
!"#\$%&' () &* ' % + &* , \$* - + . ' % + &\$# ! / # % - % (# 0 \$ # 1 % & % & 2 \$, % 2 1 ' \$ + &\$ ' 1 (\$ - *) 3 \$
1 % # ' +) 4 \$ + 5 \$ ' 1 (\$ / * / 4 \$ 6 / , * 7 3 \$ 8 *) 3 (' 9 \$

!
\$%&! ' () * (+ , ! \$ - . / + - 0 !
!

1 * . , + ! . / 2 + - / (2.3 / (, ! (4352.3 / ! 6 ! (! 7 + (82.98 , !) 3 /) + 52 ! . / ! 2 * + 3 - % : ! 2 ! 392 + / ! , + (46 ! 23 ! 4 (- ; !) 3 / 6 + < 8 + /) + 6 = !
> - 3 ? ! . 26 ! . /) + 52.3 / : ! * 8 ? (/ ! 2 - (99 .) ; . / @ ! * (6 ! + / (7 , + 4 ! . / 2 + - / (2.3 / (, ! (4352.3 / 6 = ! 1 * . , + ! 2 * + ! A / . 2 + 4 ! B 2 (2 + 6 !
(, 3 / + !) (/ / 32 ! 4.6 ? (/ 2 , + ! 2 * + ! + / 2 . - + ! 7 (7 % ! C 7 , () ; ! ? (- ; + 2 D ! (/ 4 ! 2 * + ! , . ; + , % ! 7 , () ; ! ? (- ; + 2 ! 93 - !) * . , 4 - + / E 6 !
3 - @ (/ 6 ! . / 2 + - 2 F . / + 4 ! F . 2 * ! . 2 : ! 2 * + ! A = B = !) (/ ! - + ? 3 G + ! . 26 ! , (- @ + !) 3 / 2 - . 782.3 / = ! ! \$ % ! , . ? . 2 / @ ! 2 * + ! 9 + 4 + - (, !
(4352.3 / ! 6876.4 % ! 23 ! 3 / , % ! 43 ? + 62 .) ! (4352.3 / 6 : ! 2 * + ! A / . 2 + 4 ! B 2 (2 + 6 !) (/ ! + / 68 - + ! . 2 ! 3 / , % ! (. 46 ! 6 % 62 + ? 6 !
F . 2 * . / ! . 26 !) 3 / 2 - 3 , ! (/ 4 ! (44 + 66 ! 2 * + ! / + + 46 ! 39 ! . 26 ! 3 F / !) * . , 4 - + / ! F . 2 * 382 ! * 3 ? + 6 ! ? 3 - + ! + 99 +) 2 . G + , % = ! ! H (/ % !
32 * + - ! (82 * 3 - 6 ! * (G + ! (, 63 ! / 32 + 4 ! G (- . 386 ! * 8 ? (/ ! 2 - (99 .) ; . / @ ! (/ 4 ! 532 + / 2 . (, ! 3 - @ (/ ! 2 - (99 .) ; . / @ !) 3 /) + - / 6 : !

./!5+G+/2./@!2*+!4.,82.3/!39!2*+.-!-+638-)+6-

A/.3/=!! 1 3-,4! 1 (-!U!,. ;+,%!. /65.-+4!2*.6!4+),(-2.3/:(6! ? (/%!%38/@!(48,26!+05+-./)+4!9.-62*(/4!
2*+!*3--3-6!39!*3F!)*.,4-+ /!F+-+!2-(2+4=!'!! ' (2*+-!2*(/!(!,.62!65+).9%./@!(!)*.,4E6!-.@*26!:!.2!93)86+4!

39!)*,.4-+/-D⁰¹!!Q*+!S3/G+/2.3/!3/!2*+! '.@*26!39!2*+!S*.,4!F(6!(4352+4!7%!2*+!V+/-(-,!I 66+ ? 7,%!
./!#]b]-⁰²!! f /+!39!2*+! ? 362!6F.92,%!(4352+4!-(2.9.)(2.3/6:!2*.6!4+),(-2.3/!(,2+-+4!2*+!F(%!) *.,4-+/
(-+!G.+F+4!,+@(!,%ZZ)*.,4-+!/!F+-+!9./(!,%!@.G+!/(!8/.<8+!6+2!39!-.@*26-⁰³!!Q*.6!4+),(-2.3/!(,63!,(.4!
2*+!938/4(2.3/!39!2*+!A/.2+4!T(2.3/6!S*.,4-+!/!6!>8/4!hATUSX>i;!F*.)*)!,(2+-!7+)(? +!(!5+- ? (/+/2!
? + ? 7+-!39!2*+!A/.2+4!T(2.3/6-⁰⁶!!Q*.6!3-@(/.L(2.3/!* (6!(,63!()3 ? 5.,6*+4!(!@-+(2!(? 38/2!6./)+!
2*+!/) 1 .92c mB(*+)0.2(!)-!3/!@-+!

(G(.,(7,+⁻¹³!!>3-!./62(/)+:! I 4352.3/!B+-G.)+!e-3G.4+-6!h I Be6i! ? 862!7+!(.)-+4.2+4!23!+/68-+!2*+6+!
(@+/.).+6!C ? ++2!)3 ? 5-+*+/6.G+!9+4+-(,!62(/4(-46!4+6.@/+4!23!+/68-+!2*(2!2*+%!35+-(2+!86./@!638/4!
5-39+66.3/(,!(/4!+2*.)(!,(4352.3/!5-(.)+6=D¹⁶!

!

5=k3 -#\$"#+, -#k>4- ?+, -#k@*-("22k

U/!2*+! A/.2+4!B2(2+6:(4352./@!9-3 ?!(! S3/G+/2.3/!62(2+!. /),84+6!6.0!4.62./)2!62+56=¹⁷!!>.-62:!2*+!
(4352.G+!9(? .,%! ? 862!)*336+!(/!(55-3G+4! (4352.3/!6+-G.)+! 5-3G.4+-!(/4!2*+!/! ? 862! 7+!938/4!
68.2(7,+23!(4352!(!)*.,4=¹⁸!!

/8?7+-!39!9+?(,+!3-5*(/6=26!!1*.,+!2*+!3/+P)*.,4!53,.)%!F(6!(7(/43/+4!./!"N#^:!2*+!)38/2-%!62.,,!9(+6!2*+!(92+-? (2*!F.2*!.26!3G+-9,3F./@!3-5*(/(@+6=27!

!

5=kkA*?/%##%I"2k,#k3/,##%kk

kk

XG+!/2*38@*!2*+!+02-+?+!/+4!93-!3-5*(/(@+6!-36+!(92+-!2*+!5(66./@!39!2*+!3/+P)*.,4!53,.)%:
3-5*(/(@+6!* (G+!+0.62+4!./!S*./(!+G+-!6./)+!X?5+-3-!18E6!938/4./@!39!2*+!@3G+-/?+/2P-8/
9(.,-2%!./!d"#!I=K=28!!Q*.6!3-5*(/(@+!/32!3/,%)(-+4!93-!)*.4-+!/782!(,63!93-!+,4+-,%!(48,26!F.2*382!
)*.4-+/=39!!Q*.6!(,2-8.62.)!938/4./@!633!/128-/+4!7-82(,=!U2!* (6!7++!/4.6)3G+-+4!2*(2!B*(/@*(!
3-5*(/(@+6!* (G+!*3--.9)(,%,!(786+4!2*+.-!)*.4-+!/!. /),84./@!C4+,.7+-(-2+!62(-G(2.3/!23-28-+!(/4!
6+08(,(66(8,2:!)3/2./8+4!3G+-!(!5+-34!39!? (%!%+(-6!(/4!,+4!23!2*+!8// (28-(,!4+(2*6!39!F+.,!3G+-!
#:NNN!)*.,4-+!/7+2F++/!#]b^(/4!#]"]"!(,3/+D3!!Q*+!587,.)!633/!@-+F!)3/)+-/+4!(7382!2*+6+!
)*.4-+!/!(/4!2*+!@3G+-/?+/2!9(+4!5-+668-+!23!9.0!2*+!6%62+?.)! (786+!39!2*+!)*.4-+/=3/!!
T+G+-2*+,+66:!? (%!@3G+-/?+/2!399.)+-6!C;/3F./@,%!6855-+66+4!+G.4+/)+!39!)*.,4!(786+!(2!2*+!
3-5*(/(@+!:15+-6.62+/2,%!.@/3-+4!2*+!. /62.282+E6!*.*?!?3/2*,%4+(2*!9.@8-+6:(/4!./!#]"]":!<8(6*+4!
(/!. /G+62.@(2.3/!./23!3-5*(/(@+!5-()2.)+6-D30!!U2!F(6!(6%!93-!2*+?!23!)3G+-!2*+.-!2-();6!(6!2*+!
\$8-+(8!39!I99(-6!)38,4!+(6.,%!4.6536+!39!2*+!*3--.9%./@!+-02(62(+0.2(/)0.2(+0.2(!)-24.8601.92cmBT502/3(2)0

./!2*+!#]]N6⁻³⁷!!B3 ? +!)*.4-+/-+6.4+!./!(!9362+-!)(-+!)3 ? ? 8/.2%!6%62+ ?!(/4!(-+!4.G.4+4!(? 3/@62!
386+6!./!(? 3-+!-8-(,)3 ? ? 8/.2%⁻³⁸!!>3-!+0(? 5,+:(!9362+-!)(-+!)3 ? ? 8/.2%!./!B+/%(/@:!S*./(!
5,(+6!2F3!)*.4-+/-!F.2*./!+(*)!*3 ? +=⁶⁹!! f /+!39!2*+6+!)*.4-+/-!.6!+(6.,%! ? 37.,+;!782!2*+!32*+-.!6!
392+!/4.6(7,+4!(/4!/++46!(66.62(/)+!23! ? 3G+=⁶!!K.6(7,+4!)*.4-+/-!68--+/4+-+4!23!2*+!@3G+-/ ? +/2!

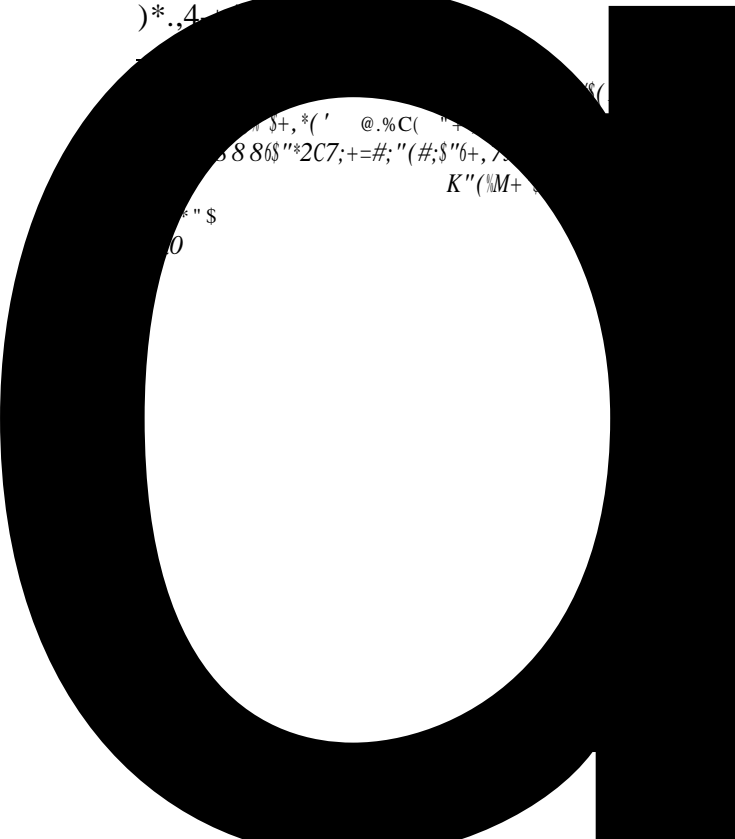
9362+!)(-+!6%62+ ? :! ? (/ %!@3G+- / ? +/2!399.).(,6!(/4!3-5*(/ (@+6!)3/2./8+!23!-+986+!23!2(; +!)-+4.2!93-! 2*+.-!(2.3/6=-7/!

!
S=U !
!

U/4.(E6!9362+!)(-+!6%62+ ? !.6! ? 3-+!4+)+/2-.,L+4!)3 ? 5(-+4!23!32*+!/ (2.3/6:!(6!.2!.6!6+2!85!(-38/4! 4.99+ +/2!G3,8/2(-%!(/4!587,.)!. /62.282.3/6=-70!! I ,3/@!F.2*!3-5*(/ (@+6!(/4!)*. ,4-+/E6!*3 ? +6:!2*+--+ (-+! (,63! /3/P)3/G+/2.3/(, ! . /62.282.3/6=-71! ! Q*+! ? 362! 5358,(-! /3/P)3/G+/2.3/(, ! (,2+-/(2.G+! .6! B(. j - .5([3 ? +6=-72!!U/62+(4!39!(!2-(4.2.3/(, !9(? ., %! ? 34+ , !2*+6+!*3 ? +6!+ /)38-(@+!2*+!3,4+-!9362+-! %382*!23!2(; +!)(-+!39!2*+!%38/@+-%382*=-! 1 * ., +!2*+!73%6!(/4!@.-,6!(-+!6+5(-2+4:!2*+!(-+!2(8@*2!23! 5-32+)2!+()*!132*+--!!

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I ,3/@! F.2*!4.99+ +/2! . /62.282.3/6: !U/4.(! (,63!* (6!. ? 5,+ ? +/2+4! ? (/ %! ,(F6!23!)3 ? 7(2!)*. ,4!(786+! (/4!/+@,+)2=-73!!Q*+!V8(-4.(/6!(/4! 1 (-46! I)2!39!#b]N!9.-62!6+2!2*+!7(6.)!482.+6!39!@8(-4.(/6!39!(! 5+-63/=76!!U2(,63!+/ ()2+4!2*+!5-3)+66!93-!7+)3 ? ./@!@8(-4.(/39!(!)*. ,4! 32*+ -F.6+! ; /3F/!(6! (4352.3/!3-!68--+/4+-./@!(!)*. ,4!2*(2!3/+!* (6!/32!5-35+-,%!2(; +/!)(-+!39=-77!! I , ? 362!3/+!*8/4+4! %+(-6!,(2+-!Q*+! [./48! I 4352.3/6!(/4!H(. /2+/(/) +! I)2!39!#]d^!, (4!382!2*+!938/4(2.3/!93-!F*(2!(! G(.4!(4352.3/!+ /)3 ? 5(66+6: !F*3!* (6!2*+!(7.,2%!23!(4352!(!)*. ,4:!(/4!2*+!37.,@ (2.3/6!2*(2!93,,3F! (4352.3/=78!!Y+2!2*+!5-3G.6.3/6!93)86!3/! [./486!43 ? .),+4!./!U/4.(:!3/,%!(,3F./@! [./48! ? (,+6! (/4!9+ ? (,+6!23!(4352=-89!!U/!2(/4+ ? :!Q*+! 1 3 ? +/6!(/4!S*. ,4-+/6!U/62.282.3/6!hJ.)+/6./@i! I)2!39! #]d^!F(6!(,63!+/ ()2+4=-8!!! 1 * ., +! /32!93)86+4!3/!(4352.3/6: !2* .6! ()2!(. ? +4!93-!2*+!7+22+- ? +/2!39! F3 ? +/!(/4!)*. ,4-+/E6!F+,9(-+!:-+<8.-./@!(!,+/@2*%!5-3)+66!93-!./62.282.3/6!)(-./@!93-!2*+ ? !23!@+2! ,.)+/6+4=-8!! J (62,%: ! 2*+! _8G+/. ,+! _862.)+! I)2! 39! #]b^! (,63! 4.4/E2! (44-+66! (4352.3/! 4.-+)2,%=-80!! U/62+(4: ! .2! 93)86+4! 3/! 2*+! -+*(7.,2(2.3/! 39! /+@,+)2+4!)*. ,4-+/! F*3! +/4! 85! 5(-2.)5(2./@! ./! 4+.,/<8+/2!)(2.G.2.+6=-81!!Q*.6!.6!a862!(6!G.2(,!39!(/!+ / ()2 ? +/2!(6!2*+!3/+6!4.-+)2,%!68--38/4./@!9362+-!)(-+! 7+)(86+! ? (/ %! 9362+-!)*. ,4-+/! 43! /32! *(G+! 2*+! 68553-2! 2*+%! /++4! 23! / (G.@(2+! ,.9+ =! '+*(7.,2(2.3/!6!. ? 5+- (2.G+!93-!2*+6+1)*. ,4-+/:(6!2*+!%*(G+!,. ; ,%!/ +G+!*(4!-3,+! ? 34+ ,6!23!@8.4+! 2*+ ? !2*-38@*!- .@*2!(/4!F-3/@=!! f G+-!2*+!5(62!2F3!*8/4-+4!%+(-6:!.2!6!)+(-!2*+!,+@.6, (28-+!* (6!7++/! (22+ ? 52./@!23!-+93- ? !2*+!9362+-!)(-+!6%62+ ? !(/4!2*+!4.-+!382)3 ? +6!2*+!5-3@-(? !)(/!*(G+!3/!2*+!)*. ,4



)+\$\$(\$2%L+*J('4%: "":O, (2%8 "+%8(, (% , #EOE; (2\$; -%#O+I\$(O%
,7+\$\$ (29D+*J(' ,7+\$\$ (29D+*J('
K"(%M+ &20# -&=#"(<<: & (@." \$(&" , #* &(* + : %\$(@ &(
" \$
0

!

XG+!/F.2*!G(-.386!5-3@-(?6!23!2-%!23!+/)38-(@+!(4352.3/;!?(a3-!5-37,+?6!62.,!+0.6!F.2*./!2*+!
6%62+?=!I!62(@@+./@!3/+P938-2*!39!K+,*E6!*3?+,+66!(-+!)*,4-+/:!(/4!3/+!382!39!+G+-%!*8/4-+4!
5-362.282+6!.6!(!)*.,4!8/4+-!2*+!(@+!39!9.92++/=83!I44.2.3/(,%,?!?(/%!(7(/43/+4!7(7.+6!(-+!,+92!382!
3/!2*+!62-++2!23!+.2*+-!62(-G+!3-!4.+!9-3?!G(-.386!(/.?(,E!(22());6-86!!XG+!/F*+!/)*.,4-+!/(-+!
C(4352+4D!7%!*3?+6:!(/%!39!2*+6+!(4352.3/6!28-!/382!23!7+!5(-2!39!(!7,());!?(;-+2!6)*+?+:!6+,,./@!
2*+!7(7.+6!(6!)*.,4-+!/3-!3-@(/6-87!

!

K=

C ? (; +!68-+!2*(2!)*. ,4-+/. /!) (-+!234(%!43!/32!7+)3 ? +!2*+!G.)2. ? 6!39!23 ? 3--3F=D!¹⁹⁷!!S3/6+<8+/2,%:!
./2+-)38/2-%!(4352.3/!39!)*. ,4-+/. /!2*+!T+2*+-. (/46!.6!/3F!8/(G(.,(7,+=¹⁹⁸!

!

X= ' !

' 866.(E6!9362+-!)(-+!6%62+ ? !.6!7(6+4!(-38/4!3-5*(/ (@+6:!. /!F*.)*)!9362+-!9(? .,+6!)(/!7+)3 ? +!(/!
./2+@-(,! 5(-2! 39! ? (. /2(. / . / @! 2*+!)*)*. ,4-+! / (/4! 2*+! 68553-2! -+<8.-+4! 23! -(.6+! 2*+ ? =! ! ' 866.(/!
3-5*(/ (@+6!(-+! ; /3F /!(6!C\$(7%! [386+6:D!93-!)*. ,4-+!9-3 ? !2*-++!23!9.G+:(/4!CK+26;%!K3 ? E6:D!
93-!)*. ,4-+!(@+6!6G+ /!23!6.02++ / =! ¹⁹!! 1 .2*!3G+-! \NN:NNN!3-5*(/6!)8--+/2,%!.G. / @! . / ! ' 866.(:!2*+!
/8 ? 7+!)3/2. /8+6!23!./)-+(6+!7%!###` :NNN!+G+-!%+(-=!!Q*.6/8 ? 7+-. /),84+6!(7382!]dn !39!63).(,!
3-5*(/6: ! ? + (/ . / @! (! , .G. / @! 5(-+ /2! 68--+/4+-+4!2*+ ? !23!2*+! 62(2+!! XG+ / !.9!)*. ,4-+! (-+! . / !2*+.-!
5(-+ /2E6!)(-+!63 ? +2. ? +6!2*+!@3G+- / ? + /2!(66.@ /6!2*+ ? !23!3-5*(/ (@+6!.9!2*+!5(-+ /26!*(G+!-+986+4!
23!+ / -3, ,2*+ ? !. /!(/!+48)(2.3 / (, ! /62.282.3 / =! ¹!!Y+2:163 ? +!39!2*+6+!3-5*(/ (@+6!3 / , %!5-3G.4+!)*. ,4-+!
F.2*! +48)(2.3 / ! 85! 23! 2*+! 6.02*! @-(4+! F*.)*! + /46! 85! ,. ? .2. / @! 3-5*(/6! 23! ,3FP+48)(2.3 /!
3553-28 / .2.+6!3 /)+!2*+%(@+!382!39!2*+!6%62+ ? =! ¹⁰!!

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5= < > < CD2+ " < & - . & > E ; 2 " &

>8-2*+- ? 3-+! ? (/ % !39!2*+! ' 866.(/!3-5*(/ (@+6!(-+! ; /3F /!23!7+!C56%)*363).(, %!4+5-.G. / @! ' 866.(/!
./62.282.3 /6! 2*(2! 5-3G.4+4! (4+<8(2+! 5*%6.)(, ! -+638-)+6! 782! /32!)3/6.62+/2: ! -+653/6.G+!
)(-+@.G. / @=D!¹¹!!

k*+-1!(/4!4-(@!k*+-1!7%!2*+!*(-=!7!!Q*+%!(G+!k*+-1!5.,6!23!)(,?!*+-!43F/εD!8!!I/32*+-!%38/@!
?(/!/32+4!2*+!62(99!C)3/62(/2,%!@(G+k)*.,4-+/!./a+)2.3/6:!(/4!2*+/!2*+%!6+/2!k2*+?1!23!2*+!7+4-33?!
63!2*(2!k2*+%1!F38,4!6,++5=D!9!!
!

CT(2.3/(, I)2.3/!B2-(2+@%!./!2*+!U/2+-+626!39!S*.,4-+!/93-"N#"P"N#\D!F(6!-+)+/2,%!. ? 5,+ ? +/2+4!
./!(/+993-2!23!-+28-/)!.4-+!/F.2*!4.6(7.,2.+6!23!2*+.-!7.-2*!9(? ..+6!(/4!5-3G.4+! ? 3-+!./),86.G+!
)3 ? ? 8/.2.+6!23!5--G+/2!)!.4!(7(/43/ ? +/2=!!U/!(44.2.3/!2*+!@3G+-/ ? +/2!6!(,63!62(-2./@!23!5,())+!
? 3-+!+ ? 5*(6.6!3/!9362+-!9(? ..+6=!/8!! f G+-(:,!2*+!@3G+-/ ? +/2!7+,.+G+6!2*.6! F.,!*,5!(G3.4!2*+!
(786+!2(;./@!5,())+!F.2*./!2*+!3-5*(/(@+6=!!

!
1 *+!/./!9362+-!)(-+!)!.4-+!/F.,!7+!/65+)2+4!7%!(!e6%)*3,3@3PH+4.)(,Pe+4(@3@.)(,!S3 ? ? .66.3/!
heHeSi=¹⁰⁹!!Q*.6!)3 ? ? .66.3/! F.,!C ? +4.)(,,%!(/4!56%)*3,3@.)(,,%!+0(? ./+!)!.4-+!/!.4+/2.9%!
4+G+,35 ? +/2(,! 4+,(%6:!(/4! 93- ? 8,(2+! (! 62-8)28-+4! 5,(/! 93-! (!)*.4E6! 98-2*+-! +48)(2.3/!(/4!
857-./@./@=D!0!!

j 3-+(16+/2!:=!!:=!!:=! j 3-+(!F(6!2*+!/8 ? 7+-P3+/!6+/4./@!)38/2-%!39!)*.,4-+!/23!2*+!A/.2+4!B2(2+6!8/2.,!
#]j]d=D!06! ! Q*+6+! *.623-.)(! ? 3 ? +/26! F++! 98/4(? +/2(! 23! ./2+-/(2.3/(! (4352.3/E6! ./)-+(6./@!
5358,(-.2%!!!!

!
Y+2!:2*+! 1 3-,4! 1 (-6!F++!/32!2*+!3/,%!./9,8+!) +6!3/!./2+-/(2.3/(! (4352.3/6:!(6!2*+--+!F++! ? (/!
)+,+7-.2.+6!2*(2!*+.@*2+/+4!2*+!4+ ? (/4!93-!./2+-/(2.3/(!)*.,4-+/=!!B3 ? +!39!2*+!9.-62!) +,+7-.2.+6!23!
(4352! ./2+-/(2.3/(!, %! F++! H/"& C- ;#4& -.& I ; 2,(E6! _8, +! I /4-+F6! (/4! H/"& J, #I& % #4& GE6! Y8,!
\$-+//+-=107!! Q*+6+! 9-./46! 732*! (4352+4! (!5(-! 39!)*.,4-+!/9-3 ? ! c .+2/(? !./! 2*+! #] \N6:!(/4!
)+,+7-.2.+6!H.(!>(-3F!(/4! I /4-+F!e+,G./!(4352+4!)*.,4-+!/9-3 ? ! j 3-+(-108!! [3,,%F334!(4352.3/6!
)(-.+4! ./23! 2*+! 2F+/2%P9.-62!)+/28-%:!(6!6++!/ F.2*! I /@+,./(!_3, +! (/4! \$-(4! e.22-! ! Q*.6!)385,+!
(4352+4!)*.,4-+!/9-3 ? !S(? 734.(!X2*.35.(!H(, (F.:!(/4! c .+2/(? =119!! 1 *.,+!) +,+7-.2%!(4352.3/6!
43!/32! ? (; +!85!2*+! ? (66!5+-)/2(@+!39!(4352.3/6: !2*+%!35+/+4!2*+!+%+6!39!2*+! I ? +-.) (/587,.)!23-!
2*+!5366.7.,.2%!(/4!(-@8(7,%!) + (2+4!(!C2-+/4D!93-!(4352./@!./2+-/(2.3/(!)*.,4-+/=!11!

!
>8-2*+--!:-+.,@.3/!*(6!7++/!(/!./9,8+!) +13/!./2+-/(2.3/(! (4352.3/!6++/!(6!(!F(!23!65-+(4!9(.2*!(/4!
,3G+!23!)38/2-.+6!2*(2!(-+!5(-2.)8,(-,%!6899+-./@=11!>3-!)+2(./!-+.,@.386!6+)23-6:!.2!.6!/32!(!2-+/4:!
782! (!482%=-10! ' +@(-4,+66: ! ? (/ %! -+.,@.3/6! (/4!)*8-)*+6!9./4! 7+(82%!.!/(, !93- ? 6! 39! (4352.3/!:
G.+F./@!.2!(6!(!F(!23!5-3G.4+!2*+!8/)3/4.2.3/(!,3G+!3/,%!(15(-+/2!)(/!@.G+!23!(!)*.,4=!!U/2+-/(2.3/(!
(4352.3/!9)+6!6+G+-(,!668+6: !+G+!/2*38@*! ? (/ %! 39!2*+ ? ! ? (%!7+!8./2+/4+4=!!B8)*!5-37,+ ? 6!
9(./@!./2+-/(2.3/(! (4352.3/!./),84+!8 ? (/!2-(99.);./@!(6!F+,,!(6!532+/2.(!3-@(/!2-(99.);./@!(/4!
(-G+62./@=!!>8-2+ - ? 3-+!2*+!./)-+(6+4!93)86!3/!) *.,4-+!/3G+-6+(6!4.-+)2,%!.@/3-+6!2*+!)*.,4-+!/./!
38-!3F/!43 ? +62.)!9362+!)-(+!6%62+ ? 6=!!!

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I = Q X \$ I !

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I,2*38@*! *8 ? (/! 2-(99.);./@! *(6! *.623-.) (, %! 7++/! (! 5-+G(+/2! ./4862-%:!.2! *(6! 7+)3 ? +! (!
)3/)+-././@,%!,(-@+! 5(-2! 39! ./2+-/(2.3/(! (4352.3/6! 48+!23! ? 34+-/P4(%!2+)* /3,3@%!(/4!+(6+! 39!
2-(G+,,! I 6!2*+!5358,(-.2%!39!./2+-/(2.3/(! (4352.3/6!./)-+(6+4!./!2*+!,(2+!#]NN6: !2*+!4+ ? (/4!93-!
(4352(7,+!)*.,4-+!/!-36+!(6!F+,,=111!

+0)++4+4!2*+!(G(.,(7,+!)*.4-+!/93-!(4352.3/!/!2*+6+)38/2-.+6=-¹¹²!! I 6!)3/2-() +52.G+6!7+)(? +! ? 3-+!
-+(4.,%! (G(.,(7,+!(/4!2*+!62.@ ? (!68--38/4./@!8/F+4! ? 32*+-6!4+)-+(6+4:!2*+-+! F+-+!+G+!/9+F+-!
)*.4-+!/!(G(.,(7,+!23!(4352!F3-,4F.4+⁼¹¹³!!T3F:!(6!)38/2-.+6!5-3@-+66.G+,%!4+)-. ? ./(.L+!(73-2.3/!
2*+-+!,. ; +,%!F.,!7+!+G+!/9+F+-!)*.4-+!/!(G(.,(7,+⁼¹¹⁶!

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\$= Q B I > [X !

U/.2(.,%:!(4352.3/!F(6!C4-.G+!/7%!(!*8 ? (/2(-./!-+653/6+:D!782!5-365+)2.G+!5(-+/26! F*3! F+-+!
4+65+-(-2+!23!*(G+!)*.4-+!/62(-2+4!5(%./@!68762(/2.(,!(? 38/26!39! ? 3/+%!23!(<8.-+!)*.4-+!/=!!Q*.6!

U/! 3/+! 623-%! 8/)3G+-+4! 7%! S*(-, +! S862+-.! /! Q I :!(! 9(? .,%! (4352+4! (!)*.,4! 9-3 ?!
S*./ (= !23!! Q*+! (4352.G+! 5(-+/26! 62(-2+4! ./G+62.@(2./@! 2*+! 3-.@./6! 39! 2*+.-! (4352+4! 4(8@*2+-! (92+-!
/32.)./@! 63 ? +! .--@8, (-.2.+6! ./! 2*+! (4352.3/! 5-3)+66= !26!! 1 *+ /! 2*+! 5(-+/26! F+-+! 9./ (, %! (7,+! 23! @+2!
./! 238)*! F.2*! 2*+! ? (/! F*3! C938/4D! 2*+!, .22,+! @.-, :! *+! (4 ? .22+4! 2*+!)*.,4! F(6! 58-)* (6+4=!! B28//+4:!
2*+! 5(-+/26! 2*+ /! *+(-4! (7382! 2*+! 4.-+)23-! 39! 2*+! 3-5* (/ (@+! :! F*3! 6++ ? +4! 23!)3/9.- ? !2*+! (4352.3/!
(@+ /)%! 738@*2! 2*+! 7(7%= !27!! U/! (/3! 2*+-.! ./2+-G.+F! 587,.6*+4! 7%! Q V :! 2F3! (4352.G+!

5+35,+!C9./4+-6!9++6:D!(!5(% ? +/2!93-!)*.4-+!/7-38@*2!23!2*+.-!(@+/@)%=-!32!!Q-(99.);+-6!392+/-+)-8.2!
>./4+-6!F.2*!(!5-3 ? .6+4!5(% ? +/2:!. /)-+(6+4!62(286:!3-!,+66!(786+=!33!

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XG+!/2*+!@3G+-/ ? +/2!.6!/32!6(9+!9-3 ?!)3--852.3/:(6! ? (/!@3G+-/ ? +/2!399.).(,6!* (G+!2(; +/!5(-2!./!
2*+!6)*+ ? +=!36!!>3-!./62(/)+!3/+!39!2*+!C,(-@+62!-./@6!k./!V8(2+ ? (,(!!.6!(,+,@+4,%!*+(4+4!7%!(!235!
@3G+-/ ? +/2! 399.).(,=D!37! ! Q*+! -./@! ./),84+4! 2*+! 3-5*(/(@+! .26+,9:!(6! .2! C_m7+,3/@+4! 23! 2*+!
@3G+-/ ? +/2:!(/4! ? (/%!k)*.4-+!/1!F*3!F+/2!2*-38@*!2*.6!./62.282.3!/F+-+!6+/2!23!S(/(4(!3-!2*+!
A/.2+4!B2(2+6:!.+,+@ (,%,!7+)(86+!2*+-+!F(6!(/!(@-++ ? +/2!7+2F++/!2*+!V8(2+ ? (,(/!@3G+-/ ? +/2!
(/4!2*+!3-5*(/(@+=D!38!!

@-(2,%!8/4+---+53-2+4=D¹⁶⁶!!

62--+26=^9!!Q*+!/(2.3/!633/(4G(/)+4:!(6!./!#^ ^!(!6+G+/P%+(-P3,4!7+)(?+!2*+!9.-62!-)3@/.L+4!
9362+-!)*,4=^9/!!

!

B2.,:!(4352.3/!-+@8,(2.3/6!F+--+! /32!. ? 5,+ ? +/2+4!8/2.,!2*+! ? .4P#bNN6!F*+!/H(66()*86+226!5(66+4!
(!62(282+193)86./@!3/!)*,4!F+,9(-+!./!2*+!(4352.3/!5-3)+66=^90!!>3,,3F./@!6*3-2,%:!S*(-,+6!J3-./@!
\$-())+:!2*+!4.-+)23-!39!2*+!T+F!Y3-;!S*,4-+/E6!I.4!B3).+2%:!7+@(/!2*+!9362+-!)(-+!6%62+?!
?3G+?+/2!./!#bd`=^91!!K8+!23!2*.6!3-@(/.L(2.3/E6!5,(+)?+/26:!?(%!62(2+6!(/4!63).(!(@+/.).+6!
7+@(/!23!@+2!./G3,G+4!./!2*+!?(22+-ZZ98-2*+-./@!2*+!,+@(!5-32+)2.3/6!39!2*+6+!)*,4-+/=^92!!Q*-+!
62(2+6!,+4!2*+! ? 3G+ ? +/2k!H(66()*86+226!e+//6%,G(/.(:!(/4!B382*!K(;32(=^93!!H(66()*86+226!7+@(/!
6876.4.L./@!9(?.,,+6!F*3!233;!./!(!9362+-!)*,4:!(/4!B382*!K(;32(!7+@(/!6876.4.L./@!2*+!S*,4-+/E6!
[3?+!B3).+2%=^96!!e+//6%,G(/.(!5(66+4!(!9362+-!,.)+6./@!,(F:! ? (;./@!.! ? (/4(23-%!23!372(./!(!
.,)+/6+!7+93-+!9362+-./@! ? 3-+!2*(/!3+/!)*,4=^97!!U2!F(6/E2!8/2.,!2*+!#]NN6!2*(2!@3G+-/?+/2!(@+/.).+6!
7+@(/!23!;+5!-)3-46!3/!9362+-!)*,4-+/:!5+-93-?!*3?+!/G+62.@(2.3/6!(/4!4+2-?./+!2*+!7+62!
./2+-+62!39!2*+!)*,4=^98!!

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XG+/(92+-!%+(-6!39!. ? 5,+ ? +/2(2.3/!2*+!9362+-!)(-+!62.,!9()+6! ? (a3-!.668+6-! 1 .2*(7382!MM` :NN!
9362+-!)(-+!)*,4-+/:./!2*+!A/.2+4!B2(2+6!2*+!/8?7+-6!* (G+)3/2./8+4!23!-.6+!3G+-!2*+!,(62!2+/
%+(-6=^9!!

23!6899+!9-3 ? !4-8@!(786+:!2*-++!2. ? +6! ? 3-+!,. ;+,%!23!7+!5-+6)-.7+4!56%)*32-35.)! ? +4.) (2.3/6:!(/4!
2F.)+!(6!,. ;+,%!23!6899+!9-3 ? !5362P

(6! ? (/%! (4352.G+!9(? ..+6!* (G+!23!,+(-/!(,3/@!2*+!F (%=/10!!e-3G.4./@!859-3/2!,+@(!,-+<8.-+ ? +/26!
)38,4!*+,5!9(? ..+6! (/4!)*.,4-+!/7+!)3//+)2+4! ? 3-+!<8.);,%:!(/4!*+,5!2*+!9(? ..%!5,(/!93-!2*+!
9./(/).(!,-+<8.-+ ? +/26!>8-2*+:-! ? (/%!9362+-!9(? ..+6! (-+!8/(F (-+!39!2*+!2-(8 ? (!9362+-!)*. ,4-+!
*(G+! 9()+4! (/4! *3F! .2!)38,4! (99+)2! 2*+ ? =/11! ! e-3G.4./@! ? 3-+!)3 ? 5-+*+/6.G+! 2-(././@! (/4!
+48)(2.3/(,-+638-)+6!23!2*+!532+/2.(,! (4352.G+!9(? ..+6!F38,4!./93- ? !2*+ ? !3!/F*(2!23!+05+)2!3/)+!
2*+%!* (G+!(!)*.,4!./!2*+.-!*3 ? +=/12!

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1 *.,+!* (6!7++/!(!2-+ /4!23!(4352!./2+-/(2.3/(,%,!+G+-!6./)+!2*+! 1 3-,4! 1 (-6:!2*+--+!(-+! ? (/%!F(%6!
23!@.G+!2*+!587,.)! ? 3-+!/6.@*2!23!F*(2!)*.,4-+!/43F /!2*+.-!62-++26!(-+!9()./@=!! I 4G+-2.6./@:!F*.,+!

9(? ,%!) * (-) 2+- .62.) 6: ! (/4! 32*+-! 9() 23-6! 2* (2! 5, (%! . /23! (4352.3 / =! ! H (/ %! (-2.9.) . (! . /2+ , , @+ /) +!
2+) * /3, 3@ . +6! * (G+! 7++ /! 86+4! 23! 4+G+ , 35! ? (2) * . / @! 6.2+6! 93-!) * . , 4-+ / ! (/4! 9(? .. , +6: ! 6. ? .. , (-! 23! 4(2. / @!
6.2+! 6+-G.) +6 = / 2! !! U / G+62. / @! . / ! 2*+6+! 2%5+6! 39! 5-3@- (? 6!) 38, 4! , + (4! 23! ? 3-+!) * . , 4-+ / ! 7+ . / @! 5, () +4!
F. 2*! 9(? .. , +6! 633 / + - =!
!

I / 32*+-! F (%! 23! ? (; +! 2*+! 5-3) +66! ? 3-+! +99.) . + / 2! F 38, 4! 7+! 23! 4+G32+! -+638-) +6! 23!) -+ (2. / @! (! ? 3-+!
) 3 ? ? 8 / . 2% P7 (6+4! 9362+-!) (-+! 6% 62+ ? =! ! S -+ (2. / @! 5 (-2 / + -6* . 56! 7+2F++ / ! 2*+! 62(2+! 9362+-!) (-+! 3-!
(4352.3 / ! (@+ /) . +6! (/4! 5-G(2+!) 3 ? ? 8 / . 2% ! 3-@ (/ . L(2.3 / 6! , + (46! 23! G(-.386! 7+ / +9.26! 93-! 2*+! 9362+-!
) * . , 4-+ / ! (/4! 9(? .. , +6 = / 2! !! T 32! 3 / , %! 43+6! . 2! * 3, 4! 2*+! 62(2+6! ()) 38 / 2(7, +! F *+ / ! + / @ (@ . / @! F. 2*! 2*+!
) 3 ? ? 8 / . 2. +6! (/4! 5-G(2+! 3-@ (/ . L(2.3 / 6: ! 782! . 2! (, 63! @ . G+6! 2*+! 62(2+! ()) +66! 23! , 3) (, L+4! 4(2(=! ! Q* . 6!
*+ , 56! (@+ /) . +6! . ? 5-3G+! ? (/ (@+ ? + / 2: ! . 4+ / 2. 9%!) * . , 4-+ / ! (2! - . 6; ! 39! + / 2+ - . / @! 2*+! 6% 62+ ? : ! (/4! +G(, 8(2+!
2*+! +99+) 2.G+ / +66! 39! 2*+ . -! 5-3@- +66 = / 20!!
!

U / ! "N# \ : ! Q+0(6! F(6! 2*+! 9. -62! 23! 399.) . (, , %! 7+@ . / ! 2* . 6! -+93- ? (2.3 / ! F *+ / ! . 26! , +@ . 6, (28-+! 5(66+4! B+ / (2+!
\$.. , ! ## = / 21! ! Q* . 6! 7 .. , ! 5-3G. 4+4! 93-! 2*+! 2- (/ 6.2.3 / ! 39! 2*+! S * . , 4! e-32+) 2.G+! B+-G.) +6! hSeBi: ! 2*+!

Q*+!A/.2+4!B2(2+6!43+6!/32!*(G+!2*+!53F+-!23!)3/2-3,!32*+!)38/2-.+6E!(4352.3/!6%62+ ? 6:!782!.2!43+6!
(G+!2+!53F+-!23!)3/2-3,!26!3F/=! !'+@(-4,+66!39!2*+!A/.2+4!B2(2+6!+)3/3 ? %E6!7+ /+9.26!9-3 ?!
./2+-/(2.3/(,! (4352.3/6:!2*+!587,.)!. /2+-+62!(/4!)3/)+- /!93-!)*.4-+/E6!6(9+2%!6*38,4!+0)++4!(/%!
./2+-+62!. /!5-39.26=(/27!!>8-2*+- ? 3-+;!48+!23!