 62'+,;2'+2)*'! M2))0! K,'$C! ?,11$)+*+,(#!B)(&(1*'^X!9#&2:',1.$4!&)$1$#+*+,(#X!9MN!?$&*)+6$#+!(=!L$(/)*&.0X! 9#,-$)1,+0!M("$/$!N(#4(#P!

!

?*)3b4$.X! cP@P! *#4! ":23Q*66*4X! bP"P(')2($)-4$6I6N4(4)-4(!)-42*(?)2($)1(0DE.;.s44(!)-4

[illegible]

[illegible]

!

\ (#$)X! cP!0DEEaV!]Q(7!$%;$&+,(#*'!,1! c$7!o()Rg! K,/)*+,(#!*#4! 6 2'+,;2'+2)*',1 6 !,#!+. $!
$6&,)$!;,+0^X! X!`EX!UX!III3FED`P!

!

L'*1$)X!APLP!*#4!@+)*211X!"PNP!0FIIIV!
D#4!$4,+,(#

Y*)*(16*#(n'2X! ?P! 0DEF_V!]"2+.$#+,;*+$4! 1&*;$1! :'(//,#/! 1$#12*'! $%&$),$#;$1! ,#!
J2)R,1.!/),"!)$1+*2)*#+1!,#!N(#4(#P^! X!FaX!`X!DD_fD`GP!

!

Y*+<X!MP!0FII_V!]B'*0,#/!+.$!=,$'4C![2$1+,(#1!(=!=,$'47()R!,#!/$(/)*&.0^X!
X!_UX!Ua3aDP!

!

Y$,+.X!KP!0DEESV! X!
N(#4(#C!8(2+'$4/$P!

!

Y#$*'$X!hP! *#4! ?70$)X!MP!0DEE_V!]M(#126&+,(#^X!,#!hP@P! ?2#;*#X! cPMP!h(.#1(#X! 8PQP!
@;.$,#X! KP"P! K*'4$#! 0$41PV! X! A*';R7$"!
B2:',1.,5/!N+]TJ0Tc 50T2(!)-62(,)2(E)-4((C)-2)-4(')2(')2(!)]J/TT0j/TT1144(?)2(2)C%F2;$(2^5 60

M,+0!M (2# ; , '!0 7 7 7P 6 *# ; . $1+$)P / (-P2RT!DD! " 2 / 21+!DEF I VP!

!

K *# ; . $1+$)! M,+0! M (2# ; , '! 0DEFGV!

!

X!N(#4(#C!M?8M!
0M(#126$)!?*+*!8$1$*);.!M$#+)$VX!*-*,'*:'$!*+C!
.++&1CHH4*+*P;4);P*;P2RH4*+*1$+H;4);3DEFF3;$#1214*+*3&*;R1=()3'(;*'3*2+.(),+03!
4,1+),;+36*#;.$1+$)3$EGEEEEE`T!EU!K*0!DEFIP!
!
b=,;$!=()!c*+,(#*'!@+*+,1+,;1X!c*+,(#*'!8$;()41!(=!@;(+'*#4X!c()+.$)#!W)$'*#4!@+*+,1+,;1!
#4! 8$1$);.! "/$#;0! 0DEFaV!
X! *-*,'*:'$! *+C! .++&CHH4%P4(,P()/HFEPSDSaH;$#121H*//)$/*+$3DEFF3DT! EU! K*0!
DEFIP!
!
b=,;$!=()!c*+,(#*'!@+*+,1+,;1!*#4!b)4#*#;$!@2)-$0!0DEFaV!
J,+;.=,$'4C!bc@!
L$(/)*&.0X!b=,;$!=()!c*+,(#*'!@+*+,1+,;1X!*-*,'*:'$!*+C!
.++&CHH/$(&()+*'P1+*+,1+,;1P/(-P2RH4*+*1$+1H;(2#+,$13*#432#,+*)03*2+.(),+,$13!
4$;$6:$)3DEFa3=2"3$%+$#+3:(2#4*),$13,#32Rg/$(6$+)0v3!
a_P`aeDM_UPEFaeDMF_PaSFeDMU`P_`_u&*/$vUC!*;;$11$4C!EU!K*0!DEFIP!
!
b^c$,"X!KPX!L,*[2,#+(X!AP!*#4!Q*1$4w,xX!\P!0DEFIV!]K,/)*+,(#X!6$6()0!*#4!&*;$C!*)+1!
#4!7'R,#/!*1!;(#-,-,*'!6$+.(4('(/,$1!,#!&*)+,;,&*+()0!)1*);.!f!*!-,12*'!$11*0^X!
,#! KPNP! A$)/! *#4! KP! c(7,;R*! 0$41PV!
X!N(#4(#C!9MN!B)$11X!IU3FFIP!
!
B.,",&1X!"P!0DEEaV! B),#;$+(#X!chC!B),#;$+(#!
9#,-$)1,+0!B)$11P!
!
B(++,$3@.$)6*#X!oP!*#4!Q,$:$)+X!?P!0DEFSV!]"2+.$#+,;,+0!7,+.!*!:*#/C!$%&'(),#/!
12:2):*#! ;2'+2)$! *#4! 6,/)*+,(#! +.)(2/.!+.$! #$7! &.$#(6$#(#! (=! +.$!
8,;.6(#4!c,/.+!K*)R$+^X! X!SDX!`X!S`G3SS_P!
!
X!*-*,'*:'$!*+C!
.++&CHH777P'$/,1'*+,(#P/(-P2RH2R&/*HFIUSHa`H&4=1H2R&/*yFIUSEEa`y$#P&4=!
0*;;$11$4C!DE!"2/21+!DEFIVP!
!
X!*-*,'*:'$!*+C!
.++&CHH777P'$/,1'*+,(#P/(-P2RH2R&/*HFIUGHaFH$#*;+$4!0*;;$11$4C!DE!"2/21+!DEFIVP!
!
8.013J*0'()X! "P! 0DEF`V!]J.$!$11$#;$1! (=! 62'+,;2'+2)$C! *!1$#1()0!$%&'()*+,(#! (=! *#!
,##$)3;,+0!1+)$$+!6*)R$+^X! X!DEC_X!`I`3_EUP!
!
82$'X!KP!0FIIDV!]M.),1+,*#1!*1!A$',$-$)1^X!,#!hP!?*-,1!0$4PV!
X!N(#4(#C!";*4$6,;!B)$11X!I3`FP!
!
@*,4X!>P!0FIaGV! X!N(#4(#C!B$#/2,#P!
!
!

!