!
!
"#$%!&'&()!*'+!,(!-./+0.'-(-!/$1#.21!*#')3(!'14!#11&%455///6*.0.)'-.6(-25&).3)'758&/56!!
!
"#$%!&'&()!*'+!'0%.!,(!-./+0.'-(-!/$1#.21!*#')3(!'1!1#(!9.*$'0!9*$(+*(!:(%('*#!;(1/.)<4!
#11&%455%%)+6*.75',%1)'*1=>?@A?BC6!!
!
!

"DEFG!HI!JH ; "G ; "9!!

! "#$%& ' (&) ' *+%*+ ,&----------&. !

/ 0%12+34%&52 6 6 "78&----------&9!

:*+7 ' ; 21+3 ' *&----------&<!

:-&="1>?7 ' 2* ; &----------&@!

A-&="1>?7 ' 2* ; & ' *&BACD&----------&@!

"#(!
,'+<%!1#'1!8$+'+*(-!SDTF!$+*2))(-!'+!'--1.+'0!^]6]!,00.+!$+!*.%1%!$+!1#(!8.)7!.8!'**.2+1!
0.%2)(%X!+.1!$+*02-$+3!.%1%!)(0'1(-!1.!)(&21'1$.+'0!-'7'3(6!I2)1#()X!'1!0('%1!^>@!7$00$.+!/'%!
'0%.!$+*2))(-!,R!1'Y&'R()%!'+-!.1#()!0.*'0!%1'<(#.0-()%6!D00!.8!1#(%(!8$32)(%!')(!(%1$7'1(-!,'%(-!
.+!&2,0$*0R!)(&.)1(-!-'1'!1.!-(7.+%1)'1(!1#(!7'3+$12-(!.8!8$+'+*$'0!0.%%(%!*'2%(-!,R!&..)!
%.*$'0!)$%<!7'+'3(7(+16!!
!
"#(!-'1'!&.$+1%!1.!%(Q()'0!*.+*02%$.+%6!

M+!8'*1X!'!8200!'+-!)$3.).2%!'+'0R%$%!.8!#27'+!)$3#1%!'+-!%.*$'0!
NJžăʅă ŦI·ťťă ƛYYŜŘƛI·ťŜťè ǿƛťKƛy˜I·y˜ƶŦŦƛŎŜNJΩă ŦƛŘdzŎƛI·NJè!ŘdzťƛŜă ōŜŎI·dzăŜ ƶŦ ťKƶăŜ NJžăʅăΩ LJƶťŜyťƛI·ť
7'1()$'0!$7&'*1!.+!&).[(*1!%2**(%%!'+-X!1#()(8.)(X!.+!1#(!*.7&'+R6!!
!!

6!!
² KŜy˜LJNJƶƨŜŎťăΣ ădzŎK I·ă 5 ! t [Σ ƶŎŎdzNJ ƶy˜I·yŘ yŜI·NJ ƛyŘƛƎŜyƶdză LJŜƶLJťŜăΩ ťI·yŘă I·yŘ ťŜNJNJƛťƶNJƛŜăΣ
1#(%(!)$%<!'+'0R%(%!72%1!'**.2+1!8.)!$+-$3(+.2%!'+-!#27'+!)$3#1%!2+-()!'&&0$*',0(!
$+1()+'1$.+'0!%1'+-')-%_!1#(!7$+$727!%1'+-')-%!%(1!,R!7.%1!3.Q()+7(+1%!'%!1.!$+-$3(+.2%!
&(.&0(%!')(!+.1!'-(W2'1(!'+-!72%1!,(!%2&&0(7(+1(-!1#).23#!$+-(&(+-(+1!'+-!*2012)'00R!

M ; " : HSLJ"MH ; ?!!

!

M7&'*1!$+Q(%1.)%!#'Q(!,((+!2%$+3!(+Q$).+7(+1'0X!%.*$'0X!'+-!3.Q()+'+*(!UG9bV!%1'+-')-%!8.)!
%(Q()'0!-(*'-(%!1.!(Q'02'1(!'!*.)&.)'1ƛƵƴΩă LJNJI·ŎŰƛŎŜă I·ƴŘ ƛƴLJI·ŎŰφ>!"#).23#!(+Q$).+7(+1'0!
)$1()$'X!$+Q(%1.)%!*.+%$-()!#./!'!.7&'+R!&()8.)7%!'%!'!%1(/')-!.8!+'12)'0!)(%.2)*(%6]!
LƴØŜăŰƵNJă dzăŜ ƎƵØŜNJƴI·ƴŎŜ ŎNJƛŰŜNJƛI· ŰƵ ŜØI·fdzI·ŰŜ I· ŎƵƴLJI·ƴèΩă fŜI·ŘŜNJăKƛLJΣ ŜÈŜŎdzŰƛØŜ LJI·èΣ I·dzŘƛŰăΣ
$+1()+'0!*.+1).0%X!'+-!%#')(#.0-()!)$3#1%6ª!"#).23#!%.*$'0!*)$1()$'X!$+Q(%1.)%!(Y'7$+(!#./!'!
*.7&'+R!7'+'3(%!)(0'1$.+%#$&%!/$1#!$1%!(7&0.R((%X!%2&&0$()%X!*2%1.7()%!'+-!1#(!*.772+1(%!
/#()(!$1!.&()'1(%6C!c#$0(!(+Q$).+7(+1'0!'+-!3.Q()+'+*(!%1'+-')-%!')(!/(00\')1$*20'1(-!/$1#$+!
1#(!$+-2%1)RX!%.*$'0!%1'+-')-%!)(7'$+!'7,$32.2%!&')1$*20')0R!$+!)(0'1$.+!1.!1#(!&).1(*1$.+!'+-!
&).7.1$.+!.8!#27'+!)$3#1%6A!!ă I· NJŜădzfŰΣ ŰKŜNJŜ I·NJŜ ǿƛŘŜ ƎI·LJă ƛƴƛƴØŜăŰƵNJăΩ!',$0$1R!1.!&).&()0R!
'%%(%%!'+-!W2'+1$8R!%.*$'0!)$%<6@!
"#$%!*'%(!%12-R!(Y'7$+(%!1#(!+27().2%!$7&'*1%!'11(+-'+1!1.!1#(!S'<.1'!D**(%%!T$&(0$+(!USDTFV!
&).[(*1!1.!#$3#0$3#1!1#(!*.%1%!1#'1!*.7&'+$(%X!8$+'+*$'0!$+%1$121$.+%!'+-!$+Q(%1.)%!0$+<(-!1.!1#(!
&).[(*1!8'*(-!,R!+.1!)(%&(*1$+3!1#(!#27'+!)$3#1%!.8!$+-$3(+.2%!&(.&0(%6!"#$%!%12-R!%()Q(%!'%!'!
,'%$%!8.)!1#(!'%%()1$.+!1#'1!%.*$'0!)$%<!)(%201$+3!8).7!1#(!',%(+*(!.8!'-(W2'1(!#27'+!)$3#1%!
&).1(*1$.+%!*'+!#'Q(!7'1()$'0!$7&'*1%6!"#()(8.)(X!$+Q(%1.)%!72%1!*.+-2*1!-2(!-$0$3(+*(!.+!
ŎƵƴLJI·ƴƛŜăΩ KdzƴI·ƴNJƛƎKŰă LJƵfƛŎƛŜă I·ƴŘ LJNJI·ŎŰƛŎŜă I·ă LJI·NJŰ ƵŦ I· ŰKƵNJƵdzƎ#!)$%<!'%%(%%7(+1!&)$.)!1.!
7'<$+3!$+Q(%17(+1!-(*$%$.+%6!".!(+%2)(!'!*.7&0(1(!'+-!'**2)'1(!-2(!-$0$3(+*(!&).*(%%X!
$+Q(%1.)%!%#.20-!*.+%$-()!1#(!(Y1(+1!1.!/#$*#!*.7&'+$(%!.&()'1$.+'0$Z(!,.1#!,$+-$+3!'+-!+.+\
,$+-$+3!

-2(!-$0$3(+*(!$%!/#(1#()!*.7&'+$(%!$7&0(7(+1!&).Q$%$.+%!$+!1#(!L6;6!S(*0')'1$.+!.+!1#(!:$3#1%!.8!M+-$3(+.2%!T(.&0(%!UL;S:MTV6!

!

"#$%!%12-R!82)1#()!%#./%!1#'1!1#(!7'1()$'0$1R!.8!%.*$'0!)$%<%!+(*(%%$1'1(%!1#'1!*.7&'+$(%!-$%*0.%(!$+8.)7'1$.+!1.!$+Q(%1.)%!',.21!1#($)!#27'+!)$3#1%!&.0$*$(%!'+-!&)'*1$*(%X!'%!/(00!'%!-$%*0.%(!1#(!-(3)((!.8!0.*'0!.&&.%1.+!1.!1#($)!,2%$+(%%!'*1Q1$(%6!"#$%!-$%*0.%2)(!%#.20-!,(!1$7(0R!'+-!%2,[(*1!1.!1#(!%'7(!'2-1+3!'+-!'**2)'*R!%1'+-')-%!'%!'+R!.1#()!)$%<%!1#'1!$+Q(%1.)%!(Y&(*1!1.!8$+-!$+!%(*2)1(%!8$0$+3%6!

!

"#$%!*'%(!%12-R!

M6!EDJhb:HL;S!

D6!EDJhb:HL;S!H;!SDTF!

I(/!(Q(+1%!-$-!7.)(!1.!,)$+3!1#(!%.*$'0!*.%1%!.8!-(Q(0.&7(+1!ǘƨ ƛyØŜŜǎǘƨNǎΩ l·ǘǘŜyǘƛƨyǘKl·yǘKŜ
*.+1).Q()%R!%2)).2+-$+3!5!t[Σ l· мΣмтн ƳƛƭŜ dzyŘŜNƎNƨdzyŘ LJƛLJŜƭƛyŜ ŎƨyƴŜŎǘƛyƎ bƨNǘK 5l·ʅƨǘl·Ωǎ
E'<<(+!'+-!"#)((!I.)<%!&).-2*1$.+!')('%!1.!%1.)'3(!8'*$0$1$(%!+(')!T'<.1'X!M00$+.$%6^{Bj}!SDTF!$%!
.&()'1(-!,R!G+()3R!")'+%8()!T')1+()%X!F6T6!U;P9G4G"TVX!/#$*#!$%!'!7'%1()!0$7$1(-!&')1+()%#$&!
/$1#!.+(!.8!1#(!7.%1!-$Q()%(!&.)18.0$.!.8!(+()3R!'%%(1%!$+!1#(!L696X!$+*02-$+3!7.)(!1#'+!ABX j j j!
7$0(%!.8!&$&(0$+(%6^{BB}!G"T!./+%!>@6?am!.8!SDTF!'+-!1#(!)(7'$+$+3!%1'<(%!')(!#(0-!,R!T#00&%!CC!
T')1+()%!U?amV!'+-!O')G+!E'<<(+!J.7&'+R!FFJ!U>C6AamV6$^{B?}$!

!

@

$+1()+'1$.+'0!'11(+1$.+X!'11)'*1$+3!'%!7'+R!'%!BaXjjj!&(.&0(!'1!$1%!&('<6?@!SDTF!'0%.!8'*(-!
.&&.%1.+!8).7!+.+\;'1$Q(!*.7 7 2+$1$(%!'0.+3!$1%!).21(6?!!
!
H+!9(&1(7,()!IX!?jBCX!$+!)(%&.+%(!1.!$%%2(%!)'$%(-!,R!1#(!1)$,(%!$+!0$1$3'1$.+X!1#)((!8(-()'0!

!

%1'1(%!1.!*'))R!.21!#27'+!)$3#1%!-2(!-$0$3(+*(!1.!$-(+1$8RX!&)(Q(+1X!7$1$3'1(!'+-!'**.2+1!8.)!
#./!1#(R!'--)(%%!'-Q()%(!#27'+!)$3#1%!$7&'*1%!$+!-(Q(0.&7(+1!&).[(*1%6]C!"#(!b2$-$+3!
T)$+*$&0(%!0$%1!1#(!*.)(!$+1()+'1$.+'00R!)(*.3+$Z(-!#27'+!)$3#1%!$+%1)27(+1%!\!1#(!L6;6!
S(*0')'1$.+!.+!i27'+!:$3#1%_!1#(!M+1()+'1$.+'0!J.Q(+'+1!.+!J$Q$0!'+-!T.0$1$*'0!:$3#1%_!1#(!
M+1()+'1$.+'0!J.Q(+'+1!.+!G*.+.7$*X!9.*$'0!'+-!J2012)'0!:$3#1%_!'+-!1#(!($3#1!M+1()+'1$.+'0!
F',.2)!H)3'+$Z'1$.+!UMFHV!*.)(!*.+Q(+1$.+%!\!'%!1#(!&)$7')R!,(+*#7')<%!8.)!'%%(%%$+3!1#(!
#27'+!)$3#1%!$7&'*1%!.8!,2%$+(%%!(+1()&)$%(%6]A!"#(!b2$-$+3!T)$+*$&0(%!'0%.!%1'1(!1#'1X!
ǻŘŜLJŜyŘƛyƎ ƻyƔŎƛNJŎdzƔăǘl·yŎŜăΣ ōdzăƛyŜăă ŜyǘŜNJLJNJƛăŜă Ƴl·ề yŜŜŘ ǘƻ ŎƻyãƛŘŜNJ l·ŘŘƛǘƛƻyƚl·ƭ ăǘl·yŘl·NJŘăΦ
l.)!$+%1'+*(X!(+1()&)$%(%!%#.20-!)(%&(*1!1#(!#27'+!)$3#1%!.8!$+-Q-2'0%!,(0.+3$+3!1.!%&(*$8$*!
ƎNJƻdzLJă ƻNJ LJƻLJdzƭl·ǘƛƻyã ǘƘl·ǘ NJŜljdzƛNJŜ LJl·NJǘƛŎdzƭl·NJ l·ǘǘŜyǘƛƻyΦέ]@!
!

SDTF!&)(%27(-!1#'1!*.7&0$'+*(!/$1#!+'1$.+'0!0'/%!/'%!%288$*$(+1!8.)!1#(!&).[(*1!1.!7.Q(!
8.)/')-!.+!9$.2Y!1())$1.)R!)'1#()!1#'+!',$-$+3!,R!$+1()+'1$.+'0!#27'+!)$3#1%!%1'+-')-%6aa!"#($)!
0'*<!.8!'11(+1$.+!201$7'1(0R!)(%201(-!$+!7'1()$'0!0.%%6!
!
c#$0(!1#(!*.+1).Q()%R!%2))).2+-$+3!SDTF!/'%!2+$W2(!-2(!1.!$1%!#$3#!7(-$'!&).8$0(X!$1!/'%!+.1!
1#(!8$)%1!*.)&.)'1(!&).[(*1!1.!(Y&()$(+*(!%$3+8*'+1!0.%%(%!-2(!1.!1#(!',%(+*(!.8!*.772+$1R!
.+%(+16!d.#+!:233$(X!/#.!0(-!1#(!-(Q(0.&7(+1!.8!1#(!b2$-$+3!T)$+$&0(%X!1.0-!*D=413/44%*).164!
ŭKl·ŭ ά₮₴ℕ l· ø₴ℕŧŘ\ŎŧI·ăă Ƴʎƴ₴Ǝ ₴LJŜℕl·ŭʎ₴ƴXŭKŜℕŜΩă l· Ŏ₴ăŭ ă₴ƳŜøKŜℕŜ ōŜŭøŜŜƳÞнл Ƴʎŧfʎ₴ƴŭ₴ Þол
Ƴʎŧfʎ₴ƴ l· øŜŜ⌊ ₮₴ℕ ₴LJŜℕl·ŭʎ₴ƴl·f ŘλăℕdzLJŭʎ₴yã ōè Ŏ₴ƳƳdzyʎŭʎŜăε l·yŘ ŭKl·ŭ ŭKŜ ŭʎƳŜ ʎŭ ŭl·⌊Ŝă ŭ₴ ōℕʎƎ
₴ʎf l·yŘ Ǝl·ă LJℕ₴ẑŜŎŭă ₴yfʎyŜ Kl·ă άŘ₴dzōfŜŘ ₴Q()!1#(!*.2)%(!.8!1#(!&)(Q$.2%!-(*'-(X!*)('1$+3!
ădzōăŭl·yŭʎl·f Ŏ₴ăŭ ʎyŧfl·ŭʎ₴y₡ε^c^! ! ŘŘʎŭʎ₴yƴl·ffèΣ άl·yƴl·fèăʎă ōè 9yØʎℕ₴yƳŜyŭl·f wŜă₴dzℕŎŜă a l·yƴl·ƎŜƳŜyŭ ₴₮
ŘŜfl·èă l·ăă₴ŎʎI·ŭŜŘ øʎŭK l· ăl·ƳLJfŜ ₴₮ мфл ₴₮ ŭKŜ ø₴ℕŧŘΩă fl·ℕƎŜăŭ ₴ʎf l·yŘ Ǝl·ă LJℕ₴Ь фл M

!

B]

!

Ba

D6!GNG ; "!9"LSP!OG" i HSHFHbP!

!

M+!&')1X!1#$%!*'%(!%12-R!(7&0.R%!'+!(Q(+1!%12-R!7(1#.-.0.3R!1.!7.)(!&)(*$%(0R!1(%1!1#(!
LJNJƧLJƧăƛǘƛƧƴǘƘl·ǘ ăƧŎƛl·ƒ NJƛăʅă Ƙl·ØŜ Ƴl·ǘŜNJƛl·ƒ ƛƴLJl·Ŏǘă Ƨƴl· ŎƧƴLJl·ƴèΩă ăǘƧŎʅ LJNJƛŎŜΦ !ă l· ăǘl·ǘƛăǘƛŎl·ƒ
7(1#.-.0.3RX!'+!(Q(+1!%12-R!7('%2)(%!1#(!7.Q(7(+1!.8!%1.*<!&)$*(%!$+!)(%&.+%(!1.!%&(*8*!
(Q(+1%6A?!"#(!7(1#.-.0.3R!$%!2%(820!,(*'2%(!$1!*'+!-$88()(+1$'1(!,(1/((+!&)$*(!802*12'1$.+%!1#'1!
)(80(*1!1#(!1R&$*'0!)'+3(!.8!Q')$'1$.+!-2(!1.!2%2'0!1)'-$+3X!'+-!&)$*(!802*12'1$.+%!1#'1!')(!#$3#0R!
2+2%2'0!'+-!#'Q(!+.!.1#()!*'2%(!1#'+!1#(!%12-$(-!(

'%%27&1$.+!.8!'+!(88$*$(+1!7')<(16@?!M+!D7416%>A%J/>134#3K%1#(!J.2)1!(+-.)%(-!1#(!&)(%27&1$.+!
1#'1!1)'-$+3!.**2)%!$+!'!/(00\-(8$+(-!'+-!$7&()%.+'0!7')<(1X!1#'1!1#(!7')<(1!)(80(*1%!'00!
'Q'$0',0(!&2,0$*!$+8.)7'1$.+!'+-!1#'1X!8.)!1#.%(!)('%.+%X!$+Q(%1.)%!*'+!)(0R!.+!$+1(3)$1R!.8!1#(!
%1.*<!&)$*(6@>!M+!%(*2)$1$(%!0$1$3'1$.+X!0'/R()%!72%1!%#./!/#(1#()!1#(!%1.*<!&)$*(!/'%!$7&'*1(-!
,R!'+!'00(3(-!7$%)(&)(%(+1'1$.+!.)!.7$%%$.+!.8!8'*1!$+!.)-()!1.!&).*((-!/$1#!'!*0'%%!.8!
&0'$+1$88%6@]!"#(!L696!92&)(7(!J.2)1!(+-.)%(-!(Q(+1!%12-R!)(%201%!8.)!2%(!'%!(Q$-(+*(!1.!
-(1()7$+(!/#(1#()!%#')(!&)$*(!/'%!$7&'*1(-!,R!$+8.)7'1$.+!$+!G788!;=")#3%C#A%>A%*"167%@A%d#.3%
!=3<K%(366@a!!
!
"#$%!*'%(!%12-R!2%(%!1#(!%'7(!(Q(+1!%12-R!7(1#.-.0.3R!,21!1.!)('*#!-$88()(+1!*.+*02%$.+%6!M+!
8'*1X!1#(!2%(!.8!(Q(+1!%12-R!'1!1#(!*0'%%!*()1$8$*'1$.+!%1'3(!$+!'!%$12'1$.+!0$<(!SDTF!/.20-!0$<(0R!
+.1!,(!%2**(%%820!'%!1#(!$+8.)7'1$.+!)(3')-$+3!%.*$'0!)$%<%!/'%!2+-.2,1(-0R!'Q'$0',0(!1.!1#(!
7')<(1!Q$'!+'1$.+'0!7(-$'!*.Q()'3(!'+-!/.20-!1#2%!,(!$+*.)&.)'1(-!$+1.!%1.*<!&)$*(!,(*'2%(!.8!
1#(!(88$*$(+1!7')<(1!&)(%27&1$.+6!
!
"#(!(Q(+1!%12-R!7(1#.-.0.3R!#'%!,((+!'&&0$(-!1.!'!,).'-!)'+3(!.8!(Q(+1%!$+*02-$+3!1'<(.Q()%X!
(W2$1R!.88()$+3%X!*#'+3(!$+!%1'1(!.8!$+*.)&.)'1$.+X!'-.&1$.+!.8!'+1$1'<(.Q()!&).Q$%$.+%X!8$0$+3!.8!
0'/%2$1%!'3'$+%1!*.)&.)'1$.+%X!-('1#%!.8!*.)&.)'1(!(Y(*21$Q(%X!'+-!&).-2*1!)(*'00%6@C!I.)!1#(%(!
)('%.+%X!$1!/$00!,(!'&&0$(-!1.!7('%2)(!(Q(+1%!1#'1!.**2))(-!'%!&')1!.8!1#(!%.*$'0!*.+80$*1!1#'1!
.**2))(-!$+!.&&.%$1$.+!1.!SDTF6!
!
E6!GNG;"!9"LSP!D;S!"I9á{éLb9{D!
!
"#$%!*'%(!%12-R!,2$0-%!.+!'+!(7()3$+3!8$(0-!.8!)(%(')*#!1#'1'&&0$(%!(Q(+1!%12-R!'+'0R%$%!1.!G9b!
(Q(+1%6@A!GY$%1$+3!&'&()%!#'Q(!2%(-!(Q(+1!%12-R!1.!'%%(%%!1#(!8$+'+*$'0!&()8.)7'+*(!.8!8$)7%!
1#'1!-$Q(%1(-!8).7!9.21#!D8)$*'!-2)$+3!1#(!'&')1#($-!()'6@@!O.)(!)(*(+10R%!(Q(+1!%12-R!/'%!
'&&0$(-!1.!'!%'7&0(!.8!a?Xjjj!7(-$'\)(&.)1(-!$+1()'*1$.+%!,(1/((+!BI!3.0-!7$+$+3!*.7&'+$(%!
'+-!Q')$.2%!%1'<(#.0-()%!.Q()!'!1$7(%&'+!.8!B@!R(')%6@I!!
!
GQ(+1!%12-R!'+'0R%$%!.88()%!'!Q'02',0(!1..0!1.!#(0&!$+Q(%1.)%!,(11()!2+-()%1'+--5(!)/MCIreWnBT1#!(Q(R%BT%

8). 7!*. 7&'+$(%X!,21!1#()(!$%!%1$00!-(,'1(!').2+-!/#$*#!G9b!$+8.)7'1$.+!$%!7'1()$'06IB!"#(!L696!
92&)(7(!J.2)1!-(8$+(%!7'1()$'0!$+8.)7'1$.+!'%!$+8.)7'1$.+!1!#'1!#'%!'!%2,%1'+1$'0!0$<(0$#..-!1.!

)(7'$+(-!$+!1#(!7(-$'!%&.10$3#1!8.)!7.+1#%!'+-!*.Q()'3(!'&&(')(-!$+!7'$+%1)('7!7(-$'X!
8$+'+*$'0!7(-$'X!'01()+'1$Q(!7(-$'X!'+-!%.*$'0!7(-$'6IA!!
!
I2)1#()7.)(X!$+!1#(!*'%(!.8!SDTFX!+(')0R!'00!.8!1#$%!7(-$'!'11(+1$.+!/'%!)(0(Q'+16!M+!%.7(!*'%(%X!
1#(!$+1(3)$1R!.8!(Q(+1!%12-$(%!*'+!,(![(.&')-$Z(-!,R!7')<(1!+.$%(τ8.)!(Y'7&0(X!%&(*20'1$Q(!
$+8.)7'1$.+!',.21!1#(!)(0('%(!.8!+(/!&).-2*1%!1#'1!7'R!.)!7'R!+.1!,(!1)2(6!ER!*.+1)'%1X!7.%1!
7(-$'!'11(+1$.+!$+!1#$%!*'%(!8.*2%(-!.+!(88.)1%!,R!1#(!91'+-$+3!:.*<!9$.2Y!")$,(!'+-!.1#()%!1.!

c (!7'-(!1#(!8.00./$+3!7.-$8$*'1$.+%!1.!(+%2)(!'!)$3.).2%!'&&0$*'1$.+!.8!(Q(+1!%12-R!
7(1#.-.0.3R!1.!1#$%!*'%(6!c#$0(!1#(!(Q(+1!/$+-./!$%!1)'-1.+'00R!-(8$+(-!8$)%1X!/(!,(3'+!,R!
*.7LJƛƒƛƴƎ I· Ŧdzƒƒ ǘƛƴŜƒƛƴŜ I·ƒƧƴƎăƛŘŜ ƘƛăǘƧƝƛŎI·ƒ ŘI·ǘI· Ƨƴ9¢tΩă ăǘƧŎʅ ƝŜǘdzƝƴƴ ŦƧƝ ǘƘŜ ŎƧƝƝƝŜăLJƧƴŘƛƴƎ
-'1(%6!M+!.)-()!1.!-(8$+(!1#(!/$+-./!8.)!(Q(+1!1(%1$+3X!/(!)(Q$(/(-!1#(!0')3()!1$7(0$+(!1#'1!/'%!

'6 J'0*20'1(!8$)7!'+-!$+-(Y!)(12)+%!8.)!B?j!-'R%!&)$.)!1.!(Q(+1!

>6 I.)!('*#!(Q(+1X!$-(+1$8R!1#(!%(W2(+*(%!.8!8$)7!'+-!7')<(1!)(12)+%!R.2!/'+1!1.!,(!
$+*02-(-!$+!1#(!(%1$7'1$.+!/$+-./6!

'6 9(1!1#(!(Y*(0!%&)('-%#((1!1.!*'0*20'1(!1#(!(Y&(*1(-!'+-!',+.)7'0!)(12)+!.+!1#(!
(Q(+1!-'1(X!('*#!.8!Bj!-'R%!,(8.)(!1#(!(Q(+1X!'+-!('*#!.8!Bj!-'R%!'81()!1#(!
(Q(+1_!*)('1$+3!'!?B\-'R!(%1$7'1$.+!/$+-./!

]6 S(1()7$+(!(Y&(*1(-!)(12)+%!8.)!1#(!8$)7!1#).23#!'!)(3)(%%$.+!'+'0R%$%6!!J'0*20'1(!1#(!
'0&#'X!,(1'!'+-!%$37'!*.(88$*$(+1%!U8.)!('*#!(Q(+1V!2%$+3!1#(!GY*(0!8.)72 0'%!$+1()*(&1X!
%0.&(X!'+-!%1(RY!)(%&(*1$Q(0R6!

'6 M+1()*(&1!U'0&#'V!=M;"G:JGT"U8$)7G%1$7'1$.+T()$.-X7')<(1G%1$7'1$.+T()$.-V!

,6 90.&(!U,(1'V!=9FHTGU8$)7G%1$7'1$.+T()$.-X7')<(1G%1$7'1$.+T()$.-V!

6 91'+-')-!())./!U%$37'!*.(88$ $(+1V!
=9"GPKU8$)7G%1$7'1$.+T()$.-X7')<(1G%1$7'1$.+T()$.-V!

a6 E'%(-!.+!1#(!'*12'0!7')<(1!)(12)+%!.+!1#(!(Q(+1!-'1(!'+-!1#(!.1#()!-'1(%!$+!1#(!(Q(+1!
/$+-./X!2%(!1#(!'0&#'!'+-!,(1'!Q'02(!.8!1#(!(Q(+1!1.!*'0*20'1(!(Y&(*1(-!)(12)+%!
1#).23#.21!1#(!(Q(+1!/$+-./6!"#(%(!)(12)+%!)(&)(%(+1!1#(!#R&.1#(1$*'0!)(12)+%!.+(!
/.20-!(Y&(*1!#'-!1#(!(Q(+1!+.1#'Q(!1'<(+!&0'*(6!

C6 S(-2*1$+3!1#(!(Y&(*1(-!)(12)+%!8).7!1#(!'*12'0!)(12)+%!.8!1#(!8$)7r%!%1.*<!1#).23#.21!
1#(!(Q(+1!/$+-./!1.!)(*($Q(!1#(!',+.)7'0!)(12)+6!

A6 SQ-(!1#(!',+.)7'0!)(12)+!1#).23#!1#(!)..1!7('+!%W2')(!()).)!U$6(6X!1#(!91(RY\Q'02(V!1.!
R$(0-!1\Q'02(%!1.!,(!2%(-!8.)!%$3+$8$*'+*(!1(%1$+36!

!

M+!.)-()!1.!-(1()7$+(!/#(1#()!1#(!'*12'0!)(12)+!/'%!%$3+$8$*'+10R!0(%%!1#'+!(Y&(*1(-X!/(!1(%1(-!
/#(1#()!1#(!',+.)7'0!)(12)+!/'%!%$3+$8$*'+10R!0(%%!1#'+!Z().6!

!

"(%1$+3!(Q(+1!%12-R!)(%201%!8.)!%$3+$8$*'+*(4!

B6 I.)!('*#!(Q(+1!/(!1(%1(-!1#(!8.00./$+3!#R&.1#(%$%6!!S(*$%$.+%!1.!)([(*1!1#(!+200!/()(!
,'%(-!.+!1#(!*.777.+0R!'**(&1(-!'0&#'!.8!6ja6!

ij4!"#(!',+.)7'0!)(12)+!$%!(W2'0!1.!Z().!,(*'2%(!1#()(!$%!+.!-$88()(+*(!,(1/((+!
1#(!(Y&(*1(-!)(12)+!'+-!1#(!'*12'0!)(12)+!UD:!=!jV!
iB

&21&'#&'+;,,%'&2)'$)<$)%%#*4'141,6%#%'=* : +1$#4<'&*'&2)' : 1$9)&'14 . '#4 . ;%&$6'#4 .)^'%*'&2)'&)%&'=*4&$*,%'
7*$'&2)' : *5) :)4&'*7'&2)'#4 . ;%&$6'1%'1' / 2*,)'1%'=* : +1$) . '&*'&2)' : 1$9)&>'
'
R4'1'& / *D71=&*$')5)4&'%&; . 6B'&2)'7#$: B' : 1$9)&B'14 . '#4 . ;%&$6'$)&;$4%'1$)'=* : +1$) . '1<1#4%&')1=2'
*&2)$>''Nxcel's line estimation (=linest) function was used to calculate the estimated line intercept
1%' /),,'1%'%,*+)%'UO)&1%VB'%&14 . 1$. ')$$*$%'14 . '$D%?;1$)%'7*$'&2)'#4 . ;%&$6'14 . ' : 1$9)&'
#4 . #=)%>''L2)%)'51,;)%'1$)'&2)4';%) . '&*'=1,=;,1&)'&2)'104*$: 1,'$)&;$4'7*$')1=2' . 1&)'#4'1'ED . 16'
)5)4&' / #4 . * />'
!
"#41,,6B' /)'=1,=;,1&) . '&2)'104*$: 1,'$)&;$4'7*$'&2)',)4<&2'*7'&2)'&# :),#4)'&*'0)&&)$';4 .)$%&14 . '&2)'
#47,;)4=)'*7'%*=#1,'+$)%%;$)' / 2#=2B'1%'%&1&) . '10*5)B'*==;$%';4)5)4,6'*5)$'&# :)'14 . '21%'1'
=; : ;,1&#5)')77)=&'$1&2)$'&214'1'+;4=&;1&) . ')77)=&'#4'&2)' : 1$9)&>'H2)!%1)'1(3R!1 . !8$+-!1#(!
' ,+.)7 '0!)(12)+!'0 . +3!1#(!1$7 (0$+(!(%%(+1$'00R!)(&('1(-!1#(!(Q(+1!%12-R!7 (1#. - .0 . 3R!8 .)!1#(!
%$+30(!8'*1 .)!$+-$*(%6!OO4*$: 1,'$)&;$4'7*$'&2)'&/ *D71=&*$'%&; .#)%' / 1%'1,%*'&2)'%1 :)'1%' .)%=$#0) . '
/#&2'1'*4)D . 1

!

!

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¢ĶŜ ăĶƨŃŭ́ ŭ́ƛƔŜŧƛƴŷŜ ł·ō₂ØŜ ł·ƴŘ ŭ́ĶŜ ŎĶł·ŃŭŘŜƴƔƨãŭ́Ńł·ŭ́Ŝ Ǿƛăƶdzł·ffè ŭ́�ł·ŭ́ 9¢ tΩă ăŭ́₂ŎƬ LJŃƛŎŜ ŃŜł·ŎĶŜŘ ƛŭ́ă

&('<!$+!9(&1(7,()!.8!?jBCX!'+-!1)(+-(-!-./+/')-!8).7!1#'1!&.$+16!GQ(+!1#(!%&$<(%!8.00./$+3!

tŃŜăƛŘŜƴŭ́ ¢ŃƶdzƔLJΩă ŜŧŜŎŭ́ƛ₂ƴ₂ƴb₂ØŜƔōŜŃ ƴΣ нлмс ł·ƴŘ ĸƛă ăƛƎƴƛƴƎ ₂₮ ŭ́ĶŜ ŜÈŜŎƶdzŭ́ƛØŜ ł·Ŏŭ́ƛ₂ƴŭ́₂

ł·LJLJŃ₂ØŜ ŭ́ĶŜ [ł·ƬŜ hł·ĶŜ Ŝł·ăŜƔŜƴŭ́ ₂ƴWł·ƴƶdzł·Ńè нпΣ нлмт ǿŜŃŜ ƴ₂ŭ́ ŜƴƲ₂dzƎK ŭ́₂ ŃŜŭ́dzŃƴ 9¢ tΩă ăŭ́₂ŎƬ ŭ́₂

$1%!&)(Q$.2%!0(Q(0%6!!

"#(!)'/!-'1'!-(7.+%1)'1(%!1/.!$7&.)1'+1!&.$+1%6!I$)%1X!1#'1!%1.*<!&)$*(!)(12)+%!-(*)('%(-!.Q()!
1$7(!'+-!-$-!+.1!)(12)+!1.!1#(!&('<!+(')!^>B!.+!9(&1(7,()!@X!?jBC6!"#(!*#')1%!$+!1#$%!%(*1$.+!
-.!+.1!%#./!1#'1!1#(!&)$*(!+(Q()!)(*.Q()(-!1.!$1%!&('<!'%!.8!-'1'!-)'/+!.+!9(&1(7,()!?@X!
?jB@6!9(*.+-X!1#(!%1.*<!&)$*(!(Y&()$(+*(-!$+*)(-$,0(!Q.0'1$0$1R!$+!3(+()'0X!'+-!'%!'3'$+%1!1#(!
7')<(16!E.1#!.8!1#(%(!8$+-$+3%!*.$+*$-(!/$1#!1#(!$+1(+%(!%.*$'0!*.+80$*1!.&&.%$+3!SDTF!1#'1!
.**2))(-!8).7!D232%1!?jBC!2+1$0!I(,)2')R!?jBA6!"#(!%.*$'0!*.+80$*1X!%1(77$+3!8).7!
2+(Y'7$+(-!%.*$'0!)$%<%X!1#2%!!
1)'+%0'1(-!$+1.!7'1()$'0!0.%%(%!$+!1()7%!.8!-(*)('%(-!)(12)+%!'+-!2+(Y&(*1(-!Q.0'1$0$1R6!!
!
CdzNJűKŜNJΣ űKŜ NJl·ǿ Řl·űl· Ƶƴ9¢tΩă ăűƵŎʅ LJNJƛŎŜ l·ă ǿŜƭƭ l·ă NJl·ǿ Řl·űl· ƵƴűKŜ Ǿl·ƭdzŜ ƵŦ űKŜ {ɘt рлл

%12-$(%!-(7.+%1)'1(!1#(!%1).+3!*.))(0'1$.+!,(1/((+!-'1(%!/#(+!%.*$'0!*.+80$*1!.**2))(-!'+-!
ǿKŜy9¢tΩă ăǘƵŎʅ LJNJƛŎŜ ŘNJƵLJLJŜŘ ădzŎK ǘKl·ǘΣ l·ǘ l· YƛyƛYdzYΣ ǘKŜ ǘƵǘl·fƛǘè ƵŦ ăƵŎƛl·f LJNJŜăădzNJŜ ǘKl·ǘ
201$7'1(0R!*'2%(-!(Y1(+%$Q(!.&()'1$.+'0!-(0'R%!\!,.R*.11%X!&).1(%1%X!7(-$'!'+-!-$Q(%17(+1!
'7&'$3+%!$+!%2&&.)1!.8!)1*'0!*.+*()+%!Q.$*(-!,R!1#(!91'+-$+3!:.*<!9$.2Y!")$,(!'+-!.1#()%!\!
.+%1$121(-!%.*$'0!)$%<%!7'1()$'0!(+.23#!1.!/'))'+1!-$%*0.%2)(!1.!$+Q(%1.)%!'1!'!72#!(')0$()!
-'1(6!!
!
!ă ăŜŜyƛyǘKŜ ƎNJl·LJK ƵŦ 9¢tΩă ăǘƵŎʅ LJNJƛŎŜ ƵǾŜNJ ǘƛYŜ ƛy{ŜŎǘƛƵyLLLφ!Σ 9¢tΩă ăǘƵŎʅ LJNJƛŎŜ NJŜl·ŎKŜŘ l·
1$&&$+3!&.$+1!$+!9(&1(7,()!?jBCX!8).7!/#$*#!$1!1)(+-%!-./+/')-6!9$3+$8$*'+10RX!1#$%!1$&&$+3!
&.$+1!.**2))(-!'81()!'!%/(00!.8!+'1$.+'00R*.Q()(-!.&&.%$1$.+!1.!SDTF!1#'1!'0%.!&('<(-!$+!
9(&1(7,()!?jBC6!"#(!104*$:1,'$)&;$4'141,6%#%'%2*/%'1'+#=&;$)'*7'=*4%#.)$10,)'5*,1&#,#&6'14.'
&2)$)'1$)'%)5)$1,'.1&)%'/2)$)'&2)'4)<1&#5)'104*$:1,'$)&;$4'=*$$),1&)%'/#&2':*:)4&%'*7'#4&)4%)'
%*=#1,'+$)%%;$)>'¢Kƛă ăŜŎǘƛƵyLJdzffă ŦNJƵY Řl·ǘl· ŦNJƵY ǘKŜ ăƛYLJfŜ l·yl·fèăƛă ƵŦ 9¢tΩă ăǘƵŎʅ LJNJƛŎŜΣ l·ă ǿŜff
'%!('*#!.8!1#(!%$+30(\8'*1.)!'+-!1/.\8'*1.)!7(1#.-!(Q(+1!%12-$(%!1.!%#./!1#(!)(0'1$.+%#$&!
ōŜǘǿŜŜyǘKŜ ăƵŎƛl·f ŎƵyŦfƛŎǘ ƵLJLJƵăƛyƎ 5!t[l·yŘ 9¢tΩă ăǘƵŎʅ LJNJƛŎŜφ!
!
"#(!)(%201%!.8!1#(!%$+30(\8'*1.)!(Q(+1!%12-$(%!'3'$+%1!1#(!9eT!ajj!')(!%#./+!,(0./6!l.)!1#(!0'%1!
%$Y!-'1(%!1(%1(-X!1#(!1(+\-'R!JD:!$%!+(3'1$Q(X!-(7.+%1)l·ǘƛyƎ ǘKl·ǘ 9¢tΩă ŘƛŘ yƵǘ NJŜōƵdzyŘ l·ŦǘŜNJ
1#(!(Q(+1!-'1(!'+-!1)(+-(-!-./+/')-!'81()!1#(!(Q(+1!-'1(6!!
!
!

G"T!N6!9TK!GNG;"!9"LSP!:G9LF"9!

	Q.02+1')R!#'01!*.+%1)2*1$.+!'1! 1#(!F'<(!H'#(!*).%%$+36BjC!!			
I5?C5BC!	H,'7'!7(+1$.+%!91'+-$+3!:.*<! I·yŘ ŎƵƳƳƛǘǎ ǘƵ ǵƝŜŘƵdzōƭŜ Ƶdz)! (88.)1%!1.!7'<(!%2)(!1#'1!(Q()R! 8(-()'0!'3(+*R!1)20R!*.+%201%! '+-!0$%1(+%!'+-!/.)<%!/$1#!R.2X! ǎƵǾŜƝŜƛƎƴǘƵ ǎƵǾŜƝŜƛƎƴǞ ŘdzƝƛƴƎ 1#(!c#$1(!i.2%(!")$,'0!;'1$.+%! J.+8()(+*(6BjA!	;.1!%$3+$8$*'+1!		

!

>j

*.+%1)2*1$.+X!'+-!'00!.8!1#(%(!(Q(+1%!&).7&1(-!;.)1#!S'<.1'!b.Q()+.)!d'*<!S'0)R7&0(!1.!
-(*0')(!'!%1'1(!.8!(7()3(+*R6$^{B?B}$!¢KŜ LJƵăƛǘƛǾŜ l·ōyƵNJƳl·f NJŜǘdzNJyƴƵy9¢tΩă ăǘƵǑ˥ ƵyƴǘKl·ǘ Řl·ề ǿl·ă
+.1!%1'1$%1$*'00R!%$3+$8$*'+1!'1!.+0R!6lBmX!#./(Q()!$+!1#(!yŜỀǘ ǘŜyƴŘl·ềă 9¢tΩă ăǘƵǑ˥ ǑƵyƴǘƛyƴdzŜŘ
-./+6$^{B??}$!S2)$+3!1#(!7.+1#!8.00./$+3!1#(!'++.2+*(7(+1!.8!&).[(*1\0(Q(0!8$+'+*$+3X!8).7!D232%1!
нΣ нлмс ǘƵ {ŜLJǘŜƳōŜNJ нΣ нлмсΣ 9¢tΩă ăǘƵǑ˥ LJNJƛǑŜ l·ǾŜNJl·ƎŜŘ Ρолφлмφ$^{B?>}$!!
!
D1!1#$%!&.$+1X!%(Q()'0!%$3+$8$*'+1!%.*$'0!'*1$.+%!ƵǑǑdzNJNJŜŘ l·yŘ LJNJŜǑƛLJƛǘl·ǘŜŘ 9¢tΩă fƵyƎ\1()7!
-./+/')-!1)(+-6!H+!9(&1(7,()!?X!1#(!91'+-$+3!:.*<!9$.2Y!")$,(!8$0(-!'+!'88$-'Q$1!$+!*.2)1!

G 7 &0 . R ((%!$+ - $* ' 1$+3!* . +%1)2*1$. +! / . 20 - !* . +1$+2 (6B?I !"#) ((! - ' R%!0 ' 1 ( )X! . +!9 (&1 (7 , ( )!BCX!? j BCX!
1# (!* . 2)1!$%%2 (- ! ' +! ' - 7 $+$%1) ' 1$Q (!$+[2+*1$. +!1 . !# ' 01!* . +%1)2*1$. +! / #$0 (!$1!* . +%$ - ( ) (- !1# (!

%(+1!1.!1#(!#.%&$1'06!HC!ER!1#$%!1$7(!7.)(!1#'+!]jj!&(.&0(!#'-!,((+!'))(%1(-6!HE!"#(!91'+-$+3!:.*<!9$.2Y!")$,(!'0%.!*'00(-!.+!1#(!8(-()'0!3.Q()+7(+1!1.!-(+R!1#(!F'<(!H'#(!*).%%$+36!HY!H+!1#$%!-'RX!1#(!',+.)7'0!)(12)+!8.)!G"T!/'%!%$3+$8$*'+10R!+(3'1$Q(!'*).%%!'00!$+-$*(%!1(%1(-6!!

!

9Mb;MIMJD;"!DE;H:ODF!:G"L:;!NDFLG9!;HNGOEG:!?BX!?jBC!!			
NL('5›'P(d'	NL('5›'T;%%),,' "LPNC_**.'	NL('5›'P(dXP(_PPRKT'	NL('5›'P(dXO\`R'
DA›YAb'	DA›CFb'	DG›!Hb'	DA›AAb'

!

!

8$+'+*$'0!-'7'3(6B]j!"#(+X!.+!S(*(7,()!CX!?jBC!/#$*#!$%!$+!1#(!1(+!-'R!)'+3(!.8!.2)!(Q(+1!1(%1(-!-'1(!.8!S(*(7,()!aX!1#(!',+.)7'0!)(12)+!/'%!%$3+$8$*'+10R!+(3'1$Q(!'1!\a6?Im6B]B!9¢tΩă&)$*(!/'%!^??6Aa!.+!1#'1!-'R6B]?!

!

H+!S(*(7,()!>jX!?jBCX!/#(+!1#(!&$&(0$+(!/'%!%2&&.%(-!1.!,(!)('-R!8.)!%()Q$*(X!.&()'1$.+!/'%!-(0'R(-!'%!'&&).Q'0%!/()(!ăűdzŐ]ƛy˝ℕŜƎdzfl·ű2ℕèfƛY˝ō2₱9¢tΩă ăű2Ő] LJNƛÔŜ Ŏf2ăŜŘ l·ű Рнп₱лн 2y˝űKƛă-'1(!'+-!'Q()'3(-!^?]6C@!-2)$+3!1#(!8.00./$+3!7.+1#6B]>!!

!

9¢tΩă ăű2Ő] LJNƛÔŜ ăLJƛ]ŜŘ l·₣űŜℕ tℕŜăƛŘŜSyű ¢ℕdzY˝LJΩă ŜÈŜŎdzűűØŜ l·ŎűűƛƵ˝ƵℕŘŜℕƛyƎ ύKŜ ¦{!/9 ű2 ₣l·ăű1)'*<!'&&).Q'0!.8!SDTF!$+!d'+2')R!?jBA6B]]!i./(Q()X!1#$%!%&$<(!/'%!%1$00!+.1!(+.23#!1.!,)$+3!9¢tΩă ăű2Ő] LJNƛÔŜ ű2 ƛűă LJŜl·] fŜØŜfă ƛy˝!dzƎdzăű Ƶℕ {ŜLJűŜY˝ōŜℕ нлмс₱B]a!

!

SDTF!/'%!8$+'00R!&0'*(-!$+1.!%()Q$*(!8$Q(!7.+1#%!0'1()!1#'+!.)3+'00R!&).[(*1(-!.+!d2+(!BX!?jBAX!'+-!9¢tΩă ăű2Ő] LJNƛÔŜ Ŏf2ăŜŘ l·ű Рнм₱фр .+!1#$%!-'1(X!'Q()'3$+3!.+0R!^?j6?j!-2)$+3!1#(!8.00./$+3!7.+1#6B]C!

!

"#(!8$+'0!-'1(!1(%1(-!/$1#!(Q(+1!%12-R!/'%!d2+(!B]X!?jBA!/#(+!d2-3(!E.'%,()3!)20(-!1#'1!1#(!L9DJG!-$-!+.1!'-(W2'1(0R!*.+%$-()!1#(!$7&'*1%!.8!1#(!&).[(*1!.+!8$%#$+3!)$3#1%X!#2+1$+3!)$3#1%!.)!1#(!$7&'*1%!'%!1.!,).'-()!(+Q$).+7(+1'0![2%1$*(!*.+*()+%6B]A!C2ftƵ2ø ƛyƎ ύKl·ű ŘŜŎƛăƛ2y˝ 9¢tΩă&)$*(!-).&&(-!'+-!#'-!'!%1'1$%1$*'00R!%$3+$8$*'+1!+(3'1$Q(!',+.)7'0!)(12)+!.+!1/.!.8!1#(!8.00./$+3!1(+!-'R%!$+!1#(!%$+30(\8'*1.)!1(%1!'3'$+%1!1#(!9eT!aj j6!"#'1!1#()(!$%!.+(!-'1(!/$1#!'!%$3+$8$*'+1!&.%$1$Q(!',+.)7'0!)(12)+!%#.//%!1#(!*.+1$+2(-!Q.0'1$0$1R!.8!1#(!%1.*<!(Q(+!'81()!1#(!&('<!.8!%.*$'0!2+)(%1!#'-!%2,%$-(-6!D1!1#$%!&.$+1!1#(!%1.*<!&)$*(!)'+3(-!,(1/((+!^B@6]C!'+-!.+0R!^?B6Ia6B]@!

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J6!HMF!T:MJG!IFLJ"LD"MH;!

H$0!&)$*(%!/()(!'+.1#()!8'*1.)!1#'1!1!$+802(+*(-!9¢tΩă ăű2Ő] LJNƛÔŜ₱ hƛf LJNƛÔŜă ŜÈLJŜℕƛŜyŎŜŘ ă2Y˝Ŝ Q.0'1$0$1R!-2)$+3!1#(!(Q(+1!%12-R!&()$.-X!,21!1#($)!.Q()'00!1)(+-!/'%!'+!2&/')-!*0$7,6B]I!"#(R!'Q()'3(-!^]]6@@!&()!,'))(0!$+!D232%1!?jBC6Baj!"#(R!*0$7,(-!%0./0R!.Q()!1#(!*.2)%(!.8!1#(!SDTF!*.+1).Q()%R!'+-!*.+1$+2(-!1.!*0$7,!'81()!*.+%1)2*1$.+!/'%!*.7&0(1(-6!;.1!.+*(!-$-!1#(R!8'00!,(0./!^]]6@@!'+-!(Q(+12'00R!)('*#(-!^A>6]>!'%!.8!O'R!>BX!?jB@6BaB!i./(Q()X!/#$0(!.$0!&)$*(%!

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#'Q(!)(*.Q()(-!8).7!1#(!-./+12)+!*.77.-$1R!()'!,(1/((+!S(*(7,()!?jBa!1.!O')*#!?jBCX^Ba?!
9¢tΩă ăǘƵŎʅ LJNJƛŎŜ Ƙl·ă ƴƵǘφ ^Ba>!
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S6!"MOGFM;G!D;S!GNG;"!9"LSP!IM;SM;b9!
!
¢ƘŜ ŦƵƒƒƵǿƛƴƎ ƎNJl·LJƘ ăƘƵǿă 9¢tΩă NJŜǘdzNJƴã l·Ǝl·ƛƴãǘ ǘƘŜ {ɘt рлл ŦƵNJ ǘƘŜ LJŜNJƛƵŘ !dzƎdzăǘ мΣ нлмс
1#).23#!;.Q(7,()!AX!?jBC6!!
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7'+'3(7(+1!.8!%.*$'0!)$%<%X!*.7,$+(-!/$1#!$1%!0'*<!.8!-$%*0.%2)(!-2)$+3!$1%!$+$1$'0!'++.2+*(7(+1!
.8!SDTFX!*)('1(-!'!72*#!7.)(!Q.0'1$0(!'+-!1#()(8.)(!72*#!)$%<$()!$+Q(%17(+1!1#'+!.)3+'00R!
&).[(*1(-6!D%!+.1(-!(')0$()!$+!1#$%!)(&.)1X!1#()(!')(!7'+R!-$88()(+1!)(%.2)*(%!'Q'$0',0(!1.!
*.7&'+$(%!1.!,(11()!2+-()%1'+-!1#(!$7&'*1%!.8!.&()'1$+3!.+!'+-!+(')!$+-$3(+.2%!0'+-%X!7'+R!
.8!/#$*#!/.)<!1.!.&()'1$.+'0$Z(!ITMJ!'+-!$+1(3)'1(!#27'+!)$3#1%!%1'+-')-%!$+1.!1#($)!*'0*202%6!
"#(!1$7(0$+(!%#./%!1#'1!G"T!7'-(!8(/!3..-!8'$1#!(88.)1%!1.!2+-()%1'+-!'+-!$+1(3)'1(!1#(!
{ǘl·ƴŘƛƴƎ wƵŎʅ {ƛƵdzÈ ¢NJƛōŜΩă ŎƵƴŎŜNJƴã l·ōƵdzǘ ǘƘŜ ŜƴǾƛNJƵƴƴŜƴǘl·fΣ ăƵŎƛl·f l·ƴŘ ŎdzfǘdzNJl·f NJƛăʅă ƛƴǘƵ
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'**.2+1(-!8.)!'!0.%%!.8!^@C6?!7$00$.+6BA?!!!
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9(Q()'0!*$1R!3.Q()+7(+1%!'0%.!1..<!2&!-$Q(%17(+1!'%!'!%1)'1(3R!1.!%1'+-!$+!%.0$-')$1R!/$1#!1#.%(!

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9(*.+-X!,'+<%!*21!1$(%!/$1#!SDTF!,R!%(00$+3!%#')(%!$+!1#(!.)3+'0!0.'+6!"#)((!.8!1#(!BA!,'+<%!
1#'1!&')1..<!$+!1#(!.)$3$+'0!&).[(*1!0(Q(0!0.'+!%.0-!1#($)!%#')(%!$+!1#(!0.'+4!E;T!T')$,'%X!S;EX!
'+-!M;b6BA!!G'*#!,'+<!$%%2(-!'!&2,0$*!%1'1(7(+1!$+!%2&&.)1!.8!1#(!91'+-$+3!:.*<!9$.2Y!")$,(6B@j!
c#$0(!1#(!1()7%!.8!1#(!%'0(%!')(!+.1!&2,0$*X!$1!$%!0$<(0R!1#'1!('*#!.8!1#(!,'+<%!1..<!'!0.%%6!;.+(!
.8!1#(%(!%'0(%!-(&)$Q(-!G"T!.8!Q'02',0(!*'&$1'0X!,21!1#(%(!'*1$.+%!2+-()%*.)(-!'+-!'7&0$8$(-!1#(!
ǘNJλōŜΩă Ŏƻ̄yŎŜNJyã ǘƻ̄ λyØŜŜăǘƻ̄NJă l·yŘ ŦλyI·yŎλl·f λyãǘλǘdzǘλƻ̄yã ǿƻ̄NJfŘǿλŘŜ l·ǘ ǘKŜ ăl·YŜ ǘλYŜ l·ă ǘKŜè
-(7.+%1)'1(-!1#(!)(&21'1$.+'0!,2)-(+!1#'1!1#(!SDTF!*.+1).Q()%R!&0'*(-!.+!$1%!$+Q(%1.)%6!!
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I$+'00RX!/#$0(!+.1!-(7.+%1)'1(-!$+!1#$%!*'%(X!$1!$%!$7&.)1'+1!1.!+.1(!1#'1!'--1.+'0!*.%1%!*.20-!
('%$0R!'**)2(!1.!,'+<%!8).7!-(0'R(-!0.'+!)(&'R7(+1%6!!
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J6!9LE9GoLG;"!DJ"MH;9!!
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H+*(!'3'$+X!-$%*0.%2)(!'+-!-2(!-$0$3(+*(!%2)8'*(!'%!<(R!1#(7(%!1.!32')-!'3'$+%1!8212)(!0.%%(%6!
M+8.)7'1$.+!$%!+.1!'Q'$0',0(!'1!1#$%!/)1+3!'%!1.!/#(1#()!G"T!-$%*0.%(-!$+8.)7'1$.+!.+!%.*$'0!
NJλăʅă ŘdzNJλyƎ yŜƎƻ̄ǘλl·ǘλƻ̄yã ǿλǘK ŦλyI·yŎλl·f λyãǘλǘdzǘλƻ̄yã ŦƻNJ ǘKŜ LJNJƻ̄ƻŜŎǘ fƻ̄l·yΦ l ƻ̄ǿŜØŜNJΣ λŦ 9¢tΩă
-$%*0.%2)(%!1.!,'+<%!7$)).)(-!$1%!-$%*0.%2)(!1.!%#')(#.0-()%!-2)$+3!1#$%!1$7(8)'7(X!$+8.)7'1$.+!
',.21!%.*$'0!)$%<%!/'%!0$<(0R!%&')%(6!!
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J.+Q()%(0RX!1#(!0'*<!.8!&).&()!)$%<!-$%*0.%2)((!4($)-1(0)-1/<001c>(-)1)).vXQ@w$XƵ'ƎTQƎ-.($)-11#(!+((-($)-11.!'

58+36!M+($)-18'*1X!1#!GW'1(.)00)($)-1T)$+ &0(%($)-1UGTV!/()(!%&(8$'00R!('1(-!'%($)-1'+!
(+Q58)(.)00+(+1'0('+-)6(($)-1%)-4((.)00) '0!)$%<($)-17'+(7(+1!8)'7(/(.)00)<!8(.)00)($)-11#$%!&2)&(.)00%(!'+-(

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X!ED;h":DJhX!7>7187)%

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D6!DSSM"MH ; DF!HTG : D"M ; b!JH9"9!

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W2$*<0R!(%*'0'1(-!'%!%.*$'0!&)(%%2)(!7.2+1(-!'+-!*.+%1)2*1$.+!/ '%!-(0'R(-6!@Y!!

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G"T!)(&.)1(-!$+8.)7'1$.+!.+!(%1$7'1(-!'--$1$.+'0!*.%1%!)(%201$+3!8).7!1#(!-(0'R!$+!'!7.1$.+!
8$0(-!.+!D232%1!B@X!?jBC!2LJLJ2ăλyЭ ŭKŜ {ŭl·yŘλyЭ w2ỏ]{λ2dzÈ ¢NλōŜΩă NŜljdzŜăŭ ₮2N l· LJNŜfλY·λYl·Nè
$+[2+*1$.+!1.!#'01!*.+%1)2*1$.+6!@A!"#(!7.1$.+!%1'1(-!1#'14!

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> '*1$.+X!.)!$1!.1#()/$%(!$%!-(1()7$+(-!1#'1!S'<.1'!D**(%%!#'%!,((+!/).+3820 0R!
> (+[.$+(-!.)!)(%1)'$+(-X!1#(!-'7'3(%!1.!S'<.1'!D**(%%!/$00!,(!%2,%1'+1$'06!!"#(!
> -'7'3(%!S'<.1'!D**(%%!/$00!%2%1'$+!'%!'!)(%201!.8!1#(!)(W2(%1(-!$+[2+*1$.+X!(Q(+!
> 8.)!'!1(7&.)')R!%#21-./+X!/.20-!1.1'0!'&&).Y$7'1(0R!^B6]!,$00$.+!$+!1#(!8$)%1!
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G"T!,)('<%!-./+!1#$%!^B6]!,$00$.+!8$32)(!'%!8.00./%4!

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DSSM"MH ; DF!HTG : D"MH ; DF!JH9"9!@G!	
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fJ.7&0(1(-\,Rf!,)('*#!&'R7(+1%!	!^]X>jj Xjjj6jj!!
S(Q$'1$.+%!8).7!*.+%1)2*1$.+!%*#(-20(!	!^Bjj Xjjj Xjjj6jj!!

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G"T!%1'1(-!1#(!^B6]!,00.+!(%1$7'1(!.8!'--$1$.+'0!$+!D232%1!.8!?jBCX!'+-!1#(!&$&(0$+(!/'%!&0'*(-!
$+1.!%()Q$*(!.+!d2+(!BX!?jBA6!"#2%X!1#$%!*'%(!%12-R!'%%27(%!1#'1!7.%1X!$8!+.1!'00X!.8!1#(%(!
(Y&(+%(%!/()(!$+*2))(-!.Q()!1#(!1(+\7.+1#!$+1()Q(+$+3!1$7(\

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á I l·fűλyЭ 5 ! t [Ŏƨyãú№dzŎűλƨy Ŝ Ø Ŝy ʎŦ űŜY LJƨ№I·№èΣ ø ƨdzfŘ №Ŝădzfű λy ădzōăűl·y1$'0![. ,!
0.%%(%!'+-!.1#()!0.*'0!,(+(8$1%X!'+-!/$00!'--1.+'00R!*'2%(!nS'<.1'!D**(%%X!FFJp!
1.!0.%(!&).8$1%!1#'1!')(!2+0$<(0R!1.!,(!)(*.Q()',0(6!9&(*8*'00RX!SDTF!(Y&(*1%!1.!
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&$&(fλyŜ Ŏƨyãú№dzŎűλƨy ʎă ŘŜfl·èŜŘ¢é!GI!!

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.+!S(*(7,()!]X!?jBC!/#(+!1#(!L9DJG!-(+$(-!1#(!('%(7(+1!1.!*).%%!F'<(!H'#(!'+-!(+-$+3!.+!
I(,)2')R!@X!?jBAX!/#(+!1#(!('%(7(+1!/'%!3)'+1(-6!"#$%!)(&)(%(+1%!'!7$+$727!,(*'2%(!1#()(!
/()(!%(Q()'0!.1#()!-(0'R%!1#'1!%&'++(-!720!1$&0(\-'R!&()$.-%!,21!0$<(0R!-.!+.1!'--!2&!1.!'!
7.+1#!$+!'33)(3'1(6!D+-X!1.!1#(!,(%1!.8!.2)!<+./0(-3(X!1#$%!+27,()!-.(%!+.1!$+*02-(!1#(!8$+'0!
.%1%!.8!.+%1)2*1$.+!8).7!I(,)2')R!IX!?jBA!1.!d2+(!BX!?jBA!+.)!-.(%!$1!$+*02-(!8((%!8.)!
7'$+1(+'+*(X!)(7.,$0$Z'1$.+X!.)!0.'+!)(+(/'06!E21X!1#(!1.1'0!-(0'R!8.)!(Q(+!1/.!7.+1#%!*.20-!
,(!'%!#$3#!'%!^B6@!,$00$.+![2%1!8.)!*.+%1)2*1$.+6!"#$%!(%1$7'1(!$%!8')!#$3#()!1#'+!1#(!^B6]!,00.+!
(%1$7'1(!1#'1!$+*02-(%!%2*#!*.%1%!.Q()!1#(!R(')6!c(!1#()(8.)(!2%(-!^B6@!,00.+!1.!(%1$7'1(!'!
7'Y$727!,.2+-6!!

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"#()(!$%!'!&'2*$1R!.8!&2,0$*0R!'Q'$0',0(!$+8.)7'1$.+!1#'1!%#./%!(Y'*10R!#./!727*#!.81#(%(!
'+1$*$&'1(-!*.%1%!/()(!'*12'00R!$+*2))(-6!G"T!-$-!%1'1(X!#./(Q()X!.+!;.Q(7,()!BaX!?jBCX!1#'1!
áűKŜ ŘŜfl·è Kl·ă l·tWŜl·Řè Ŏƨăű 5l·ʅƨűl· !ŎŎŜăă Y'2WŜ űKl·y ʎпрл Y'ʎftλ2y!12)1#()!-(0'R!/$00!*.%1!
S'<.1'!D**(%%!1(+%!.8!7$00$.+%!.8!-.00')%!&()!7.+1#!1#()('81()X!+.+(!.8!/#$*#!*'+!,(!
WŜŎƨØŜWŜŘ¢éB I B!¢KλăyƵY'ōŜW óάűŜyã 2Ŧ Y'ʎftλ2yãέú l·LJLJŜl·Wă ű2 ōŜ fŜăă űKl·y'űKŜ Þфллl Y'ʎftλ2y'ΞλØŜy'λy'
1#(!-.*27(+1!',.Q(X!,21!*'&12)(%!1#(!-)'$+!.8!7$00$.+%!.8!-.00')%!-2(!1.!-(0'R%6!

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Ŏƨ Y LJl·yêΩă Ŏƨyű№l·Ŏűă! /$1#!%#$&&()%X!/#$*#!)(%201(-!8).7!1#(!-(0'R6!DŎŎƨ№ŘλyЭ ű2 9¢tΩă
ăűl·ŮŜY'Ŝyűă ű2 űKŜ Ŏƨdz№ŮăΣ άλy'Ŏƨyy'ŜŎűλƨy'øλűK λűă fƨyЭ\1()7!1)'+%&.)1'1$.+!*.+1)'*1%!/$1#!I!
*.77$11(-!%#$&&()%X!S'<.1'!D**(%%!#'%!*.77$11(-!1.!*.7&0(1(X!1#(%1!'+-!#'Q(!SDTF!$+!%()Q$*(!
,R!d'+2')R!BX!?jBA6!"#(!0.+3\1()7!1)'+%&.)1'1$.+!*.+1)'*1%!3$Q(!%#$&&()%!')$3#1!1.!1()7$+'1(!
ŮKŜλ№ Ŏƨ Y'Y'λŮ Y'Ŝyűă λŦ 5 ! t [λă yƨű λy'Ŧdzff ăŜ№ØλŎŜ LJŜ№ ŮKŜ Ŏƨyű№l·ŎŮ ŘŜl·ŘfλyŜ¢é B I ?!b$Q(+!1#'1!SDTF!
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1$7(!1#(!&$&(0$+(!/'%!&).&.%(-!$+!?jB]!1.!?jBA6!c#(+!SDTF!/'%!8$)%1!&).&.%(-!$+!?jB]X!.$0!
&)$*(%!'Q()'3(-!^IC!&()!,'))(06

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%.7(!.8!1#(!*.%1%!1.!G"T!/()(!7'-(!&2,0$*!1#).23#!*.2)1!-.*27(+1%X!1#()(!/'%!0$1110(!-$%*0.%2)(!

NJŜLJNJŜăŜyűŜŘ ƛy˜l·űűŜY˜LJű ű2 άŎdzNJűl·ƛf l·fY˜2ăű l·yȅ Řƛăl·∃NJŜŜl·ōfŜΣ l·NJ∃dzl·ōfȅ LJNJ2űŜŎűŜŘ ăLJŜŜŎKΦέ?j>!
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$+1.!1#(!8$+'+*$'0!$7&'*1%!.8!8'0+3!1.!7'$+1'$+!&.%1Q(!)(0'1$.+%#$&%!/$1#!$+-$3(+.2%!&(.&0(%6!
i./(Q()X!0$<(!1#(!.1#()!*.%1%!1#'1!G"T!*0'$7%!1.!#'Q(!%288()(-!$+!*.2)1X!+.+(!.8!1#(%(!*.%1%!
l·LJLJŜl·NJŜŘ ƛy˜űKŜ Ŏ2Y˜LJl·yȅΩă ŘƛăŎf2ădzNJŜă ű2 ƛyØŜăű2NJă!'1!'+R!1$7(6!!
!
¢Kƛă Ŏl·ăŜ ăűdzŘȅ l·ăădzY˜Ŝă 9¢tΩă ăűl·űŜŘ Ŏ2ăű 2Ŧ LJNJ2űŜăűă l·ű Ѳолл Y˜ƛffƛ2yΦ !
!
J6!JH9"9!"iD"!D:G!9LE9"D;"MD"GS!EL"!;H"!oLD;"MIMGS!
!
I$+'00RX!1#()(!')(!.1#()!%$3+8*'+1!*.%1%!1#'1!*'+!,(!)('%.+',0R!$+8())(-X!,21!')(!+.1!
W2'+1$8$',0(!2%$+3!&2,0$*0R!'Q'$0',0(!-'1'6!!I.)!(Y'7&0(X!G"T!/'%!%.7(/#'1!$+%20'1(-!,R!'+R!
,.R*.11!(88.)1%!,(*'2%(!$1!$%!&)$7')$0R!$+Q.0Q(-!$+!1#(!-$%1)$,21$.+!)'1#()!1#'+!1#(!%'0(!.8!(+()3R6!

)$%<%!'+-!,.0%1()$+3!1#($)!.&&.%$1$.+6!?Bj!I2)1#()X!+.!7$1$3'1$.+!&0'+!/'%!&).'*1$Q(0R!&21!8.)/')-!
1.!1#(!1)$,(%!-$)(*10R!$7&'*1(-6?BB!H+!S(*(7,()!]X!?jBAX!d2-3(!E.'%,()3!.)-()(-!L9DJG!'+-!
S'<.1'!D**(%%X!FFJ!1.!/.)<!/$1#!1#(!0$%1(-!1)$,(%!1.!*.7&0(1(!.$0!%&$00!)(%&.+%(!&0'+%6?B?!H+!
D232%1!>BX!?jB@!1#(!L9DJG!%2,7$11(-!'!O(7.)'+-27!%1'1$+3!1#'1!1!1#($)!)(Q$(/!.8!1#(!&.1(+1$'0!
$7&'*1%!.8!'+!$+*$-(+1!-$-!+.1!)(Q('0!'+R!%$3+$8$*'+1!$7&'*1%!1.!#2+1$+3!'+-!8$%#$+3!)(%.2)*(%6?B>!
"#$%!-.*27(+1!%1'+-%!$+!-$)(*1!*.+1)'%1!1.!$+8.)7'1$.+!*.7&$0(-!,R!1#(!91'+-$+3!:.*<!9$.2Y!
")$,(6?B]!!
!

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' 7 . 2+1!1#'1!'00!(+1$1$(%!%&(+1!1 . !*0(' +\2&!1#(!*' 7 &!$%!+ . 1!'Q'$0' ,0(X!1#(!L9DJG!)(&.)1(-0R!%&(+1!
^B6B! 7 00 . +6FHE!!
!
: (%$- (+1%! . 8!1#(!91'+-$+3! : . *<!)(%()Q'1$. +! / ()(!' 7 . +3!1#. %(!1#'1!&')1$*$&'1(-!$+!8) . +10$+(!
'*1Q1$(%!'+-!%. 7 (!

ƎƵØŜŃyƴŜyűΩă l·ōƛƭƛűè űƵ LJŃƵØƛŘŜ ŎŃƛűƛŎl·f ăƵŎƛl·f ăŜŃØƛŎŜă űƵ űŃƛōl·f ŎƛűƛÎŜy%6?]]!D%!.8!'!)(&.)1!$+!
l(,)2')R!.8!?jB@X!1#(!)(Q(+2(%!1.!1#(!*'%$+.!#'-!+.1!)(*.Q()(-6?]a!
!

J6!JH9"9!"H!cD"G:!T:H"GJ"H:9!

!

c'1()!&).1(*1.)%X!'%!&).1(%1()%!'1!1#(!*'7&!/()(!<+./+X!*'7(!8).7!'00!.Q()!1#(!L+$1(-!91'1(%!
'+-!').2+-!1#(!/.)0-!1.!(Y&)(%%!1#($)!%2&&.)16FCY!M+-$3(+.2%!&(.&0(%!/.)0-/$-(!%2&&.)1(-!1#(!
7.Q(7(+1!'+-!1#(!91'+-$+3!:.*<!9$.2Y!")$,(6FCA!G'*#!.8!1#(%(!$+-Q-2'0%!$+*2))(-!*.%1%!
$+*02-$+3X!,21!+.1!0$7$1(-!1.X!1)'Q(0!(Y&(+%(%X!8..-!'+-!%2&&0$(%X!'+-!1$7(!%&(+1!'/'R!8).7!
/.)<!'+-!.1#()!)(%&.+%$,$0$1$(%6!"#.%(!/#.!&')1$*$&'1(-!$+!8).+10$+(!'*1Q1$(%!'+-5.)!/()(!
'))(%1(-!/.20-!#'Q(!$+*2))(-!'--$1$.+'0!0(3'0!*.%1%!U%((!&)(Q$.2%!%(*1$.+V!+.1!1.!7(+1$.+!1)'Q

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