th Annual
Research Symp

"
"
"
"
"
"
"
"
"
"
"
"
"
"

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

!$"%& ' ( )*"+,"- ./01)"2+.034" 5)603"78)*8"38"3"9*)60./+*"+," : ;99 -";<,*0<=) ')</8"
8$:& ' ;$,(10$22$,-<!(=&-0& '*$(>*<!(?&.$",(63,/$<!(@&+*;(1& '-A!((

-&/>+*"-,,0403/0+<8"
!="",;&(B"7("C(D#-$"2&-0*/(E$;*/*'$(

9&*?+8)"

#$"%+1)4" 5)/>+6+4+=C",+*"/>)";<1)8/0=3/0+<"+,"D ' */B3";</)*<)&*+<8"0<"E3*134"F) (*3,08>(
8ϑC,$;(8%$'; "ϑ&,&<!(E&0&-0*(E"0&'(N" I ;&<"(=*L*-0&(6&22&/0$'<"([,*#-$'(\A(1$+$,*A"((

-&/>+*"-,,0403/0+<8"

!="",;&(B"ϑϑ7("C(D#-$"2&-0*/(E$;*/*'$J(@$2&,-%$'-("C(]*"%$;*/&ϑ(1/*$'/$#<("=$ I (^$,#$.(G'#-*-3-$("C(
?$/0'"ϑ"7.J(M$;$,&-$;(@$2&,-%$'-("C(]*"ϑ"7*/&ϑ(1/*$'/$#(

9&*?+8)"

)';$,#-&';*'7(-0$('$3,&ϑ(/*,/3*-#(-0&-(3';$,ϑ*$(ϑ"/"%"-*"'(*#(L$.(-"(3';$,#-&';*'7(-0$(/&3#$#("C(%"-",(
F$0&+*",#(&';(;*#",;$,#A(?0*#(2,"_$/-($:2ϑ",$#(-0$(,"ϑ$("C(#2*'&ϑ(*'-$,'$3,"'#J(ϑ*'L$;(-"(-0$(7$'$(@%,-Y&J(
'(ϑ&,+&ϑ('$F,&C*#0A(6&#-(#-3;*$#(#377$#-(-0&-(-0$#$(*'-$,'$3,"'#(&,$(ϑ'L$;(-"(#2$$;R#0*C-*'7(&';(ϑ"/"%"-",(
/"",;*'&-*"'A(K$(0.2"-0$#*'$(-0&-(-0$(&/-*+*-.("C(@%,-Y&('$3,"'#(*#('$/$##&,.(C",(/"",;*'&-*'7(
ϑ"/"%"-*"'(&-(;*CC$,$'-(#2$$;#A(8ϑ-0"370(-0$,$(*#($+*;$'/$(C",(-0*#(0.2"-0$#*#(*'("-0$,(%";$ϑ#J(-0$(
C3'/-*"'("C(-0$#$('$3,"'#(0&#('$+$,(F$$'(-$#-$;(*'(&(%"+*'7(&'*%&ϑ(I 0*/0(/&'(F$(%&'*23ϑ&-$;(
$:2$,*%$'-&ϑϑ.A(8;;*-*"'&ϑϑ.J(-0$(3#$("C(0*70#2$$;(C""-&7$(-,&/L$;(3#*'7(%&/0*'$Rϑ$&,'*'7(F&#$;(
#"C- I &,$(0&#('"-(F$$'(;$#/,*F$;(*'(2,$+*"3#('$F,&(C*#0(#-3;*$##A(

5)/>+68"

8(/"'-,"ϑ(7,"32("C(Q(I *ϑ;-.2$J(Z(;&.#(2"#-(C$,-*ϑ*'&-*"'(W;2CX('$F,&C*#0(ϑ&,+&$(I &#(/"%2&,$;(-"(&'(
$:2$,*%$'-&ϑ(7,"32("C(Z(@E!?Y&R>1aN&ϑH<]"-":(R(NM6<('&/,$(RbRJ(Z(;2C('$F,&C*#0(ϑ&,+&$A(M*#0(I $,$(
#/,$$'$;(%&'3&ϑϑ.(3#*'7(&(Cϑ3",$#/$'-(;*##$/-*'7(#/"2$A(M*#0(I $,$(0$&;($%F$;;$;(*'(&7&,(W4c(ϑ" I R
%$ϑ-*'7(2"*'-(3=3*+8)X(&';(&(C*#0 I &-$,(#"ϑ3-*"'(&//",;*'7(-"(%$-0";"ϑ"7.(;$#/,*F$;(2,$+*"3#ϑ.(*'(1$+$,*(
$-(&ϑ(45UHA(d*;$"#(I $,$(/&2-3,$;("'(&(/3#-"%(+*;$"(,*7A(M*#0(I $,$(#-*%3ϑ&-$;(-"(# I *%(3#*'7(&(2,"_$/-$;(
DE!(7,&-*'7(&-("'$("C(Y(#2$$;#(WU5%%b#J(45%%b#J(Y5%%b#X(C",(Y5(#$/"';#(C",(&(-"-&ϑ("C(V4V5(C,&%$#(
2$,(+*;$"A(\&/0(#2$$;(I &#(,3'(C",(VRU4(-,*&ϑ#(2$,(C*#0(,"-&-*'7(#2$$;#(-"(%*'*%*'$(;$#$'#*-*'&-*"'("C(-0$(
#-*%3ϑ3#A(!& I (+*;$"(C*ϑ$#(I $,$(/"'+$,-$;(C,"%(A-*CC(-"(3'/"%2,$##$;(A8dG(C*ϑ$#A( )#*'7(-0$(@$$2e&FB3-(
#"C- I &,$(&//",;*'7(-"(-0$(23Fϑ*#0$;(2,"-"/"ϑJ(2"*'-#(&ϑ"'7(-0$(F*ϑ&-$,&ϑ(2$/(C*'#(&';(-0$(-&*ϑ(I $,$(-,&/L$;A(
D3-23-(C,"%(@$$2e&FB3-(I &#(-0$'(/"'+$,-$;(-"(AB1d(*'(6.-0"'J(/ϑ$&'$;(&';(,$C",%&--$;(*'(!J(&';(
&'&ϑ.'$;(*'(E8?e8]A(

@)8&4/8"

M*'&ϑ(&'&ϑ.#*#("C(F$0&+*",&ϑ(;&-&(0&#('"-(.$-(F$$'(/"%2ϑ$-$;A(

A+<.4&80+<8"

B3,,$'-(I ",L(-"(-0*#(2"*'-(0&#(7$'$,&-$;(#3F#-&'-*&ϑ(3#&Fϑ$(;&-&(&';(#322",-#(3#$(&';(/,$;*Fϑ*-.("C(-0$(
'"+$ϑ(%$-0";"ϑ"7*$#($:2ϑ",$;(*'(-0*#(#-3;.A(\+$'-3&ϑ(&'&ϑ.#*#("C(-0$#$(;&-&(I *ϑϑ(,$+$&ϑ(-0$(20$'"-.2*/&ϑ(
CC/-("C(@%,-Y&(L'"/L;" I '(*'(;$+$ϑ"2*'7('$F,&(C*#0A(
(

B$"G*H I"-./010/C"-4/)*8"J+4&</3*C"-4.+>+4"A+<8& ' ?/0+<"0<"%+<K6)?)<6)</"5 0.)(
8 9C,$;(8%$' ;"9&,&<!(8 ' ;,$ I (6&. '$<!(^&%$#(] ,3 ' ;&7$<!(>.3 '(6&,L<!(1/"--(1-$CC$ '#$ 'A"((

-&/>+*"-,,0403/0+<8"
!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(]*"%$;*/&9(1/*$'/$#<("],*70&%(g"3'7( ) '*+$,#*-.J(@$2&,-%$'-(
"C(6#./0"9"7.(&';(B$'-$,(C",(=$3,"#/*$'/$(

9&*?+8)"
8 9/"0"9(&;;*/-*"'(0&#(#-&77$,*'7(C*'&'/*&9(&';(0$&9-0(/"'#$h3$'/$#A(8(/"%%"'9.(&//$2-$;(-0$",.("C(
&;;*/-*"'(*#(-0&-(*-(F$7*'#(I *-0(&9-$,&-*"'#(-"('$3,&9(;"2&%*'$(W@8X(-,&'#%*##*"'(*'(-0$(%$#"9*%F*/(@8(
#.#-$%J(I 0*/0(*#(/,*-*/&9(C",(,$ I &,;(&';(,$*'C",/$%$'-(/*,/3*-,.A((?0*#(#.#-$%(F$7*'#(*'(-0$(+$'-,&9(
-$7%$'-&9(&,$&(Wd?8X(*'(-0$(%*;F,&*'(&';(2,"_$/-#(-"(&,$&#("C(-0$(/",-$:(&';(9*%F*/(#.#-$%A(K$(0&+$(
#0" I '(2,$+*"3#9.(-0&-(N8]8('$3,"'#(9"/&-$;(*'(-0$(d?8(&,$(2&,-*/39&,9.(#$'#*-*+$(-"($-0&'"9(W\-D>X(&';(
F$/"%$(0.2$,$:/*-&F9$(;3,*'7(I *-0;,& I &9(C,"%(/0,"'*/(\-D>($:2"#3,$A((G-(*#(-0"370-(-0&-(#"%$("C(-0*#(
/0&'7$(*#(%$;*&-$;(F.(F,&*'R;$,*+$;('$3,"-,"20*/(C&/-",(W]@=MXJ(I 0"#$(%&*'(,$/$2-",(*'(-0$(/$'-,&9(
'$,+"3#(#.#-$%(*#(-.,"#*'$(,$/$2-",(L*'&#$(](W?,L]XA(G-(0&#(F$$'(#0" I '(2,$+*"3#9.(-0&-(&/-*+&-*'7(?,L](/&'(
/&3#$(&(;" I ',$739&-*"'("C(-0$(/09",*;$R$:2",-*'7(2"-&##*3%(/09",*;$(/"-,&'#2",-$,(4(W[BB4XA(>$,$(I $(
'+$#-*7&-$(-0#(%$/0&'*#%("C(&;&2-&-*"'(*'(-0$(/"'-$:-("C(/0,"'*/(&9/"0"9($:2"#3,$(&';(2,"2"#$(C3,-0$,(
*'+$#-*7&-*"'("C([BB4(/0&'$9#A(

5)/>+68"
8 99(&'*%&9#(I $,$(%&*'-&*'$;(*'(/"%29*&'/$(I *-0(&22,"+$;(G8B)B((2,"-"/"9#A(E&9$(%*/$("9;$,(-0&'(4Q(;&.#(
I $,$(0"3#$;(/"%%3'&99.A(8'*%&9#(I $,$(%&*'-&*'$;("'(&'(*'+$,-$;(9*70-(/./9$A(8 99(;,37(&';(\-D>(
'_$/-"'#(I $,$(2$,C",%$;(+*&(*'-,&2$,*-"'$&9(*'_$/-*"'A( ]@=M(I &#(%$&#3,$;(3#*'7(\eG18A(\-D>(
/"'#3%2-*"'(I &#(%$&#3,$;(3#*'7(&(;,*'L*'7(*'(-0$(;&,L(W@G@X(%";$9(",(#*%*9&,(-I "(F"--9$(/0"*/$(
2&,&;*7%A(?"(2,";3/$(;$2$';$'/$J(%*/$(I $,$($:2"#$;(-"(\-D>(+&2",#(3#*'7(&(/0,"'*/(*'-$,%*--$'-(\-D>(
2&,&;*7%A(],&*'#(3#$;(*'(*%%3'"0*#-"/0$%*#-,.(#-3;*$#(I $,$(2,$#$,+$;(3#*'7(/&,;*&/(2$,C3#*"'("C(
20"#20&-$(F3CC$,$;(#&9*'$(&';(-0$'(Hc(2&,&C",%&9;$0.;$A(

@)8&4/8"
K$(;$%"'#-,&-$(-0&-(]@=M(9$+$9

N$(ADN" O<+.H+&/" 5 0.)" MP>0(0/" @)6&.)6" 2)<80/010/C" /+" />)" 2)63/01)" M,,)./8" +," -4.+>+4" 3<6" @)6&.)6" -4.+>+4"2))H0<="I)>310+*(

8 ' ; ,$ I (6&. '$<!(^@(DF,&.<!([d(K 0*-9$.<"(^@(N" ' '&9$'(E 3,/*&<"(B E ?(M,$*-&#<"$%(B^(B0&2%& '<(]&9; ,*;7$<"(] E(K *99*&%#<("# I^(] " . /$<("B8(1%&99<#"(18(1&9&'&,<#"

Q$"9)*0?>)*34" 5).>3<+*).)?/+*"-./013/0+<" 5+6&43/)8" 5)8+40 ' (0."R-I-"3<6"D+?3 ' 0<)"%)&*+<8"3<6"
- ')40+*3/)8"S0/>6*3T34"2C ' ?/+ ' 8"0<"M/>3<+4"D)?)<6)</"@3/8(

8,&'"'"(10 I &'.<!(=*/"9$(e&#0*L$,<!(^3;$(\%$7"<!(?&' '$,(K*99*C",;<!([&*-9.'(E/M&,9&';<!(!"#0'*(
^"7*'<!@&+*;(1&'-<!(1/"--(1-CC'#$'<"([.9$(]*99#A!((

-&/>+*"-,,040 3/0+<8"

!?0$(="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(E$;*/*'$<("],*70&%(g"3'7()'*+$,#*-.(

9&*?+8)"

?0$(-0$,&2$3-*/(F$'$C*-#(-"(-0$(#32,&#2*'&9(/$'-,&9('$,+"3#(#.#-$%(WB=1X(&--,*F3-$;(-"("#-$"2&-0*/(
%&'3&9(%&'*239&-*"'(WDEEX(&,$(2""9.(3';$,#-"";A(>"I$+$,J(-0$,$(*#(&(7,"I*'7(F";.("C($+*;$'/$(-0&-(
#377$#-#(%$/0&'*/&9(#-*%39&-*"'(WE1-*%XJ(#3/0(&#("#-$"2&-0*/(%&'*239&-*"'J(/&'(%";39&-$(#3F#-,&-$#("C(
-0$(#32,&#2*'&9(B=1A(?0*#(#-3;.(&*%$;(-"(C3,-0$,(*'+$#-*7&-$(-0$($CC$/-#("C(E1-*%J(I0$'(&229*$;(-"(-0$(
/$,+*/&9(#2*'$J("'(-0$(&/-*+*-."C(-0$('$3,"'#(&';('$3,"-,&'#%*--$,#(*'(-0$(%$#"9*%F*/(;"2&%*'$(W@8X(
#.#-$%J(&'(&,$&(*%29*/&-$;(*'(,$I&,;(&';(%"-*+&-*"'(I*-0*'(-0$(/"'-$:-("C(&9/"0"9R3#$(;*#",;$,A(

5)/>+68"

\9$/-,"20.#*"9"7*/&9J(20&,%&/"9"7*/&9J('$3,"/0$%*/&9J(#3,7*/&9J(&';(F$0&+*",&9(-$/0'*h3$#(I$,$(3-*9*'$;(
"'(%&9$(K*#-&,(,&-#A(

@)8&4/8"

e"I(C,$h3$'/.(WHVRQ5(>'X(+*F,&-*"'(;$2,$##$#(C*,*'7("C(+$'-,&9(-$7%$'-&9(&,$&(Wd?8X(N8]8('$3,"'#(WV4AQc(
F&#$9*'$<(HV5(#$/XJ(*'/,$&#$#(d?8(@8(C*,*'7(W4HQc(F&#$9*'$<(V55(#$/X(&';(F&#&9(WUSQAHY(c(2$&L(*'/,$&#$(&-(
Z5(%*'XJ(&';($+"L$;(@8(,9&#$(*'(-0$('3/9$3#(&//3%F$'#(W=8/<(UYVA5Y(c(2$&L(*'/,$&#$(&-(H5(%*'XA(
6$,*20$,&9(E1-*%J(&;%*'*#-$,$;(/"'/3,,$'-9.(I*-0(&9/"0"9J(&9-$,#(&9/"0"9R*';3/$;(;$#$'#*-*'&-*"'("C(d?8(
N8]8('$3,"'(C*,*'7(,&-$(*'(,$#2"'#$(-"(&(,$*'#-&-$%$'-(;"#$("C($-0&'"9(W4AV%7bL7<G6X(C,"%(UUSAV(c("C(
F&#$9*'$(-"(Y4AY(cA(@"2&%*'$(,$9$&#$(*'(-0$(=8/(&-(45(%*'(2"#-R*'_$/-*"'(I&#(/0&'7$;(C,"%(mVAHc("C(
F&#$9*'$(-"(UHHAH(c(&';(&-(Q5(%*'(C,"%(U5HAUc(-"(UYQA4cA(K$(;$%"'#-,&-$(-0&-(9"I(C,$h3$'/.J(F3-('"-(
0*70$,(C,$h3$'/.J(2$,*20$,&9(E1-*%(-"(-0$(9"I$,(/$,+*/&9(#2*'$(;$2,$##$#(C*,*'7("C(+$'-,&9(-$7%$'-&9(&,$&(
Wd?8X(N8]8('$3,"'#J(*'/,$&#$#(d?8(@8(C*,*'7(&';(F&#&9J(&';($+"L$;(@8(,9&#$(*'(-0$('3/9$3#(&//3%F$'#A(
M3,-0$,%",$J(E1-*%R*';3/$;(@8(,$9$&#$(I&#(%$;*&-$;J(*'(2&,-J(F.($';"7$'"3#("2*"*;(&';(&/$-.9/0"9*'$(
,9&#$(*'(-0$(=8/A(8;;*-*"'&99.J(2$,*20$,&9(E1-*%(2,"+*;$;(2,"-$/-*"'(&7&*'#-(/0,"'*/($-0&'"9(I*-0;,&I&9(
#.%2-"%#(&';(;2';$'/$R*';3/$;(*'#$'#*-*+*-."C(d?8(N8]8('$3,"'#(-"($-0&'"9(,$*'-,";3/-*"'A(
M3,-0$,J(F$0&+*",&9(*';*/$#("C(I*-0;,&I&9(W,$&,*'7J("2$'RC*$9;(/,"##$#J(-&*9(#-*CC'$##(&';(7&*-X(I$,$(
#3F#-&'-*+$9.(&%$9*",&-$;(I*-0(/"'/3,,$'-(E1-*%(-,$&-%$'-A(

A+<.4&80+<8"

?0$#$(C*';*'7#(;$%"'#-,&-$(,"F3#-(CC/-#("C(E1-*%("'(B=1(#3F#-,&-$#(-0&-(&,$('"-(-.2*/&99.(&##"/*&-$;(
I*-0(#"%&-"#$'#",.(/*,/3*-#J(#377$#-*'7(-0$('$$;(-"($:29",$(%",$(F,"&;9.(-0$($:-,&R#"%&-"#$'#",.(
CC/-#("C(2$,*20$,&9(%$/0&'",$/$2-",(&/-*+&-*"'J(&#(I$99(&#(-0$(#2$/*C*/(,"9$("C(%$/0&'",$/$2-",RF&#$;(
-0$,&2*$#(*'(-0$(-,$&-%$'-("C(#3F#-&'/$(&F3#$A(
((

!"#$%&'()'*+$,#*-.(!$#$&,/0(1.%2"#*3%(4544(6,"7,&%((((((

U$" J+4&</3*C" -)*+(0." MP)*.08)" 9*+/).8" -=30<8/" A>*+<0." M/>3<+4K;<6&.)6" A>3<=)8" /+" O3??3KV?0+06"
@).)?/+*8(

8,%&70&'(E&,;&#0-*<!(E&,*'&(1$--$99%&.$,<!(@&+*#(^"0'#-"'<!(E&,L(K&,'$,<!(d$,"'*/&(K3<!=&-0&'(
1 I &99" I <!(@&+*;(1&'-<!(1/"--(1-CC'#$'<!([.9$(]*99#<!((

-&/>+*"-,,040 3/0+<8"
!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(E$;*/*'$(

9&*?+8)"
\:$,/*#$(0&#(9"'7(F$$'(2,$#/,*F$;(&#(&;_3'/-*+$(-,$&-%$'-(C",(&9/"0"9R3#$(;*#",;$,(W8)@X(;$#2*-$(-0$(
3';$,9.*'7(%$/0&'*#%#(,$%&*'*'7(9&,7$9.(3'/0&,&/-$,*'$;A(E3R"2*"*;(,$/$2-",#(WED!#XJ(;$9-&R"2*"*;(
,$/$2-",#(W@D!#X(&';(L&22&R"2*"*;(,$/$2-",#(W[D!#X(&,$(-0$(-0,$$(-.2$#("C("2*"*;(,$/$2-",#($:2,$##$;(*'(
-0$(F,&*'(I 0*/0(&,$(2&,-("C(-0$(%$#"9*%F*/(;"2&%*'$(#.#-$%(&';(0&+$(9"'7(F$$'(-0"370-(-"(;,*+$(&9/"0"9(
I *-0;,&I &9(#.%2-"%#A(?0$.(&--$'3&-$(;"2&%*'$(WAC(W)7/(#2*)-1(-$)-64(;)-7(6(#)-164(W+2(("))-1(2)-14(W+2(-)-1(A)-2(()-6

!Y$"M134&3/0+<"+,"234013*C"I0+ ' 3*H)*8",+*"/>)"M3*4C"D03=<+808"+,"9)*0+6+</0/08"3<6";/8"-88+.03/0+<"T0/>"
:C?)*/)<80+<(
\9*'&F$-0(()""!((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(N,&;3&-$(1-3;*$#(

9&*?+8)"
D,&9(0$&9-0(*#(*'-$,;2';$'-(I*-0("+$,&99(0$&9-0(j(?0$(;*&7'"#*#("C(2$,*";"'-*-*#J(&(%39-*C&/-",*&9J(/0,"'*/(
'C9&%%&-",.(;#$&#$("C(-0$(2$,*";"'-*3%J(0&#(F$$'(#-,"'79.(9*'L$;(-"(-0$(*'/,$&#$;(2,"7,$##*"'("C(
0.2$,-$'#*"'A(?0$(/3,,$'-(&';(%"#-(I*;$9.(3-*9*'$;(;*&7'"#-*/(2,"-"/"9(C",(2$,*";"'-*-*#(*'+"9+$#(-0$(
&'&9.#*#("C(/9*'*/&9(2&,&%$-$,#(&';(,&;*"7,&20*/($:&%*'&-*"'#<(0"I$+$,J(-0$#$(;*&7'"#-*/(2,"-"/"9#(;"('"-(
0"9;(0*70(#$'#*-*+*-.(&';(&//3,&/.(-"(&;$h3&-$9.(;*&7'"#$(-0$(&/-*+$(C",%("C(-0$(;*#$&#$(",(2,$+$'-(-0"#$(
&-(,*#LA(?03#J(-0$($%$,7$'/$("C(-0$(3#$("C(#&9*+&,.(F*"%&,L$,#(&#(&(2,"#2$/-*+$(#/,$$'*'7(&';(;*&7'"#-*/(
-""9(0&#(*'/,$&#*'79.(F$$'(3#$;(-"(;*&7'"#$(&';(;$-$,%*'$(-0$(2,"7'"#*#("C(2$,*";"'-*-*#A(?0*#(*#(;3$(-"(
-0$(/"%2"'$'-("C(#&9*+&(&#(&(,$C9$/-*"'("C(-0$(0$&9-0(#-&-3#(-0&-(*'-,*/&-$9.(2,$#$'-#(-0$(32,$739&-$;(",(
;"I',$739&-$;(&/-*+*-.("C(#2$/*C*/(%*/,"F*&9(2&-0"7$'#J(&';(-0$(+&,*"3#(F*"%&,L$,#(*'+"9+*'7(@=8J(!=8J(
&';(2,"-$*'#A(?0$(23,2"#$("C(-0*#(9*-$,&-3,$(,$+*$I(*#(-"($+&93&-$(-0$(2,"%*#*'7('"'R*'+&#*+$(3#$("C(#&9*+&,.(
F*"%&,L$,#(C",(-0$(;*&7'"#*#("C(2$,*";"'-*-*#(*'(-0$(2,$+$'-*"'(&';(%&'&7$%$'-("C(0.2$,-$'#*"'A(

!!$(-"Z&3</0/3/01)"-<34C808"+,"/>)"M,,0.3.C"+,"J3*0+&8"M88)</034"V048"-=30<8/"/>)"2-@2"A+1K#"J0*&8(

\9*'&F$-0(K&7#-&CC<!(BO&';,$9.'([,&/'&L<!(],&';"'(e"2$'A!((

-&/>+*"-,,0403/0+<8"

!]*70&%(g"3'7()'*+$,#*-.1(B"99$7$("C(e*C$(1/*$'/$#(

I"(-0-1(K')(9)-1(.)1()'(&765$)0-1:2"#8(C)-1(765$)-"1(765$)&1(765$)(#()-2(9)-1(/-#A)-1(()-(0A2)-1(9)-65$)8$-(()-&76

8&*7$8)"

>3%&'#(0&+$(F$$'(-3,'*'7(-"(29&'-#(&';(29&'-($:-,&/-#(C",(%$;*/&9(23,2"#$#(C",(-0$(%&_",*-.("C(,$/",;$;(

0*#-",.A(G'(,$/$'-(.$&,#($##$'-*&9("*9#J(;$,*+$;(C,"%(29&'-#J(0&+$(F$/"%$(*'/,$&#*'7.(2"239&,(&';(0&+$(

--0(K&7#008,(#"1*-*&7#"\&9(&7#"&#*'79.&7#"C-"(#"e*#"*#($C#"&F$-0[-"(.)-#"&'-*#"#(9/-#A(0&+(#"17#008,'#008,Tc1[(-);q(I"

F$$'(#0"I"(*"(#$+$,&9(#-3,*$#(-"($.$,-(2"#*-+$(&'-*F&/-$,*&9(&',(&'-+*,&9($CC$/-#A(G'(-0$(C&/$("C(&(

I",9

!#$"G>)"@+4)"+,"ADN"0<"9)*0+6+</34"D08)38)$";<80=>/8";</+"A>*+<0.";<,43 ' ' 3/0+<"
\99*$(].F$$<!(B&,9"#(E",$'"<!(B9&3;*&(EA(?$99$'(M,$*-&#<"([A(1/"--(KF,A!(

-&/>+*"-,,0403/0+<8"
!],*70&%(g"3'7()'*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#<("!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(
"
9&*?+8)"
6$,*";"'-&9(;*#$&#$(*#(&(/0,"'*/(*'C9&%%&-",.(",&9(;*#$&#$(*'*-*&-$;(F.(6A(7*'7*+&9*#J(&(7,&%R'$7&-*+$(
F&/-$,*3%J(I*-0*'(-0$(2$,*";"'-&9(2"/L$-#(-0&-(#3,,"3';(-$$-0A(B@Hs(?(0$92$,(/$99#(W?0X(29&.(&(L$.(,"9$(*'(
-0$(",&9(&;&2-*+$(*%%3'$(,$#2"'#$A(>"I$+$,J(0.2$,&/-*+$(?0(/$99#(2,";3/$(*'C9&%%&-",.(/.-"L*'$#(-0&-(
&//9,&-$(&9+$"9&,(F"'$(9"##(&';(#"C-(-*##3$(;&%&7$A(B@V(*#(&(/",$/$2-",(C"3';("'(?(/$99#(-0&-(*'0*F*-#(?(
/$99(&/-*+&-*"'(&';(9*%*-#(CC/-",(C3'/-*"'A(K$(#$$L(-"(#-3;.(-0$(,"9$("C(B@V(*'(2$,*";"'-&9(;*#$&#$(
2&-0"7$'$#*#A(K$(0.2"-0$#*'$(-0&-(B@V(L'"/L"3-(WB@V[DX(?(/$99#(0&+$(*'/,$&#$;(&/-*+&-*"'(&';(CC/-",(
C3'/-*"'(/"%2&,$;(-"(I*9;-.2$(I0$'($:2"#$;(-"(6A(7*'7*+&9*#(e61(&';(-0&-(B@V(*#(&(2"-$'-*&9(;,37(-&,7$-(
-"(,$;3/$(*'C9&%%&-*"'(*'(2$,*";"'-*-*#A(D3,(*'*-*&9(;&-&(#0"I$;(&(C&#-$,(&/-*+&-*"'("C(B@V[D(?(/$99#(F.(
%$&#3,*'7(&/-*+&-*"'(%&,L$,#(B@Zm(&';(B@4VJ(-03#(#377$#-*'7(-0$(2"-$'-*&9(,"9$("C(B@V(*'(2$,*";"'-&9(
;*#$&#$A(?0*#(,$#$&,/0(I*99(2,"+*;$(7,$&-$,(*'#*70-(*'-"(-0$(*'C9&%%&-",.(,$#2"'#$(*'(2$,*";"'-*-*#A(((
"
5)/>+68"
D,&9(%3/"#&($2*-0$9*&9(/$99#(&';(N*'7*+&($2*-0$9*&9(/$99#(C,"%(%*/$(WBVS]ebZ(F&/L7,"3';X(I$,$($:2"#$;(-"(
e*2"2"9.#&//0&,*;$#(We61X(C,"%(6A(7*'7*+&9*#(We61R6NX(&';(e61(C,"%(\A(/"9*(We61R\BX(C",(4H(0,#A(?0$'J(
#29$'"/.-$#(C,"%(B@V(L'"/L"3-(W[DX(&';(B@V(I*9;(-.2$(WK?X(%*/$(WBVS]ebZ(F&/L7,"3';X(I$,$(*#"9&-$;(
&';(/"R/39-3,$;(I*-0(-0$(#32$,'&-&'-(C,"%(-0$(",&9($2*-0$9*&9(/$99#A(K$(*'*-*&99.(%$&#3,$;(;*CC$,$'/$#(*'(?(
/$99#(&/-*+&-*"'(F.(&'&9.'*'7(C9"I(/.-"%$-,.(%&,L$,#(B@Zm(&';(B@4V(W$&,9.(&';(9&-$(&/-*+&-*"'(%&,L$,#A(
M"99"I*'7(-0$#$(,$#39-#J(I$(3#$(&'(\eG12"-(&##&.(-"(*;$'-*C.(-0$(2,$#$'/$("C(*'C9&%%&-",.(&';(&'-*R
'C9&%%&-",.(/.-"L'$#(WGeRZJ(GeR4J(GeRUS&J(GeRU5(G=MR7&%%&J(&';(?NMRF$-&XA((M*'&99.J(I$(3#$;(&'(!?Rh6B!(
-"(/0&,&/-$,*'$(;*CC$,$'/$#(*'(7$'$(-,&'#/,*2-*"'("C(-I"(&;;*-*"'&9(%"9$/39$#a(BM1R&(&';(!8=[eA"
"
@)8&4/8"
D3,(*'*-*&9(;&-&("F#$,+$;(&'(*'/,$&#$(*'($&,9.(&';(9&-$(?(/$99(&/-*+&-*"'(%&,L$,#(WB@Zm(&';(B@4VX(*'(B@V[D(
?(/$99#(/"R/39-3,$;(I*-0(7*'7*+&9(",(",&9(%3/"#&9($2*-0$9*&9(/$99#(#-*%39&-$;(I*-0(!"#$%&$%'()%*(e61(/"%2&,$;(
-"(K?(?(/$99#A(6,$9*%*'&,.(;&-&(#377$#-$;(;*CC$,$'/$#(*'(2,"-$*'($:2,$##*"'(&';(7$'$(-,&'#/,*2-*"'("C(L$.(
'C9&%%&-",.(/.-"L'$#(-0&-(/"'-,*F3-$(-"(*'C9&%%&-*"'(&';(&9+$"9&,(F"'$(9"##(I$,$(&9#"("F#$,+$;(
F$-I$$'(B@V[D(&';(K?(?(/$99#A((
"
A+<.4&80+<8"
D3,(2,$9*%*'&,.($#39-#(;$%"'#-,&-$(-0&-(B@V(29&.#(&(2,"%*'$'-(,"9$(*'(2$,*";"'-&9(;*#$&#$A(?0*#(,$#$&,/0(
I*99(2,"+*;$(+&93&F9$(*'#*70-#("(,('"+$9(-,$&-%$'-#("(,2$,*";"'-*-*#J(&#(I$99(&#('"+$9(*'#*70-#(*'-"(/0,"'*/(
'C9&%%&-"'A(
((

!B$" 5 3<&34" 5 3<0?&43/0+<"-<34+=&)"- ')40+*3/)8" 5 +*?>0<)K;<6&.)6"JG-"R-I-"%)&*+<"D)8)<80/0[3/0+<"
3<6"I)>310+*34" 5)38&*)8"+,"S0/>6*3T34"

N&+*'(^"'$#<!(@&99*'(D--$#"'<!(B0,*#-*'&(1%&99<"(?&.9",(63,/$99<!#=&-0&'*$9(>*99<!(?.9$,(897$,<!(@&+*;(1&'-<!(
[.9$(]*99#A!((

-&/>+*"-,,0403/0+<8"

!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(E$;*/*'$<("],*70&%(g"3'7()'*+$,#*-.J(B"99$7$("C(e*C$(
1/*$'/$#(

9&*?+8)"

6,$+*"3#(,$#$&,/0(#377$#-#(-0&-(&229*$;(%$/0&'*/&9(#-*%39&-*"'(WE#-*%XJ(9*L$("#-$"2&-0*/(",(/0*,"2,&/-*/(
%&'3&9(%&'*239&-*"'J(%";39&-$#(#3F#-,&-$#(I0*/0(&/-*+&-$(-0$(%$#"9*%F*/(;"2&%*'$,7*/(W@8X(2&-0I&.(
F$-I$$'(-0$(+$'-,&9(-$7%$'-&9(&,$&(Wd?8X(&';('3/9$3#(&//3%F$'#(W=8/XA(K0*9$(-0*#(-,$&-%$'-(0&#(F$$'(
$:29",$;(*'(,&-#(I*-0(&9/"0"9(;2';$'/.J(*-(0&#('"-(2,$+*"3#9.(F$$'(#-3;*$;(*'(&(/"'-$:-("C("2*"*;(
I*-0;,&I&9A(K$(&*%(-"(;$-$,%*'$(I0-0,(E1-*%(-,$&-#(-0$(CC/-#("C(%",20*'$(I*-0;,&I&9(&#(
%&'*C$#-$;(F$0&+*",&99.(&';($9$/-,"20.#*"9"7*/&99.A

!L$"R)<)/0."O<+.H6+T<"+,"< ' 36K!"D) ')/>C438)"0<"A\"M4)=3<8"/+"-,,).//"E+<=)10/C(
>&,9&'(1-$+$'#A!(((

-&/>+*"-,,0403/0+<8"
!],*70&%(g"3'7( )'*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#(

9&*?+8)"
8#(",7&'*#%#(&7$J(-0$(/"'/$'-,&-*"'("C(0*#-"'$(2,"-$*'#(;$/,$&#$#(I0*/0($:2"#$#(-0$(C",%$,9.(2,"-$/-$;(
@=8(-"(7$'$-*/(*'#-&F*9*-.J(&';(&9-$,&-*"'#("//3,(*'($2*7$'$-*/(%&,L#(-0&-(/"'-,"9(-0$(/0,"%&-*'(#-&-$A(8(
,$/$'-(#-3;.(*;$'-*C*$;(Y5(2,$+*"3#9.(3'-$#-$;(/&';*;&-$(7$'$#(*'(BA($9$7&'#(W&(%";$9(",7&'*#%X(-0&-(/"39;(
&CC$/-(9"'7$+*-.A(8%"'7(-0"#$J(&(7$'$(2,$+*"3#9.(&##"/*&-$;(I*-0(@=8(,$2&*,(&';(/$99(,$2,";3/-*"'J(
;$%$-0.9&#$('%&;RU(#-&';#("3-A(K0*9$(,$/$'-(,$#$&,/0(0&#(C"3';(-0&-("-0$,(;$%$-0.9&#$#(*'(BA($9$7&'#(
%2&/-(&7'7J(=Z(%$-0.9&-*"'(,$739&-*'7(7$'$#J(#3/0(&#('%&;RUJ(0&+$('"-(F$$'($:2$,*%$'-&99.(9*'L$;(-"(
&7*'7A([''"/L*'7(;"I'('%&;RU($:2,$##*"'(3#*'7(!=8(*'-$,C$,$'/$(W!=8*X(*#($:2$/-$;(-"(*'/,$&#$(BA($9$7&'#(
9*C$(#2&'A(=%&;RU(0&#(&(/9"#$(%&%%%&9*&'(0"%"9"7(8e[]>HJ(#"(,$#$&,/0(F&#$;("'(BA($9$7&'#(;$%$-0.9&#$(
/"39;(9&-$,(F$(3#$;(*'('"+$9(-0$,&2$3-*/(&22,"&/0$#(-"(&%$9*",&-$(&7$R,$9&-$;(0$&9-0(/";*-*"'#(*'(
03%&'#A(

5)/>+68"
?"(L'"/L(;"I'('%&;RUJ(I$(3#$;(!=8*(C$$;*'7(C",(BA($9$7&'#A(8C-$,(*#"9&-*'7(&'($:"'("C(-0$('%&;RU(7$'$(
-0,"370(6B!J(I$(9*7&-$;(*-(*'-"(&'(eHHH5(+$/-",A(?0*#(+$/-",(I&#(-0$'(-,&'#C",%$;(*'-"(0-UUV(\A(/"9*(I*-0(
G6?NR*';3/*F9$(?S(2"9.%$,&#$(&/-*+*-.A(8(2"#*-*+$(/"'-,"9(3#*'7(&'(G6?NR*';3/*F9$(N?6(%&,L$,(&';(&(
'$7&-*+$(/"'-,"9(&,$(&9#"(3#$;A()#*'7(I-(I",%#J(I$(I*99(2*/L(Y5(eH(I",%#("'-"(&('$I(29&-$(&';(C$$;(-0$%(
I*-0(F&/-$,*&($:2,$##*'7(;#!=8(-"(*'0*F*-('%&;RU(-,&'#9&-*"'A(K$(I*99(-,&'#C$,(-0$(I",%#($+$,.(-0,$$(;&.#(
&';(/"3'-(0"I(%&'.(I",%#(&,$(&9*+$($&/0(;&.A(

@)8&4/8"
=8(

A+<.4&80+<8"
=8(
((

!N$";<1)8/0=3/0+<"+,"A>3<=)8";<"-88) ' (4C"3<6"]&<./0+<"+,"/>)"9)*+P08+ ' 34"; ' ?+*/"53.>0<)*C"0<":& ' 3<"
9M^!Y"93/0)</"]0(*+(438/8"
^&L$(N,&CC<!(\#-0$,(=3F9A!((

-&/>+*"-,,0403/0+<8"
!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$(

9&*?+8)"

!Q$"9*)60./0<="5 3*H)*8"+,"2)1)*)"AVJ;DK!X"G>*+&=>"G*3<8.*0?/+ ' 0.8"-<34C808(
^$CC,$.(B9&'/.<!(],$--(6*/L$--A!((

-&/>+*"-,,0403/0+<8"
!],*70&%(g1(g132B#Tc7.6520Td("))Tj/T/T(()11(()1,-1-(0)-1(.)()11((#Tm((G5()119mF-(0)-1(.)e/T(()11F-(0G5()119,/0)-1/(0

!"#$%&'()'*+$,#*-.(!$#$&,/0(1.%2"#*3%(4544(6,"7,&%((US(f(6 & 7 $ (
(

!Ua(5)/3K-<34C808" +," G*3<8.*0?/+ ' 0." D3/38)/8" ,+*" />)" ;<1)8/0=3/0+<" +," D0,,)*)</034" MP?*)880+<" 0<"
:3</310*&8K;<,)./)6":&'3<"G088&)"
^"0'([,&2"0<!(],$--(6*/L$--A!#(

-&/>+*"-,,0403/0+<8"
!],*70&%(g"3'7()'*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#(

9&*?+8)"
D,-0"0&'-&+*,3#(*#(&(7$'3#(/"'-&*'*'7(;$&;9.('""'"-*/(+*,3#$#(-0&-(&,$(2&##$;(C,"%(,";$'-(-"(03%&'(
-0,"370(C$/$#J(3,*'$J(",(F*-$#A(B3,,$'-9.J(-0$,$(&,$('"(L'"I'(-,$&-%$'-#(C",(-0$(;*#$&#$J(&';(*-(,$%&*'#(&(
-0,$&-(&,"3';(-0$(79"F$A(>&'-&+*,3#$#(-&,7$-(03%&'($';"-0$9*&9(-*##3$(F.(F*';*'7(-"(*'-$7,*'(F$-&RYJ(
I0*/0(*#(C"3';(*'(0*70(h3&'-*-*$#("'(%"#-(03%&'($';"-0$9*&9(/$99#A(K0$'(&(/$99(*#(*'C$/-$;J(0&'-&+*,3#$#(
,$29*/&-$(I*-0"3-(/&3#*'7(/.-"2&-0*/(CC/-#(",(&2"2-"#*#(*'(-0$*,(0"#-A(G'#-$&;J(0"#-(*%%3'$(/$99#(&,$(
,$/,3*-$;(&';(&--&/L(-0$(-*##3$J(/&3#*'7(*'-$,/$993&,(_3'/-*"'#(-"(F,$&L(;"I'A(?0*#(/&3#$#($;$%&(*'(-0$(
-*##3$(&';(-0$(#.%2-"%#("C(0&'-&+*,&9(;*#$&#$#J(*'/93;*'7(0$%",,0&7*/(C$+$,(&';(;$&-0A(K$(0"2$(-"(
3'/"+$,(7$'$-*/(2&-0I&.#(-0&-(&,$(&##"/*&-$;(I*-0(*%%3'$(,$/,3*-%$'-(*'(0&'-&+*,3#(*'C$/-*"'(*'(-0$(
0"2$#("C(C*';*'7(&(-&,7$-(C",(2"-$'-*&9(-,$&-%$'-#A(

5)/>+68"
K0*9$('"-($:-$'#*+$J(-0$,$(&,$(%&'.(-,&'#/,*2-"%*/(;&-&#$-#("C(03%&'(*'C$/-*"'(I*-0(0&'-&+*,3#(&+&*9&F9$(
-0,"370(23F9*/(#$,+$,#A(].(2,"/$##*'7(-0$#$(;&-&#$-#(-"7-0,(3#*'7(-0$(;&-&(2*2$9*'$(8!ED!J(I$(/&'(#$$(
2&--$,'#("C(*'C$/-*"'(-0&-(&,$("'9.("F+*"3#(*'(&(%$-&R&'&9.#*#A(E"#-(#2$/*C*/&99.J(I$(/&'(#$$(0"I(
;*CC$,$'-*&9($:2,$##*"'("//3,#(F.(/$99(-.2$(&';(#&%29$(-.2$(W*'(+*+"(",(*'(+*-,"X(&';(#$$(0"I(-0$(*%%3'$(
,$#2"'#$(*#(&CC$/-$;A(G'(&;;*-*"'J(F.(2$,C",%*'7(&(2&-0I&.($',*/0%$'-(&'&9.#*#("C(-0$(;*CC$,$'-*&99.(
$:2,$##$;(7$'$#J(I$(/&'(*;$'-*C.(/93#-$,#("C(7$'$#(-0&-(0&+$(F$$'(2$,-3,F$;J(&#(I$99(&#(-&,7$-#(C",(;,37(
-,$&-%$'-A(

@)8&4/8"
1"%$($%$,7$'-(2&--$,'#(/&'(F$(#$$'(-0&-(/&'(F$(*'-$,2,$-$;(-"(F$(3'*+$,#&9(&%"'7(&99(0&'-&+*,3#(#2$/*$#J(
&#(I$99(&#(;*CC$,$'-*&9($:2,$##*"'(2&--$,'#(3'*h3$(-"(*'(+*+"(#-3;*$#(-0&-(&,$('"-(2,$#$'-(*'(+*-,"(#-3;*$#A(
?0$#$(*%2&/-$;(2&-0I&.#(,$9&-$(-"(-0$(-.2*/&9(*''&-$(*%%3'$(,$#2"'#$(-"(+*,&9(*'C$/-*"'A(
"
A+<.4&80+<8"
K0*9$(-0$(2&-0I&.#(*';*/&-$;(*'(-0$(#-3;.(&,$(*'-$,$#-*'7J(-0$(;*CC$,$'-*&9($:2,$##*"'(/0&'7$#(F$-I$$'(
/$99(&';(+*,3#(-.2$J(&#(I$99(&#(&'.(2"-$'-*&9(-0$,&2*$#J(#-*99('$$;(-"(F$(+&9*;&-$;(*'(+*-,"A(?0*#(#-3;.(%&.(
2,"+$(-"(F$(3#$C39(-"(-0"#$(#$$L*'7(-"(3#$($:*#-*'7(%$;*/&-*"'#(-"(-,$&-(0&'-&+*,3#(*'C$/-*"'J(F3-(-0$(#-3;.(
'$$;#(C3,-0$,(#3229$%$'-&-*"'(I*-0(&;;*-*"'&9(#-3;*$#(&#(-0$.(F$/"%$(&+&*9&F9$A(
((

!X$"R4&/3 ' 0<)"38"3<"-.)/C4KEC80<)"5 0 ' 0."0<"%&.4)+8+ ')"9+80/0+<0<="2/&60)8(
E*/0&$9(E&' '<!(((

-&/>+*"-,,0403/0+<8"
!],*70&%(g"3'7( ) '*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#(

9&*?+8)"
=3/9$"#"%$(2"#*-*" '*'7J(",(-0$(29&/$%$'-("C('3/9$"#"%$#(&9" '7(@=8J(*#(L' " I '(-"(F$(&(#*7'*C*/&'-(C&/-",(
'(;$-$,%'*'7(7$'$($:2,$##*" '(*'($3L&,."-*/(/$99#A(M3,-0$,J(2"#-R-,&'#9&-*" '&9(%";*C*/&-*" '#(W",(6?E#X(
0$92(%";39&-$(7$'$($:2,$##*" '(F.(&/-*'7(&#(&'(*'-$,%$;*&-$(-"("-0$,(C&/-",#A(?0$($:-$'-(-"(I 0*/0(6?E#(
;*,$/-9.(&CC$/-('3/9$"#"%$(2"#*-*" '*'7(*#(2"",9.(3';$,#-"";J(0" I $+$,A(1*'/$(7$'$($:2,$##*" '(*#(L' " I '(-"(
F$(&CC$/-$;(F.(#$+$,&9(/"*'/*;$'-(6?E#(" '($&/0(0*#-" '$J(-0$(7"&9("C(-0*#(,$#$&,/0(*#(-"($+&93&-$(-0$(
#3*-&F*9*-."C(&(e.#RRvN9'(%3-&-*" '(&#(&(#3F#-*-3-$(C",(0*#-" '$(9.#*'$(&/$-.9&-*" 'A(GC(#3//$##C39J(-0*#(,$#$&,/0(
/&'(F$(3#$;(-"(#322",-(C3-3,$(/"%F*'&-",*&9(#-3;*$#(" '(6?E#(&';('3/9$"#"%$(2"#*-*" '*'7(I *-0"3-(-0$(
;*CC*/39-."C(/"%F*'*'7(#$+$,&9(C",%#("C(6?E#(#*%39-&'$"3#9.A(

5)/>+68"
D3,(2,"/$;3,$(I *99(0&+$(-0,$$(%&*'(2&,-#a(WUX("F-&*'*'7(2,"-$*'($:2,$##*" '(29&#%*;#(I *-0(-0$(2,"2$,(>Y(
9.#*'$Rv793-&%*'$(&';(&/$-.9R9.#*'$(%3-&-*" '#J(W4X(-,&'#C",%*'7(\A(/"9*(]e4U(F&/-$,*&(-"($:2,$##(-0$(K*9;(
-.2$(>Y(W>YK?X(2,"-$*'#(&';(F"-0(-0$(%3-&'-#J(&';(WYX(*#"9&-*'7($&/0("C(-0$(-0,$$(;$#*,$;(2,"-$*'#(C,"%(
-0$(F&/-$,*&(&';(2$,C",%*'7(-0$(/"%2&,&-*+$('3/9$"#"%$(2"#*-*" '*'7(-$#-A(K$i99(2$,C",%(&(1*-$R@*,$/-$;(
E3-&7$'$#*#(6B!(%3-&-*" '(2,"-"/"9(" '(-0$(>YK?(29&#%*;(-"(,$29&/$(-0$(/";" '#(C",(C*+$(-&,7$-(9.#*'$(
,$#*;3$#(I *-0($*-0$,(&%F$,(#-"2(/";" '#(W)8NX(",(793-&%*'$(/";" '#(W8)BXA(8C-$,(-,&'#C",%*'7(@>Vw(\A(
B"9*(-"("F-&*'($'"370(/"2*$#("C(-0$('$I 9.(%3-&-$;(29&#%*;#J(I $(I *99(-,&'#C",%(\A(B"9*(]e4UJ(&(2,"-$*'R
$:2,$##*'7(#-,&*'J(I *-0(F"-0(%3-&'-(29&#%*;#(&#(I $99(&#(-0$(>YK?A(8C-$,(-$#-*'7(2,"2$,(2,"-$*'(2,";3/-*" '(
C,"%("3,(F&/-$,*&9(/"9" '*$#J(I $(I *99(*#"9&-$(-0$(-0,$$(;$#*,$;(+&,*&'-#("C(-0$(>Y(2,"-$*'(3#*'7(/"93%'(
/0,"%&-"7,&20.(&';(2,$2&,$(C",(-0$(/"%2&,&-*+$(2"#*-*" '*'7(-$#-A(G'($&/0("C("3,(-0,$$(-,*&9#J(I $(I *99(
&##$%F9$(0*#-" '$(2,"-$*'(/"%29$:$#(W$&/0(I *-0(-0$(/",,$#2" ';*'7(>Y(+&,*&'-X(&';(23-(-0$%(*'(#"93-*" '(
I *-0('&L$;(@=8J(&99" I ('3/9$"#"%$#(-"(C",%J(-0$'(2$,C",%(E=&#$(;*7$#-*" 'J(*#"9&-*" '("C(-0$('3/9$"#"%$(
/",$J(&';(0*70R

#Y$"9)*0+6+</0/08"3<6";<.*)38)6"A+=<0/01)"D).40<)"0<"-4[>)0 ')*_8"D08)38)"
="%*L"#([9" '&,*#<!(B9&3;*&(M,$*-&#<"(^"#3$(N"' '&9$'A%(

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(N,&;3&-$(1-3;*$#<("!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$<(
%],*70&%(g"3'7()'*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#A(

9&*?+8)"
6$,*";"'-&9(;*#$&#$(W6@XJ(&(/0,"'*/(*'C9&%%&-",.(;*#$&#$("C(-0$(73%#(*#(/0&,&/-$,*'$;(F.(2$,*";"'-&9(
2"/L$-(C",%&-*"'(&';(F"'$(,$#",2-*"'A(6$,*";"'-*-*#(0&#(F$$'(&9#"(&##"/*&-$;(I*-0(-0$("'#$-("C(
89'0$*%$,i#(;*#$&#$(W8@XJ(I0*/0(*#(-0$(9$&;*'7(/&3#$("C('$3,"/"7'*-*+$(;*#",;$,A(8@(&CC$/-#(%",$(-0&'(Z(
%*99*"'(8%$,*/&'#("C(&99(&7$#(&//",;*'7(-"(-0$(89'0$*%$,i#(;*#$&#$(&##"/*&-*"'A(8#(F"-0("C(-0$#$(;*#$&#$#(
&,$(/0&,&/-$,*'$;(F.(*'C9&%%&-*"'J(-0$(23,2"#$("C(-0*#(I",L(*#(-"($+&93&-$(/3,,$'-(9*-$,&-3,$(#0"I*'7(-0$(
&##"/*&-*"'(F$-I$$'(6@(&';(8@A(E",$(#2$/*C*/&99.J(0"I(2$,*";"'-*-*#(#.#-$%*/(*'C9&%%&-*"'(%&.("'#$-(
8@A((
"
5)/>+68"
M*,#-J(I$(#$&,/0$;(63FE$;J(E\@eG=\J(1/"23#J(K$F("C(1/*$'/$J(&';(N""79$(#$&,/0($+&93&-*'7(-0$(%"#-(
,$/$'-(2$$,R,$+*$I(9*-$,&-3,$("'(2$,*";"'-*-*#J(*'C9&%%&-*"'J(&';(8@A(1$/"';J(I$(2,"2"#$(&(2"##*F9$(

#!$(I4+.H0<="AGE-K

##$";</)*3./0+<8"+,"9+/)</034" -660./0+<"9>3* ' 3.+/>)*3?0)8"3<6"2&(8/3<.)8"+," -(&8)"T0/>"/>)"OAA#"
A>3<<)4(

!3-0(>3'-$,<!([.9$(6,*%&+$,&<!(8';,$I(6&.'$A!((

-&/>+*"-,,0403/0+<8"

!="",;&(B"99$7$("C(D#-$"2&-0*/J(]*"%$;*/&9(1/*$'/$#(

9&*?+8)"

8#(&;;*/-*"'(0&#(F$/"%$(%",$(2,$+&9$'-(*'(-0$()'*-$;(1-&-$#J(I*-0()-&0(F$*'7("'$("C(-0$(9$&;*'7(#-&-$#(
'("2"*;(&;;*/-*"'J(F$--$,(-,$&-%$'-#(C",(#3F#-&'/$(3#$(;*#",;$,#(W1)@#X(&,$('$$;$;A(M",($:&%29$J(
%2,"+$;(%$&'#("C(;$/,$&#'7(-0$(#.%2-"%#("C(I*-0;,&I&9(C,"%(/0,"'*/(&9/"0"9($:2"#3,$(/"39;(F$(
*'+&93&F9$A(?0$(2"-&##*3%(/09",*;$(/"-,&'#2",-$,(4(W[BB4X(0&#(2,$+*"3#9.(F$$'(#0"I'(-"(F$(*%29*/&-$;(*'(
1)@#(,$9&-$;(-"(&9/"0"9J('*/"-*'$J(&';(/"/&*'$A(8/-*+&-*'7([BB4(0&#(F$$'(#0"I'(-"('",%&9*'$(#-,$##R
';3/$;(&9/"0"9(/"'#3%2-*"'(*'(,&-#A(M3,-0$,%",$J(I$(0.2"-0$#*'$(-0&-(-0$(;"I',$739&-"'("C([BB4(
%$;*&-$#(#"%$("C(-0$(#.%2-"%#("C(&9/"0"9(I*-0;,&I&9A(G'(#2*-$("C(-0$(/9*'*/&9(2"-$'-*&9("C(-0*#(2,"-$*'J(
-0$,$(*#('"(;*,$/-(&7"'*#-("C([BB4J(&';(-0$,$(&,$(2,"F9$%#(I*-0(-0$(*';*,$/-(&7"'*#-#(-0&-($:*#-A((?0$(
2,$#$'-(I",L(C"/3#$#("'(-0$(%";$9*'7("C([BB4(-"(*;$'-*C.(2"-$'-*&9(;*,$/-(F*';*'7(#*-$#(&#(I$99(&#(%";$9*'7(
"C("-0$,(2,"-$*'#(-"(*;$'-*C.(*%2,"+$;(*';*,$/-(&7"'*#-#A(?0$(;$+$9"2%$'-("C(&(;*,$/-(&7"'*#-(C",([BB4(
/"39;(9$&;(-"(*%2,"+$;(&;;*/-*"'(-,$&-%$'-(I*-0(C$I(#*;$(CC/-#A(

5)/>+68"

)-*9*'*'7(83-";"/(*'(e*'3:(&';(&(2,$+*"3#9.($#-&F9*#0$;(/,.#-&9(#-,3/-3,$J(-0$([BB4(/0&''$9(I*99(F$(
%";9;A(13F#-&'/$#("C(&F3#$(#3/0(&#(&9/"0"9(&';(2"-$'-*&9(20&,%&/"-0$,&2*$#(I*99(&9#"(F$(%";9;(*'(
83-";"/A()#*'7(#"C-I&,$(#3/0(&#(N!DE8B1J(-0$#$(#3F#-&'/$#(I*99(F$(&3;*-*"'$;(&7&*'#-(-0$(2,"-$*'(-"(
,$+$&9(2"-$'-*&9(*'-$,&/-*"'#A(].(&'&9.'*'7(I0$,$(-0$(%"9$/39$#(&//3%39&-$J(*'-$,&/-(&';(F*';(I$(I*99(
;$'-*C.(2"-$'-&9(20&,%&/"97*/&9(F*';*'7(#*-$#A(87$'-#(-0&-($:0*F*-(0*70(&CC*'*-.(C",(-0$(2,"-$*'(/&'(-0$'(
F$(&##&.$;(C",(20.#*"9"7*/&9(&/-*+&-*"'(",(;$&/-*+&-*"'("C(-0$(2,"-$*'(*'(&(C3-3,$(#-3;.A(

@)8&4/8"

=8(

A+<.4&80+<8"

=8(

((

#L$" 5)/3K3<34C808" +," GT+" @%-8) ‘ " D3/38)/8" /+" D)/)* ’ 0<)" D03=<+8/0." I0+ ’ 3*H)*8" 3<6" D*&=" /3*=)/" A3<60063/)8",+*"9)*0+6+</0/08"

B&,9"#(E",$’"<!<([A(1/"--(K$F$,<!(],$--(\A(6*/L$--<!(\9*‘&F$-0(].F$$<!(B9&3;*&(EA(?99‘(M,$*-&#A"(

-&/>+*"-,,0403/0+<8"

!],*70&%(g"3’7()’*+$,#*-.J(B"99$7$("C(e*C$(1/*$’/$#<(("!"#$%&"(

#Na(;6)</0,0.3/0+<"+,";<>0(0/+*8"+,"R2OKB"I)/3",*+ ' "%3/&*34"9*+6&./8(
d*'/$'-(8'$99&<!(?.9$,(!"#$A!((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(60&,%&/.(

9&*?+8)"
B3,,$'-9.J(-0$,$(&,$("'9.(&(#%&99('3%F$,("C(;,37#(&+&*9&F9$(-"(-,$&-(89'0$*%$,y#(;*#$&#$A(>"I$+$,J(-0$#$(
;,37#(;"('"-(/3,$J(,$+$,#$J(",(#-"2(-0$(;*#$&#$(C,"%(2,"7,$##*'7A(?0$.(&99(I",L(F.(&(#*%*9&,(%$/0&'*#%("C(
&/-*"'(F.(*'0*F*-*'7(&/$-.9/0"9*'$#-$,&#$(-"(F""#-(-0$(&%"3'-("C(&/$-.9/0"9*'$(*'(-0$(#.#-$%A(?0*#("'9.(
%";$,&-$9.(0$92#(%&*'-&*'(-0$(C3'/-*"'("C(-0$('$3,"'#(F3-(;"$#('"-(#-"2('$3,"'&9(;$&-0A(G'(-0$",.J(
*'0*F*-*"'("C(-0$($'.%$(N1[RY(I*99(#-"2(-0$('$3,"-":*/(-&'79$#(-0&-(&,$(/&3#*'7(-0$(/0"9*'$,7*/('$3,"'(
;$&-0A(?0*#(#0"39;(0$92(-"(#9"I(",($+$'(#-"2(-0$(2,"7,$##*"'("C(-0$(;*#$&#$A(?0$(2,"_$/-(I*99(0$92(*;$'-*C.(
0$,F&9(/"%2"3';#(-0&-(/"39;(2"##*F9.(F$(3#$;(*'(-0$(2,$+$'-*"'(",(-,$&-%$'-("C(89'0$*%$,y#(;*#$&#$(

5)/>+68"
8'(:R,&.(/,.#-&9(#-,3/-3,$("C(03%&'(N1[Y(2,"-$*'(I*99(F$(;"I'9"&;$;(C,"%(-0$(!B1](6,"-$*'(@&-&(]&'L(
WO--2#abb(III A,/#FA",7bX(&';(3#$;(*'(&(/"%23-$,RF&#$;(#/,$$'("C(/0$%*/&9(#-,3/-3,$#(;$,*+$;(C,"%(29&'-(
#"3,/$#A(>$,F#(I*99(F$(*;$'-*C*$;(-0&-(/"'-&*'(/"%2"3';#(-0&-(F*';(-0$(N1[Y(&/-*+$(#*-$(*'(-0$(/"%23-$,(
%";$9A(G;$'-*C*$;(0$,F#(I*99(F$(23,/0&#$;(&';($:-,&/-$;(*'(0"-(#"9+$'-#("C(+&,*"3#(2"9&,*-*$#J(*'/93;*'7(
I&-$,J(&9/"0"9J($-0.9(&/$-&-$J(&';b",(0$2-&'$A(\:-,&/-(#"93-*"'#(I*99(F$(C*9-$,$;(-"(,$%"+$(2&,-*/39&-$(
%&--$,A(\:-,&/-#(I*99(F$(-$#-$;(C",(-0$*,(&F*9*-.(-"(*'0*F*-(03%&'J(,$/"%F*'&'-(N1[Y($'.%$(23,/0&#$;(
C,"%(]61(]*"#/*$'/$A(N1[Y(L*'&#$(&/-*+*-.(I*99(F$(%"'*-",$;(3#*'7([*'&#$RN9"z(,$&7$'-(C,"%(6,"%$7&A(
?0*#(,$&7$'-(I",L#(F.(2,";3/*'7(93%*'$#/$'/$(*'(,$#2"'#$(-"(-0$(&%"3'-("C(8?6(*'(-0$(&##&.(#"93-*"'A(
e$##(8?6(2,";3/$#(9$##(93%*'$#/$'/$(&';(%",$(8?6(2,";3/$#(%",$(93%*'$#/$'/$A(8'.(*'0*F*-*"'(#0"39;(

"
"
"
"
"
"
"
"
"
"
"
"
"
"
"

. /$) $%"/&

* +#, -"%,#"

"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"
"

#U$"-??*+?*03/)"78)"+,"I+<)"9*+/).//01)"-=)</8"0<":+* ' +<)K2)<80/01)"9*+8/3/)"A3<.)*"
@&'*99(N3';,3%<!(@&+*;(N*99<"(899*#"'(1'"L$<"([$9#$.(],"I'A"((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(60&,%&/.<("G'-$,%"3'-&*'(>$&9-0/&,$J(G'-$,%"3'-&*'(E$;*/&9(D'/"9"7.(

9&*?+8)"
]"'$(2,"-$/-*+$(&7$'-#(W]68#X(0&+$(&'($#-&F9*#0$;(,"9$(*'(-0$(-,$&-%$'-("C(%$-&#-&-*/(/&#-,&-*"'(,$#*#-&'-(
2,"#-&-$(/&'/$,(W%B!6BXA(I"9$;,"'*/(&/*;(&';(;$'"#3%&F(0&+$(F$$'(#0"I'(-"(0&+$(#*%*9&,9.(*%2,"+$(
2,"7,$##*"'(C,$$(#3,+*+&9(W6M1XJ("+$,&99(#3,+*+&9(WD1XJ(&';(,&-$#("C(#L$9$-&9(,$9&-$;(&;+$,#$($+$'-#(W1!\#X(*'(
%$'(I*-0(2,"#-&-$(/&'/$

#W$"A+ ' ?3*0<="/>)"M,,0.3.C"+,"2+60& ' "]4&+*06)"3<6"2041)*"D03 ' 0<)"]4&+*06)"0<"-**)8/0<="A3*0)8"/>*+&=>"
2/3/08/0.34"-<34C808\"
\9&'&(M$,,*#!(((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(N,&;3&-$(1-3;*$#(

9&*?+8)"
@$'-&9(/&,*$#(*#(&(/"%%"'(;*#$&#$(*'(/0*9;,$'<(-0$,$C",$J(*-(*#(*%2",-&'-(-"(;$-$,%*'$($CC$/-*+$(-,$&-%$'-(
&22,"&/0$#(-0&-(&,$(%&'&7$&F9$(C",(2$;*&-,*/(2&-*$'-#A(

5)/>+68"
?I"(*';*+*;3&9(,&';"%*'$;(/"'-,"99$;(-,*&9#(I$,$(#-3;*$;(&';(#-&-*#-*/&99.(&'&9.'$;A(?0$(-"-&9('3%F$,("C(
,$/,3*-$;(2&-*$'-#(I&#(SHZ(I*-0(&(%$&'(&7$("C(YAS(.$&,#A(G'(-0$(C*,#-(,&';"%*'$;(/"'-,"99$;(-,*&9(W!B?XJ(
,$#$&,/0$,#(C"/3#$;("'(/&,*"3#(9$#*"'#("C(322$,(&'-$,*",(2,*%&,.(-$$-0("'9.A(?0*#(#-3;.(/"%2&,$;(-0,$$(
-,$&-%$'-#a(29&/$F"(W

BYa(

B!$" M,,).//01)<)88" +," />)" 5 3/*0P" 5 +6)4" 0<" G*)3/0<=" 2&(8/3<.)" 78)" D08+*6)*8" 38" 3"]&<./0+<" +," />)" 2&(8/3<.)8"-(&8)6(

D;$--$(>"%#*<!(1$$%&(8,#0$;<!(8';,$I(6&.'$A!#(

-&/>+*"-,,0403/0+<8"

!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(]*"%$;*/&9(1/*$'/$#(

9&*?+8)"

@,37("+$,;"#$#(&,$(-0$('3%F$,("'$(/&3#$("C(*'_3,.R,$9&-$;(;$&-0#(*'(-0$()'*-$;(1-&-$#A(8;;*-*"'&99.J(
#3F#-&'/$(3#$(;*#",;$,#(W1)@#X(&,$('"-",*"3#9.(;*CC*/39-(-"(-,$&-J(%&L*'7(-0$%(&(2,"F9$%("C(/,*-*/&9(
%2",-&'/$A(G'(#2*-$("C(-0$(;*CC*/39-.(*'(-,$&-'7(1)@#J(&;+&'/$#(0&+$(F$$'(%&;$A(6,$+*"3#(,$#$&,/0(0&#(
#0"I'(-0&-(-0$(E&-,*:(E";$9(/&'(*%2,"+$(-,$&-%$'-("3-/"%$#(*'(2&-*$'-#(I0"(&F3#$(#-*%39&'-#(&';(
"-0$,(;,37#("C(&F3#$A(>"I$+$,J(&;;*-*"'&9(I",L(*#('$$;$;(-"(;$-$,%*'$(-0$("2-*%&9(/"%F*'&-*"'("C(
-,$&-%$'-(%";&9*-*$#(I*-0*'(-0$(E&-,*:(E";$9A(?0$("F_$/-*+$("C(-0*#(2,"#2$/-*+$(#-3;.(*#(-"(&'&9.'$(-0$(
CC/-*+$'$##("C(-0$(E&-,*:(E";$9("'(2&-*$'-#(I*-0(1)@#(&#(&(C3'/-*"'("C(-0$(#3F#-&'/$W#X(&F3#$;A(K$(
0.2"-0$#*'$(-0&-(-0$(E&-,*:(E";$9(I*99(2,"+$($h3&99.(CC/-*+$(C",(2&-*$'-#(I0"(&F3#$(;*CC$,$'-(
#3F#-&'/$#A(?0*#(#-3;.(I*99(F,*'7(&I&,$'$##(-"(0$&9-0(",7&'*'&-*"'#(&';(/9*'*/*&'#(/&,*'7(C",(*';*+*;3&9#(
I*-0(1)@#(&F"3-(;$+$9"2*'7(F$--$,(#-,&-$7*$#(*'(2,$+$'-*"'(&';(%&'&7$%$'-("C(1)@#A(

5)/>+68"

@&-&(I*99(F$(/"99$/-$;(C,"%(+&,*"3#(&;;*/-*"'(C&/*9*-*$#J(*'/93;*'7(#"%$(-0&-(*%29$%$'-(&(C",%("C(-0$(E&-,*:(
E";$9A(?0$(CC/-*+$'$##("C(-0$#$(-,$&-%$'-#(I*99(-0$'(F$(&'&9.'$;(&#(&(C3'/-*"'("C(-0$(#3F#-&'/$W#X(
&F3#$;J(-0$(#2$/*C*/(-,$&-%$'-(%"T(&-%)1(=(*)-1(/()-922(&')-1(-)-1(())1(()-92(#2$)1(/*)-1(C)-1(*)-1(/(2'(C)-1(*)-)-2(0

B#a(M134&3/0+<"+,":)?3/0/08"I"2.*))<0<=",+*"93/0)</8"@).)010<="2C8/) ’0."-</0.3<.)*"G>)*3?C(
6&39(?"<

BB$"2&..)88,&44C"@)6&.0<="2)1)*)"-8/> ' 3"MP3.)*(3/0+<8"3<6"; ' ?*+10<="-8/> ' 3"A+</*+4"0<"3"9*3= ' 3/0."
2/&6C" +," -,*0.3<" - ')*0.3<aI43.H" b--aIc" 3<6" :08?3<0.aE3/0<P" b:aEc" -6&4/8" T0/>" 5+6)*3/)K2)1)*)"
-8/> ' 3"b9@M9-@Mc(
8$:(B"9"'<!(\9*"-(C#,&$9<"(^3&'(B&,9"#(B&,;$-<(%^$' '*C$,(B&,,"99<&(K*9#"'(6&#$<(&8' '$(M309F,*77$<&(e*9*'(10$<'(
=&'/.(E&0$,<"(]&,F&,&(g&I '<(6&39*'&(8,*&#<"(^&/h3$9*'$(!";,*73$'A"(

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(60&,%&/.<("],*70&%(&';(K"%$'i#(>"#2*-&9J(>&,+&,;(E$;*/&9(1/0""9J(
1/0""9("C(E$;*/*'$<(%)'*+$,#*-.("C(1"3-0(M9",*;&J(E",#&'*(B"99$7$("C(E$;*/*'$<(&)'*+$,#*-.("C(B"9",&;"J(
@$2&,-%$'-("C(M&%*9.(E$;*/*'$<('@3L$()'*+$,#*-.J(1/0""9("C(E$;*/*'$<(()'*+$,#*-.("C(E*''$#"-&J(1/0""9(
"C(E$;*/*'$(

BL$"" - ??) 3*3<.)"+,"@) 3. /01)" : C?+=4C.) ' 03"0<"V/>)*T08)" :)34/>C"93/0)</8" T0/>"G*) 3/ ')</K@) 808/3</"
5 0=*30<)(

K . &--(E&7"CC*'<!(B&9$F(E / [$$<!(82&, '&(=&*L<!(e$'&(@*6,*'*-"<!(6&39"([$99.<!(@&+*;(1&'-<!(^"0'([,*&L<!([.9$(
]*99#A!((

-&/>+*"-,,0403/0+<8"

!?0$(="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(E$;*/*'$(

9&*?+8)"

E*7,&*'$(*#(-0$(%"#-(/"%%"'('$3,"9"7*/&9(;*#",;$,(*'(-0$(I ",9;A(G-(*#(&(%39-*#.#-$%*/J(%39-*/&3#&9(
/"';*-*"'(/0&,&/-$,*'$;(F.(*'/,$&#$;('$3,"'&9(&/-*+*-.(*'(+&,*"3#(F,&*'(,$7*"'#(*'/93;*'7(-0$(0.2"-0&9&%3#(
&';(-,*7$%*'&9('$,+$(/"%29$:A(!$&/-*+$(0.2"79./$%*&(0&#('"-(F$$'(2,$+*"3#9.(/0&,&/-$,*'$;(&#(&(
;*&7'"#-*/&99.(",(-0$,&2$3-*/&99.(,9+&'-(&'/*99&,.(-"(/0,"'*C*$;(%*7,&*'$A((6,$+*"3#(,$2",-#(0&+$(*';*/&-$;(
&'(&##"/*&-*"'(F$- I $$'(%*7,&*'$(&';(,$;3/$;(*'#39*'(#$'#*-*+*-.(9$&;*'7(-"(*'/,$&#$;(&+$,&7$(F9"";(
793/"#$(9$+$9#A((8%"'7(-0$(2"##*F9$($:29&'&-*"'#J(&,$(-0$(/"''$/-*"'#(F$- I $$'(-0$(+$'-,"%$;*&9('3/9$3#(
"C(-0$(0.2"-0&9&%3#J(%*7,&*'$#J(&';(79 3/"#$(,$73 9&-*"'A((?0*#(/&#$(#$,*$#(2,$#$'-#(C"3,(/0,"'*/(%*7,&*'$(
2&-*$'-#(I *-0(/"R"//3,,*'7(,$&/-*+$(0.2"79./$%*&(

5)/>+68"

0,1(-#&

*+#,-"%,#

BN$"9+/)</034"

BQ$" : +8?0/340[ ) 6"93/0) </8"78) "+,";<>34) *8$" - 88) 88 ') </"+,"S38/) 6"D+8) 8(
1&%&.&(B,*#-*'&<!(1&+&' '&0(M9",$#A"((

-&/>+*"-,,0403/0+<8"
!G'-$,%"3'-&*'(>$&9-0/&,$J(B"99$7$("C(60&,%&/.(

9&*?+8)"
?0$(23,2"#$(I&#(-"(*'+$#-*7&-$(-0$(&%"3'-("C(I&#-$(C,"%(,$-3,'$;(%$-$,$;R;"#$(*'0&9$,#(WE@GX(&';(;,.R
2"I;$,(*'0&9$,#(W@6GX(-0&-(&//3%39&-$;(&-()-&0(d&99$.(G'-$,%"3'-&*'(>"#2*-&9(W) d>X(;3,*'7(&(C*+$R%"'-0(
2$,*";(-"($+&93&-$(-0$(%"'-09.(&';(.$&,9.(I&#-&7$(/"#-#A(

5)/>+68"
?0*#(*#(&(,$-,"#2$/-*+$(/0&,-(,$+*$I(-0&-($#-*%&-$;(0"#2*-&9(/"#-#(C,"%(E@G(&';(@6G(I&#-$;(;"#$#A(@&-&(
I&#(/"99$/-$;(C,"%(&(#$/3,$(0"#2*-&9(;&-&F&#$(F.(#-3;.(*'+$#-*7&-",#A(822,":*%&-$9.(455(*'0&9$,#(I$,$(
'/93;$;(*'(-0*#(#-3;.A(?0:*%/"#-#("'I(-$#A(8A(I&76+6-1..1(,)1(#)1(A(8)2&76+6-1.MA()-61(F1(,)1(#3(:)1(%,)1(.)2(()-

BU$"7/040[3/0+<"V,"5)60KA34"D)</34"I)<),0/8(
]$&-,*/$(]&3-*#-&<!(^3'7I$"'(6&,L<!(8%*,(E"0&_$,*<!(

!"#$%&'() '*+$,#*-.(!$#$&,/0(1.%2"#*3%(4544(6,"7,&%((((((

BW$" 5) 603" 5 3*H) /0<="+,"MKA0=3*) / /) 8$"A3440<="D) </34"M6&.3/0+<"0<" - ./0+<(

]$'(!&.%"';<!(^3'7 I $"'(6&,L<!(B0&#$(>&,;.<!(8';,$ I (12$'/$,<!(B9&,*##&(N"0<!(E&,-*'(e*2#L.<!(^"#$20(

B0$$+$,<!(!.&'(E"CC&-<!(M,&'L(e*/&,*<!(E&'(>3'7A!((

-&/>+*"-,,0403/0+<8"

! !"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"

].(*%29$%$'-*'7(%&'.(%&,L$-*'7(-&/-*/#(-"(*'/,$&#$(2,";3/-(2"239&,*-.J(-0$(%&'3C&/-3,$,#("C($R

/*7&,$--$#(&,$(9*L$9.(2,"%"-*'7(0&,%(-"("3,(."3-0A(>$,$J(I $(#-3;.(0"I (&;"9$#/$'-#(2$,/$*+$(0&,%("C($R

/*7&,$--$(3#$(&';(C*+$(-.2$#("C(&;+$,-*#*'7($:2"#3,$#a(#"/*&9(%$;*&J(,&;*"J(F*99F"&,;J('$ I #2&2$,J(&';(

-9+*#*"'A(

5)/>+68"

?0$(6"239&-*"'(8##$##%$'-("C(?"F&//"(&';(>$&9-0(#-3;.(2,"+*;$#(;&-&("'(2&,-*/*2&'-#i(L'" I 9$;7$("C(

-"F&//"(3#$J(0$&9-0("3-/"%$#J(&--*-3;$#J(&';(F$0&+*",#A(e*'$&,(,$7,$##*"'(&'&9.#*#(I &#(3#$;(-"(*'+$#-*7&-$(

-0$(,$9&-*"'#0*2(F$- I $$'(0&,%(2$,/$2-*"'(&';(,$/&99$;(+*$ I *'7("C(-0$(C*+$(%$;*&(I *-0*'(-0$(2&#-(Y5(;&.#A(

8(#$/"';&,.(&'&9.#*#($:29",$;(2,"-$/-*+$($CC$/-#("C(&'-*R-"F&//"(%$;*&(&';($'+*,"'%$'-&9(C&/-",#(#3/0(&#(

BX$"A&**)</"G*)<68"0<"/>)"2-@2KA+JK#"93<6) ' 0."D&*0<="/>)"M ')*=)<.)"+,"/>)"V ' 0.*+<"J3*03</(
]$'_&%*'(E$' '$99<!(

LY$";6)</0,C0<="I 038"0<":)34/>.3*)"3<6"A*)3/0<=";</)*1)</0+<"2/*3/)=0)8"-/"A+44)=)8"+,"5)60.0<)"3<6"+/>)*"
:)34/>.3*)"9*+,)880+<8(

B&%$," '(B0&9%$,#<!(\%%&'3$9(D.&9&F3<!# E&,*&(\A(d&'h3$'R8%&,&9A!((

-&/>+*"-,,0403/0+<8"

!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$(

9&*?+8)"

\+$'-#("+$,(-0$(9&#-(#$+$,&9(.$&,#J(0&+$(*';*/&-$;(-0&-(-0$(%$;*/&9($;3/&-*"'(/"%%3'*-.(*#('"-(*%%3'$(
-"(*##3$#("C(F*&#(&';(-0&-(*-(%&.(29&.(&'(*%2",-&'-(2&,-(*'(-0$(%*-*7&-*"'("C(-0$(/"'-*'3$;(*##3$#("C(F*&#(*'(
-0$(;$9*+$,.("C(0$&9-0/&,$(*'(-0$()'*-$;(1-&-$#A(>"I$+$,J(%",$(,$#$&,/0('$$;#(-"(F$(;"'$(,$7&,;*'7(
h3&'-*C.*'7(-0&-(F*&#(&-(&99(9$+$9#("C(%$;*/&9($;3/&-*"'(*'(",;$,(-"(/,$&-$(%*-*7&-*'7(#-,&-$7*$#(C",(#-3;$'-#J(
C&/39-.(&';(#-&CC(&-(/"99$7$#("C(%$;*/*'$(&';("-0$,(0$&9-0/&,$(2,"C$##*"'#A(

5)/>+68"

?0$(C*,#-(&*%(I *99(F$(-"(/,$&-$(&(#3F#-&'-*&9(;&-&F&#$("C(%39-*29$(2"*'-#("C(;$%"7,&20*/(*'C",%&-*"'(
,$7&,;*'7(,$#2"';$'-#(-"(#3,+$.#(&F"3-(F*&#(I 0"(&,$(*'+"9+$;(*'(%$;*/&9($;3/&-*"'A(?0$(#$/"';(&*%(*#(-"(
&'&9.'$(,$#2"'#$#(-"(#3,+$.(h3$#-*"'#(&F"3-($:2$,*$'/$("C(F*&#(&#(I $99(&#(/"%%"'9.(0$9;(F$9*$C#A(?0$(
-0*,;(&*%(*#(-"(&'&9.'$(-0$(;&-&(*'(,$9&-*"'(-"(;$%"7,&20*/#(-"(/,$&-$(-,$&-%$'-(#-,&-$7*$#(-&*9",$;(-"(
#2$/*C*/(;$%"7,&20*/#(I *-0*'(-0$(0$&9-0/&,$(/"%%3'*-.A(

@)8&4/8"

K",L(*'(6,"7,$##(

A+<.4&80+<8"

K",L(*'(6,"7,$##(

((

L!$"2&..0<0."2) ' 0346)>C6)"D)>C6*+=)<38)"D),0.0)<.C"b22-D:Dc$"Z&340/3/01)"%))68"-88)88 ')</",+*"
93/0)</8"S0/>"3"@3*)"%)&*+4+=0."D08+*6)*(
B&##&';,&(]"+$$<!(\#-0$,(=3$F$9<!$"(E"3#3%*(]"#$A%((

-&/>+*"-,,0403/0+<8"

!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(E$;*/*'$<("!"#$%&'()'*+$,#*-.J(B"99$7$("C(E$;*/*'$<((
%E"'-/9&*,(1-&-$()'*+$,#*-.J(=3-,*-*"'(&';(M""';(1-3;*$#(

9&*?+8)"

?0*#(2,"_$/-(*#(&'(M@8R73*;$;(h3&9*-&-*+$('$$;#(&##$##%$'-(C,"%(-0$(/&,$7*+$,(/"%%3'*-.("C(2&-*$'-#(I*-0(
13//*'*/(1$%*&9;$0.;$(@$0.;,"7$'&#$(@$C*/*$'/.(W118@>@XA(118@>@(*#(&(;*#",;$,(-0&-(*#(&##"/*&-$;(I*-0(
&(I*;$(+&,*$-.("C('$3,"9"7*/&9(;$C$/-#J(#$/"';&,.(-"(;C/-#(*'(N8]8(%$-&F"9*#%A(].(3';$,#-&';*'7(-0$(
'$$;#("C(&CC$/-$;(2&-*$'-#(-0,"370(-0$*,(C&%*9.(/&,$7*+$,#J(-0*#(2,"_$/-(I*99(#$,+$(&#(-0$(C*,#-(#-$2(*'(2&-*$'-R
C"/3#$;(-0$,&2$3-*/(;$+$9"2%$'-(&';($+&93&-*"'(C",(118@>@A(

5)/>+68"

?0$(h3&9*-&-*+$(;&-&(I*99(F$(/"99$/-$;(-0,"370(&(+&,*$-."C(%$-0";#J(*'/93;*'7(/&,$7*+$,(C"/3#(7,"32#(&';(
2&-*$'-(*'-$,+*$I#AJ(?0$(,$#39-#(I*99(F$(#3%%&,*'$;(&';(&'&9.'$;(3#*'7(*';3/-*+$(/"'-$'-(&'&9.#*#(
-$/0'*h3$#A(B"%%"'(-0$%$#(I*99(F$(*;$'-*C*$;J(3#*'7(I",;#(&';(20,&#$#(-0&-(/&,$7*+$,#(3#$;(-"(;$#/,*F$(
-0$*,("F#$,+&-*"'#(&';($:2$,*$'/$##A(M",(/"'-$'-(+&9*;*-.J(%39-*29$(-$/0'*h3$#(*'/93;*'7(2$$,(;$F,*$C*'7(
&';(%$%F$,(/0$/L*'7(I*99(F$(3#$;(-"($'#3,$(-0&-(-0$%$#(&,$(7$'$,&-$;(,*7","3#9.A(

@)8&4/8"

?,*&9("'7"*'7A(

A+<.4&80+<8"

K0*9$(-0$(C"/3#(7,"32#(&,$("'7"*'7J(-0$(,$#39-#("C(-0$(h3&9*-&-*+$('$$;#(&##$##%$'-(I*99(F$(,$+*I;(&';(
#3%%&,*'$;(-"(;$-$,%*'$(-0$(;$+$9"2%$'-(C",(C3-3,$(/9*'*/&9(-,*&9#(-"(-,$&-(118@>@(&';(*%2,"+$(-0$(
h3&9*-."C(9*C$(C",(2&-*$'-#(&';(-0$*,(C&%*9*$##A(
((

L#$""2/&6)</"9)*.)?/0+<8"+,"AVJ;DK!X8"M,,)./"+<"D)</34"M6&.3/0+<(
@&+*;(1-$I&,-<!(=*/"9$(>&F9*-‘$9<!(10&,"’(13<!(^3’7I$"’(d(6&,L<!(BO&#$(>&,;.<!(@*&,%*;(>&99<!(E&,-*’(
e*2#L.<!(M,&’L(e*&/&,*<!#E&’(>3’7A!((

-T21Tf6.9’11&+*-1(9)-3(*)**<A

LB$"780<="3"@).+<.0403/+*C"5+6)4"/+"A>3<=)"-//0/&6)8"G+T3*68"AVJ;DK!X(
N&F,*$99&(>3FF9$<!(E&,L(!"/LI"";<!(^",;&'(K*99*#<!(^&%*$(^$'#$'A!((

-&/>+*"-,,0403/0+<8"
!],*70&%(g"3'7()'*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#(

9&*?+8)"
?0*#(,$#$&,/0(I&#(;$#*7'$;(-"(#$$(*C(I$(I$,$(&F9$(-"(/0&'7$(3'*+$,#*-.(#-3;$'-#i(&--*-3;$#(&F"3-(BDdG@R
Um(*'(,$7&,;(-"(2,$/&3-*"'&,.(F$0&+*",#(#3/0(&#(%&#LRI$&,*'7J(#"/*&9(;*#-&'/*'7J(&';(+&//*'&-*"'#(3#*'7(&(
,$/"'/*9*&-",.(%";$9A(?0$(,$/"'/*9*&-",.(%";$9(0&#(0&;(#3//$##(*'($+"93-*"'(,$#$&,/0(&';(I$(I&'-$;(-"(
&##$##(*-#(#3//$##(0$,$A(8;;*-*"'&99.J(I$(I&'-$;(-"(-$#-(*C(#-3;$'-#i(2$,/$2-*"'("C(-0$(,$#2$/-C3'$##(&';(
,$9&-&F*9*-.("C(-0$(2,$#$'-$,(*'C93$'/$;(&(/0&'7$(*'(&--*-3;$A(

5)/>+68"
K$(/,$&-$;(#*:(;*CC$,$'-(+*;$"#(C,"%(+&,*"3#(*';*+*;3&9#(C",("3,(,$/"'/*9*&-",.(%";$9A(?0$#$(+*;$"#(

LL$"78)8"+,"V*/>+6+</03d"I*3.)8"+*"@)/30<)*8"-.*+88"D) ' +=*3?>0."R*+&?8(

N"9' "3#0(I&L$,*<!(10&," '(13<!(8%*,(E"0&_$,*<!(8#09$.(>*'L9$<!(^3'7I$" '(6&,L<!(E&'(>3'7<!#?&'*#0&(

[03,&'&A!((

-&/>+*"-,,0403/0+<8"

!!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"

6"239&-*"'RF&#$;(#-3;*$#(0&+$(C"/3#$;("'(2&-*$'-#i(,$';$,*'7(",-0";"'-*/(-,$&-%$'-(;3$(-"(-0$*,(

%&9"//93#*"'(&';(%$;*/&9('$$;#A(>"I$+$,J(-0$,$(*#(&(#/&,/*-."C(;&-&(C,"%('&-*"'&9(#"3,/$#("'(-0$(

2,$+&9$'/$("C(",-0";"'-*/(+*#*-#(&';(&##"/*&-$;(2&-*$'-(/0&,&/-$,*#-*/#A?0*#(#-3;.(9""L$;(&-(-0$(

;$%"7,&20*/(2,"C*9$(*'/93;*'7(&7$J(#$:J(,&/$J(*'/"%$(&';(%&,*-&9(#-&-3#("C(",-0";"'-*/(2&-*$'-#(-"(

$+&93&-$(C",(&'.(;$%"7,&20*/(;*CC$,$'/$#(*'(",-0";"'-*/(+*#*-#(&';(#$,+*/$#(3#$;(*'(-0$()'*-$;(1-&-$#(

5)/>+68"

?0*#(#-3;.(3#$;(;&-&(/"99$/-$;(C,"%(-0$(45Um(E$;*/&9(\:2$';*-3,$(6&'$9(13,+$.(WE\61XA(@$%"7,&20*/#(

&';(#"/*"R$/"'"%*/(/0&,&/-$,*#-*/#J($%29".%$'-J(&//$##(-"(/&,$J(#&-*#C&/-",.(9$+$9("C(0$&9-0(/&,$(&';(

0$&9-0(#-&-3#(;&-&(I$,$($:-,&/-$;(C,"%(-0$(2&,-*/*2&'-(,$#2"'#$#(-"((-0$(E\61(>"3#$0"9;(B"%2"'$'-(

W>BXA(G';2';$'-(#&%29$#(-R-$#-(&';(/0*R#h3&,$(-$#-(I$,$(3-*9*'$;(&#(&22,"2,*&-$(-"($+&93&-$(

;$%"7,&20*/(;*CC$,$'/$#("C(-0$(,$#2"';$'-#(I0"(0&;(*';*/&-$;(I0-0,(-0$.(3#$;(",(;*;('"-(3#$(

",-0";"'-*&J(F,&/$#J(",(,$-&*'$,#A(

@)8&4/8"

?0$(#&%29$(#*'$(I&#((4QJ4S5<("C(I0*/0J(YJ5YY(,$#2"';$'-#(*';*/&-$;(3#&7$("C(",-0";"'-*&J(F,&/$#(",(

,$-&*'$,#(I*-0(ZUAUc(C$%&9$#J(Z5AQc(K0*-$#(J(UmAmc(>*#2&'*/#JUUAZc((8C,*/&'(8%$,*/&'J(&';(V5AYc9$##(

-0&'(UZ(.$&,#("9;(&';(YZASc('$+$,(%&,,*$;A(?0$,$(I&#(&(#*7'*C*/&'-(;*CC$,$'/$(*'(&7$(F$- I$$'(-0"#$(I0"(

3#$;(",-0";"'-*&(W%$&'(t(UmAU4(.$&,#<(1@(t(UUAS5(.$&,#X&';(-0"#$(I0"(;*;('"-(3#$(W%$&'(t(H5AQZ(.$&,#<(

1@(t(4YAQH(.$&,#XW2u5A5VXA(?0$(;*#-,*F3-*"'#("C(#$:J(,&/$J(*'/"%$(&';(%&,*-&9(#-&-3#(F$- I$$'(-0"#$(3#$;(

LN$"M,,0.3.C"+,"J3..0<)"3<6"%3/&*344CK-.'&0*)6"-</0(+60)8"/+"2-@2KA+JK#"
^&;$'(E*';.!J(]*+&#0(8,'"9;!J(B""L(=$32&'$<!(!$:(!*229*'7$,A!((

-&/>+*"-,,0403/0+<8"
!="",;&(B"99$7$("C(D#-$"2&-0*/(E$;*/*'$J(B"99$7$("C(E$;*/*'$(

9&*?+8)"
?0$(23,2"#$("C(-0*#(#-3;.(*#(-"(WUX(&##$##(-0$($CC*/&/.("C('&-3,&99.R&/h3*,$;(&'-*F";*$#(*'(-0$(2,$+$'-*"'("C(
,$*'C$/-*"'(I*-0(-0$(18!1RB"dR4(+*,3#J(&';(W4X(-0$(,&-$("C(F,$&L-0,"370(*'C$/-*"'#(C"99"I*'7(+&//*'&-*"'(
I*-0("'$("C(-0$('$I9.R;$+$9"2$;(+&//*'$##A(((E3/0($%20&#*#(0&#(F$$'(29&/$;('&-*"'I*;$("'(-0$(/&%2&*7'(
-"(+&//*'&-$(-0$(2"239&-*"'(I*-0(-0$('$I(%!=8(+&//*'$J("#-$'#*F9.(-"(&/0*$+$(0$,;(*%%3'*-.A(>"I$+$,J(
'"-('$&,9.(&#(%3/0(*'-$,$#-(0&#(F$$'(;*#29&.$;(F.(-0$(%$;*/&9(/"%%3'*-.(*'(7$'$,&9(j(&';(2"9*/.%&L$,#(
#2$/*C*/&99.(j(*'(-0$(+&93$("C('&-3,&99.R&/h3*,$;(&'-*F";*$##A((K$(0.2"-0$#*'$(-0&-(-0$($CC*/&/.("C('&-3,&99.R
&/h3*,$;(*%%3'*-.(/"%2&,$#(C&+",&F9.(I*-0(-0$(*%%3'*-.(&/h3*,$;(C"99"I*'7(+&//*'&-*"'A(?0$,$C",$J(-"(
C3,-0$,(&##$##(-0$($CC*/&/.("C('&-3,&9(*%%3'*-.(&';(+&//*'$R*';3/$;(*%%3'*-.(I$(2,"2"#$(-"(/"99$/-(;&-&(
F.(#3,+$.(*'h3*,*'7(&C-$,(*'C",%&-*"'(,$7&,;*'7(2,*",(BDdG@(*'C$/-*"'J(+&//*'&-*"'(#-&-3#J(&';(F&#*/(
;$%"7,&20*/#A(M"99"I*'7(&'&9.#*#J(#0"39;("3,(;&-&(F$(/"'#*#-$'-(I*-0("-0$,(#-3;*$#(#0"I*'7(&(#*7'*C*/&'-9.(
,$;3/$;(,*#L("C(,$*'C$/-*"'(&';b",(#3F#$h3$'-(#$,*"3#(*99'$##J(I$(I"39;(2,"2"#$(-0&-(-0"#$(*';*+*;3&9#(
I0"(0&+$(#3,+*+$;(&(BDdG@(*'C$/-*"'(#0"39;(F$(/"'#*;$,$;(&#(C399.(*%%3'$A(

5)/>+68"
G'C",%&-*"'(&F"3-(+&//*'&-*"'(#-&-3#J(+&//*'&-*"'(;&-$#J(&#(I$99(&#(*'C$/-*"'(;&-$#(I*99(F$(7&-0$,$;(*'(
#3,+$.(C",%&-A(?0$(#3,+$.#(I*99(F$(/"';3/-$;(*'(23F9*/(#$--*'7#(*'(%39-*29$(/"'3'-*$#(*')-&0J(F"-0(+*,-3&99.(
&';(*'R2$,#"'A(?0$(h3$#-*"'#(&#L$;(I*99(7&-0$,(*'C",%&-*"'(&F"3-(*'C$/-*"'(&';(+&//*'&-*"'J(&#(I$99(&#(
&F"3-(2"-$'-*&9(/"'C"3';*'7(C&/-",#(#3/0(&#(&7$J($-0'*/*-.J(&';(#$:A(?0$(#3,+$.(0"2$#(-"(7&*'(%",$(-0&'(
UV5R455(2&,-*/*2&'-#(&';(h3$#-*"'#(I*99(F$(+&9*;&-$;(-"(&##$##(/"0$,$'/.A(((8C-$,(&/h3*#*-*"'J(;&-&(I*99(F$(
&'&9.'$;(3#*'7(9"7*#-*/(,$7,$##*"'(-"(&//"3'-(C",(/"+&,*&-$#A(D;;#(,&-*"#("C(*'C$/-*"'(,&-$#(I*99(F$(/&9/39&-$;(
F.(3#*'7(*';*+*;3&9#(-0&-(0&;('"(2,$+*"3#(*'C$/-*"'(",(BDdG@RUm(+&//*'&-*"'(&#(F&#$9*'$A(8(#$/"';(9"7*#-*/(
,$7,$##*"'(&'&9.#*#(I*99(/"%2&,$(+&//*'&-$;(*';*+*;3&9#(-"(*';*+*;3&9#(I*-0('&-3,&9(*%%3'*-.(F.(3#*'7(
+&//*'&-$;(*';*+*;3&9#(&#(F&#$9*'$A(G'C$/-*"'#(;3,*'7(-0$(;$9-&R;"%*'&'-(2$,*";(W^3'$(-0,"370(="+$%F$,(
454UX(I*99(F$(&'&9.'$;(#$2&,&-$9.(C,"%(*'C$/-*"'#(-0&-("//3,,$;(;3,*'7(-0$(D%*/,"'R;"%*'&'-(2$,*";(
W@$/$%F$,(454U(-0,"370(2,$#$'-XA(

@)8&4/8"
6$';*'7(

A+<.4&80+<8"
6$';*'7(
((

LQ$" 5 +<0/+*0<="S3/)*"]4&+*06)"0<"- ')*0.3_8"A+ ' ' &<0/C"S3/)*"2C8/) ' 8(
^"; .(B0*&'7<!(^3'7 I $"'(6&,L<!(8%*,(E"0&_$,*<!(]$&-,*/$(]&3-*#-&<!(M,&'L(e*/&,*<!(E&'(>3'7A!((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"
M93",*;&-$;(23F9*/(I&-$,(#.#-$%#(*#(&(L$.(23F9*/(0$&9-0(*'-$,+$'-*"'(-"(2,$+$'-(;$'-&9(/&,*$#(*'(-0$()'*-$;(
1-&-$#A(?"(*%2,"+$(-0$(0$&9-0("3-/"%$#("C(*';*+*;3&9#(*'(-0$('&-*"'J(&//3,&-$(%"'*-",*'7("C(C93",*;&-$;(
I&-$,(9$+$9(#0"39;(F$(&##$##$;(

LU$"; ' ?3./"V,"AVJ;D!X"+<"2/*)88d"2)4,"M8/)) ' "3<6"E0,)8/C4)"I)>310+*"- ' +<="D)</34"2/&6)</8"e"-"A*+88K
2)./0+<34"2/&6C(

e&';"'((e$;*'70&%<!(?&2&#.&(N3,3%3,-0.<!(?$,$#&(d3<U(^"#03&(M*'/0<!(8%*,(E"0&_$,*<!([&%,&'(8I&'<!(
B9&3;*&(EA(?99'(M,$*-&#<!(!$$.&(10,$#-0&A!((

-&/>+*"-,,0403/0+<8"

!!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"

?0$(23,2"#$("C(-0*#(#-3;.(I&#(-"(&'&9.'$(-0$(2$,/$*+$;(2#./0"9"7*/&9(*%2&/-("C(-0$(BDdG@Um(2&';$%*/(
&%"'7(;$'-&9(#-3;$'-#A(?0$(#-3;$'-#i(2$,/$*+$;(/0&'7$#(I$,$(&##$##$;(*'(#$9C($#-$$%J(#-,$##(&';(9*C$#-.9$(
F$0&+*",(/0&'7$#(F&#$;("'(-0$(*%2&/-("C(-0$(2&';$%*/A(

5)/>+68"

8(#$9CR;$#*7'$;J(&'"'.%"3#("'9*'$(h3$#-*"''&*,$(I&#(&;%*'*#-$,$;(-"(-0$()'*+$,#*-.(;$'-&9(#-3;$'-#A(8(
#$,*$#("C(-0$%$;(h3$#-*"'#(,$7&,;*'7(#-,$##b&':*$-.J(#$9CR$#-$$%(&';(9*C$#-.9$(F$0&+*",#(I$,$(2,$#$'-$;J(
&(-"-&9("C(UQ(h3$#-*"'#J(I*-0(#*:(h3$#-*"'#(*'($&/0(#$/-*"'A(6&,-*/*2&'-#(*'(-0$(#3,+$.(I$,$(&#L$;(I0$-0$,(
-0$.(#-,"'79.(&7,$$;J(&7,$$;J(;*#&7,$$;J(",(#-,"'79.(;*#&7,$$;(-"($&/0(h3$#-*"'J(#"(-0$(#3,+$.(I&#($'-*,$9.(
"C(&(#$9CR,$2",-*'7('&-3,$(&';(/"%29$-$9.(#3F_$/-*+$A(B0*R#h3&,$(-$#-(I&#(3#$;(C",(/"%2&,*#"'("C(
2#./0"9"7*/&9(C&/-",#(-"I&,;#(#"/*"R;$%"7,&20*/(+&,*&F9$#A(B",,$9&-*"'#(F$-I$$'(#-,$##(&';(#$9CR$#-$$%(
&#(I$99(&#(9*C$#-.9$(F$0&+*",(I&#(&9#"(,$2",-$;A(?0$(#-3;.(I&#(&22,"+$;(F.(-0$(*'#-*-3-*"'&9(,$+*$I(F"&,;A(

@)8&4/8"

?0$,$(I$,$(#-&-*#-*/&99.(#*7'*C*/&'-(;*CC$,$'/$#(F$-I$$'(#-3;$'-#(*'(&7$#(&';(.$&,#("C(#-3;.(I*-0(,$7&,;#(
-"(#-,$##(&';(9*C$#-.9$(F$0&+*",(/0&'7$#A(8(-"-&9("C(YUY(#-3;$'-#(I*-0(-0$(%$&'(&7$("C(4QAUV(W1@aHA4UX(
2&,-*/*2&-$;(*'(-0$(#-3;.A(!$7&,;*'7(%&,*-&9(#-&-3#J(#-&-*#-*/&99.(#*7'*C*/&'-(;*CC$,$'/$#(I$,$("F#$,+$;(C",(
#-,$##(&';(#$9CR$#-$$%A(89#"J(I$(C"3';(,&/$(;*CC$,$'/$#(F$-I$$'(#-3;$'-#(*'(9*C$#-.9$(F$0&+*",(/0&'7$#A(
6"#*-*+$(/",,$9&-*"'#(I$,$("F#$,+$;(I*-0(#$9CR$#-$$%(&';(9*C$#-.9$(F$0&+*",(/0&'7$#J(&#(#-3;$'-#(I*-0(
0*70$,(9$+$9#("C(#-,$##(#0"I$;(#*7'*C*/&'-(#$9CR$#-$$%(2,"F9$%#(&';(9*C$#-.9$(F$0&+*",(/0&'7$#A(

A+<.4&80+<8"

M3,-0$,(#-3;*$#(&,$('$$;$;(-"(&##$##(-0$(9"'7R9&#-*'7(*%2&/-#("C(BDdG@RUm(2&';$%*/("'(3'*+$,#*-.(
0$&9-0/&,$(#-3;$'-#A(D3,(,$#39-#(#0"I$;(-0&-(-0$(BDdG@RUm(2&';$%*/(*%2"#$#(#*7'*C*/&'-(2#./0"9"7*/&9(
*%2&/-("'(;$'-&9(#-3;$'-#A(
((

!"#$%&'()'*+$,#*-.(!$#$&,/0(1.%2"#*3%(4544(6,"7,&%((((((

LW$"@+8) ' 3<"7<01)*80/C"+,":)34/>"2.0)<.)"A+44)=)"+,"D)</34" 5)60.0<)"M4) ./*+<0."A0=3*)//)"- T3*)<)88(
!.&'([*' '$.<!(=3#0,&0(\9&0*<!(\9*'&F$-0( ) " "<!(B9&3;*&(EA(?$99$'(M,$*-&#<"(([&%,&'(8 I &'A"((

-&/>+*"-,,0403/0+<8"
! ! "#$%&'( ) '*+$,#*-.J(B"99$7$("C(N,&;3&-$(1-3;*$#<(" ! "#$%&'( ) '*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"
?0$(3#$("C(9/-," '*/(/*7&,$--$#(W$R/*7&,$--$#X(0&#(*' /,$&#$;(*'(&;39-#(*'(-0$( ) '*-$;(1-&-$#J(&';(,$/$'-(
#-3;*$#(0&+$(#0" I '(-0&-(%",$(-0&'(- I "(%*99*" '(&;"9$#/$'-#(&,$(3#*'7($R/*7&,$--$#(I *-0(%",$(C,$h3$'/.A(
K0*9$(" '7"*'7(#-3;*$#(&,$(0$92*'7(-"(F$--$,(3';$,#-&';(-0$(2"-$'-*&9(F$'$C*-#(&';(,*#L#("C($R/*7&,$--$#J(
-0$(*'-$'-*" '("C(-0*#(h3$#-*" ' '&*,$(I &#(-"(*'+$#-*7&-$(-0$(2$,/$2-*" '("C($R/*7&,$--$#(&%" '7(;$'-&9(C3-3,$(
0$&9-0/&,$(2,"C$##*" '&9##A(?0$(23,2"#$("C(-0*#(#-3;.(I &#(-"(h3&9*-&-*+$9.(%$&#3,$(0" I (0$&9-0(2,"C$##*" '&9(
#-3;$'-#(2$,/$*+$;($R

LX$"2+.034"; ' ?3./"+,"AVJ;DK!X"+<"7<01)*80/C" :)34/>.3*)"2/&6)</8"%3/0+<344C"3<6";</)*<3/0+<344C((
13L0L&,'(N&03'*&<!

NYa(@)6&.)6"-..)88"/+"D)</34"A3*)"D&*0<="AVJ;DK!X(
d&9(^"#$20((B0$$+$,<!(8%*,(E"0&_$,*A!((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"
?"(&##$##(-"(I0&-(;$7,$$(BDdG@RUm(0&;(&CC$/-$;(&//$##(-"(,"3-*'$(;$'-&9(/&,$A(

5)C6C&9(/6&1dj-0.002Tc/;'-&9BD(2$8T[(-&/)-10&;-0-&/

N!a(

’%15/"-#1$6&57&&

8("%1$)9&") :&;("-)$)9&

*+#,-"%,#&

N#$"-"2/3<63*60[)6"-??*+3.>"/+"I4++6"9*)88&*)"G*30<0<="0<"]0*8/Kf)3*"5)60.34"2/&6)</8(
8';,$I(!"%'$.<!(B0$9#$&(!"%'$.<"(e.'#$.(@,$IA!((

-&/>+*"-,,0403/0+<8"
! "

! "#$%&’() ’*+$,#*-.(!$#$&,/0(1.%2"#*3%(4544(6,"7,&%((VQ(f(6 & 7 $ (

NN$(;</)*?*+,)880+<34" b;9Mc" -./010/0)8" 3<6" ;</)*3./0+<8" K" -" A+ ' ?3*08+<" +," D063./0." A&**0.&4& ' " 3<6" @+/3/0+<"MP?)*0)<.)8"

"

\%*9.(B0,*#-*&'#$'<!([,*#-0$&'&(!*/"<!(8'7$9&(B03<!(E*/0$99$(>"'<!(\,*'(^"0&'#"'<!(13#&'(=73.$'A!(

(

-&/>+*"-,,0403/0+<8"

!"#$%&'()'*+$,#*-.J(B"99$7$("C(60&,%&/.(

(

9&*?+8)"

NQ$"93*/0.0?3/0+<"0<"A&**0.&4& ' aA&4/&*34"- ' (38836+*"R*+&?"/+"M<>3<.)"2/&6)</"I)4+<=0<=<)88(
^&/"F(?3C-<!(!&/0$9(="+&L<!(!"F$,-"(e&,&<!(],""L$(K*9;$,RB",,*7&'<!(^&/"F(1/0+&'$+$9;-A!((

-&/>+*"-,,0403/0+<8"
!!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"
BDdG@RUm('$7&-*+$9.(*%2&/-$;(#-3;$'-#y(&F*9*-*$#(-"(2&,-*/*2&-$(*'(9*+$J(*'R2$,#"'($+$'-#<(#-3;$'-#(I$,$(
3'&F9$(-"(*'-$,&/-(I*-0(2$$,#",(F3*9;($9&-*"'#0*2#(/,*-*/&9(-"(#3//$##(&';(I$99RF$*'7A({3&,&'-*'$J(#"/*&9(
;*#-&'/*'7(&';(+*;$"(/"'C$,$'/*'7(;*;('"-(/,$&-$(-0*#(2,"F9$%(0"I$+$,J(*-(#*%29.(&%29*C*$;(-0$(C&/-(-0&-(
;$'-&9(#-3;$'-#(#$$%*'79.(9&/L(/&%&,&;$,*$(&';(&(#$'#$("C(F$9"'7*'7'$###A(?0$(B3,,*/39 3%(&';(B39-3,&9(
8%F&##&;",(7,"32(I&#(/,$&-$;(-"(&99"I(#-3;$'-#(-"(F"';("+$,(#0&,$;(7"&9#(*'(-0$(0"2$#("C(*%2,"+*'7(
-0$*,($:2$,*$'/$#(I*-0*'(;$'-&9(#/0""9A(?0*#(7,"32(7*+$#(#-3;$'-#(-0$(&F*9*-.(-"(O]$(-0$(B0&'7$P("'(/&%23#(
&';($'&/-(,$&9R-*%$(/0&'7$(-"(C"#-$,(&(#$'#$("C(F$9"'7*'7'$###A(?0*#(#-3;.(I*99(2,"+*;$(;&-&(,$7&,;*'7(-0$(
CC/-*+$'$##("C(-0$(8%F&##&;",(7,"32(-"(*'/,$&#$(#$'#$("C(F$9"'7*'7'$##(&';(*'-$,$#-(*'($;3/&-*"'A(

5)/>+68"
M*,#-J(#$/"';J(-0*,;(&';(C"3,-0(.$&,(#-3;$'-#(*'+"9+$;(*'(-0$(B3,,*/39 3%(&';(B39-3,&9(8%F&##&;",#(7,"32(
W'tH5X(I*99(&--$';(&(%"'-09.(*'R2$,#"'(%$$-*'7(-"(;*#/3##(-"2*/#(,$9&-$;(-"(-0$(3'*+$,#*-.i#(/3,,*/39 3%(&';(
/39-3,$A(1-3;$'-#(0&+$(-&L$'(&(2,$(#3,+$.(&';(I*99(-&L$(&(2"#-(#3,+$.J(*'/93;*'7(h3$#-*"'#(,$7&,;*'7(-0$*,(
;$%"7,&20*/(*'C",%&-*"'J(#$'#$("C(F$9"'7*'7'$##(&-(-0$(3'*+$,#*-.J(#"/*&9(&':*$-.J(*'-,"+$,#*"'J(&';(-0$*,(
;$#*,$(-"(F$/"%$(&(C3-3,$($;3/&-",A(

@)8&4/8"
@&-&(I*99(F$(&'&9.'$;(&C-$,(-0$(#$/"';(#3,+$.(*#(7*+$'A(E39-*29$(9*'$&,(,$7,$##*"'#(I*99(F$(3#$;(-"(
;$-$,%*'$(I0*/0(C&/-",#(2,$;*/-(*'/,$&#$#(*'(#-3;$'-(L'"I9$;7$J(#$'#$("C(F$9"'7*'7'$##J(&';(;$#*,$(-"(
F$/"%$(&(C3-3,$($;3/&-",A(G';2';$'-(#&%29$(-R-$#-#J(2&*,$;(#&%29$(-R-$#-#J(&';(E&''RK0*-'$.(3R-$#-#(
I*99(F$(3#$;(-"(/"%2&,$(#3,+$.(,$#39-#A(D2$'($';$;(h3$#-*"'#(I*99(F$(/";$;(C",($%$,7$'-(-0$%$#A(

A+<.4&80+<8"
B"'/93#*"'#(I*99(F$(,$&;.(*'(M$F,3&,.("C(4544A(?0*#(#-3;.(I*99(2,"+*;$(%$&'*'7C39(;&-&(-0&-(/&'(F$(3-*9*'$;(
&-(&99(;$'-&9(#/0""9#(-"(F$--$,(3';$,#-&';(#$'#$("C(F$9"'7*'7(&';(0"I(-"(*%2,"+$(*-A(
((

NU$"J)*(340[)6"2/&6C0<="3<6"M43(+*3/01)";</)**+=3/0+<"0<"/>)"J0*/&34"A4388*++ ' (
^",;"'(D/L$.<!(!&/0$9(="+&L<"(\9*'&F$-0(]&*9$.<!(]$-0&'.(]9*'#L.<"#]3,L$(1"CC$<"(@&+*;(6&--$,#"'<"(^&%*$(
^$'#$'A!#(

-&/>+*"-,,0403/0+<8"

!],*70&%(g"3'7()'*+$,#*-.J(B"99$7$("C(e*C$(1/*$'/$#<("!"#$%&'()'*+$,#*-.J(B"99$7$("C(@$'-&9(E$;*/*'$(

9&*?+8)"

@3$(-"(23F9*/(0$&9-0(%$&#3,$#($'&/-$;(*'(,$#2"'#$(-"(-0$(B"+*;RUm(2&';$%*/J($;3/&-",#(&';(#-3;$'-#(
&9*L$(0&+$(F$$'(#3;;$'9.(-0,3#-(*'-"(-0$(,$&99%("C($%$,7$'/.("'9*'$(9$&,'*'7A(?"(F$--$,(3';$,#-&';(0"I(
&/-*+$(&';(/"99&F",&-*+$(9$&,'*'7(%$-0";#(/&'(&229.(-"(#-3;$'-#(#-3;.*'7(*'(*#"9&-*"'J(I$(/"%2&,$;(-0$(
CC/-#("C(-I"(-$&/0R&';Rh3$#-*"'(W?{X(&##*7'%$'-#a("'$(-0&-(3-*9*'$#(-0$(&/-*+$(9$&,'*'7(%$-0";("C(
,$/*2,"/&9(2$$,(-3-",*'7(&';(&(#"9"(+$,#*"'(-0&-(,$h3*,$;(*';*+*;3&9(+$,F&9*'$;(#-3;.*'7(&';($9&F",&-*+$(
'-$,,"7&-"'A(

5)/>+68"

K$(3#$;(&(h3&#*R$:2$,*%$'-&9(;$#*7'J(I*-0(#-3;$'-(2&,-*/*2&'-#($',"99$;(*'(UU(#$/-*"'#("C(&'("'9*'$(
'-,";3/-",.(03%&'(&'&-"%.(/"3,#$J('tUZSA(?0$(C,#-(-,$&-%$'-(7,"32(/"%29$-$;(,$739&,(?{(#-3;.(
&##*7'%$'-#(+*,-3&99.(I*-0(&(2$$,J(&';(-0$(#$/"';(-,$&-%$'-(7,"32(/"%29$-$;(-0$(#&%$(&##*7'%$'-(
*';2';$'-9.A(?0$(#-3;$'-#(/"%29$-$;(4Y(?{(&##*7'%$'-#(-"-&9A(899(&##*7'%$'-#(I$,$(&3;*"R,$/",;$;(
&';(329"&;$;(-"(-0$(9$&,'*'7(%&'&7$%$'-(#.#-$%(C",(/,$;*-A(

@)8&4/8

NW$"G>)"; ' ?4) ')</3/0+<"+,"G)4)>)34/>"2.)<3*0+8"3<6"AVJ;DK!X"G*30<0<="/+"9*)?3*)"%&*8)8",+*"/>)"]&/&*)"
+,":)34/>.3*)(

10&%&,(e$ &,;*<!(((

-&/>+*"-,,0403/0+<8"

!!"#$%&'()'*+$,#*-.J(B"99$7$("C(=3,#*'7(

9&*?+8)"

?0$(23,2"#$("C(/,$&-*'7(-$9$0$&9-0(#/$'&,*"#J(&';(-0$(*%29$%$'-&-*"'("C(BDdG@RUm(-,&*'*'7J(I&#(-"(
2,$2&,$(3';$,7,&;3&-$('3,#*'7(#-3;$'-#(C",(-0$(C3-3,$("C(0$&9-0/&,$(&';(-0$(;$9*+$,.("C(/&,$(3#*'7(
-$9$0$&9-0A((1-3;$'-#(I$,$(2,"+*;$;(-0$("22",-3'*-.(-"($'7&7$(*'(UA(8##$##*'7(&(/9*$'-(3#*'7(-$9$0$&9-0(
/"%%3'*/&-*"'(-$/0'*h3$#J(4A(3

R

NX$"D)1)4+?0<="3"E)3*<0<="G++4",+*"@+8) ' 3<"9>3* ' 3.C"2/&6)</8K"G>)"A+</0<&34"M1+4&/0+<"+,"@+8) ' 3<"
I380.8(

?&.9",(?&.9",<!(=*/"9$(d$'-,$99"<!(E&0;$$;(!&_&<!(10&' ' "'([*'&,;<!(B&-0$,*'$(D# I &9;<!(B0,*#-"20$,(1"A!(

-&/>+*"-,,0403/0+<8"

! ! "#$%&'() '*+$,#*-.J(B"99$7$("C(60&,%&/.(

9&*?+8)"

G'(^39.("C(454UJ(! "#$%&'(B"99$7$("C(60&,%&/.(WBD6X(9&3'/0$;(&(#$9CR2&/$;(" '9*'$(/"3,#$(-*-9$;(! "#$%&'(
]&#*/#(W!]XA(?0*#(/"3,#$(I &#(;$#*7'$;(-"(*'-,";3/$(*'/"%*'7(#-3;$'-#(-"(+&,*"3#(/" '/$2-#(2,*",(-"(
%&-,*/39&-*'7(*'-"(20&,%&/.(#/0""9J(&#(I $99(&#(2,"+*;$(,$#"3,/$#(" '/$(&(#-3;$'-(*#($',"99$;A(?0$(2,*%&,.(
23,2"#$("C(-0*#(2"#-$,(*#(-"(;$#/,*F$(-0*#(! "#$%&'(]&#*/#(B"3,#$A(((1$/" ';&,.(2"*'-#(*'/93;$(*;$'-*C.*'7(
I 0&-("-0$,(20&,%&/.(#/0""9#(0&+$(;" '$(&#(I $99(&#(I &.#(-"(*%2,"+$(-0$(/3,,$'-(/"3,#$(I *99(F$(#0&,$;A(

5)/>+68"

E$%F$,#("C(-0$(BD6(B3,,*/39 3%(B"%%*--$$(2,"+*;$;(*'C",%&-*" '(,$7&,;*'7(-0$($+"93-*" '("C(-0$(!](-"(
-0$(&3-0",#("C(-0*#(2"#-$,A((?0$(&3-0",#(I *99(2$,C",%(7$'$,&9(#$&,/0(h3$,.(3#*'7(#$&,/0($'7*'$#J(#3/0(&#(
N""79$(1/0"9&,(&';(63FE$;J(3#*'7(+&,*"3#(L$. I ",;#(&';(20,&#$#A(M3,-0$,%",$J(23F9*#0$;(9*-$,&-3,$(
#$&,/0$#(I *99(F$(;" '$(#$$L*'7(*'-$,$#-*'7(#-,&-$7*$#(C",(-0$(/" '-*'3$;(;$+$9"2%$'-("C(#3/0(&(29&-C",%A(
B"99$/-$;(9*-$,&-3,$(I *99(F$(,$+*$ I $;(&';(/"%2&,$;(-"(-0$(!](/"3,#$(-"(*;$'-*C.(2"-$'-*&9(I &.#(-"(*%2,"+$(
-0$(/"3,#$A(

@)8&4/8"

?0*#(,$#$&,/0(*#(" '7"*'7(&';('"-(.$-(C*'*#0$;A(

A+<.4&80+<8"

?0$(/" '/93#*" '(*#(&(I ",L(*'(2,"7,$##(&';(I *99(*'/93;$(C*';*'7#(C,"%(-0$(%$-0";#(#$/-*" '#A(899(,$#$&,/0(I *99(
F$(/" '/93;$;(&';(,$2",-$;(32" '(F.(-0$(! "#$%&'(,$#$&,/0(#.%2"#*3%A(
(

! "#$%&'() '*+$,#*-.(!$#$&,/0(1.%2"#*3%(4544(6,"7,&%((ZH(f(6 & 7 $ (
(

ROSEMAN UNIVERSITY

SCIENCES